SPACE

Activity Pack

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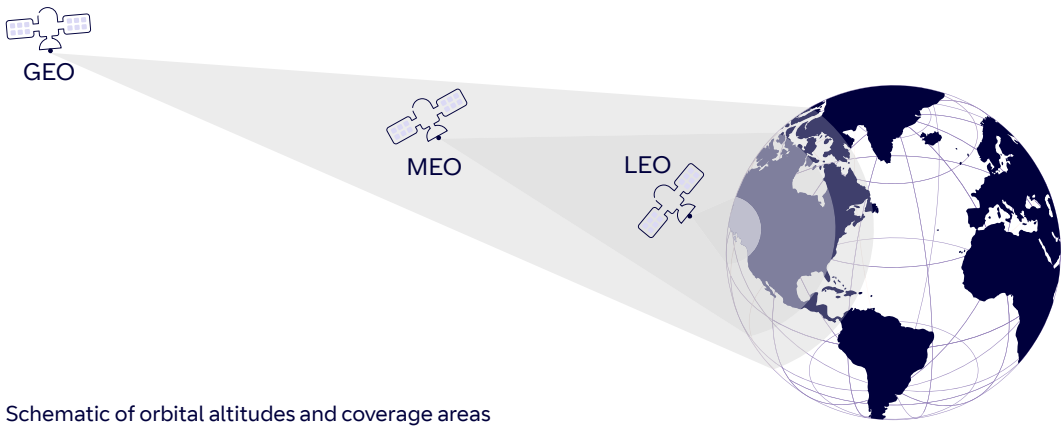
Space is such a huge and exciting topic! When you think about space, you may think of planets, aliens, or rockets. For this activity we've focused on satellites that orbit in space and look at how they can be used to increase connectivity back down on Earth or provide helpful services for us humans.

Let's focus on three types of satellite in space. LEO, MEO & GEO starting with the ones furthest from Earth:

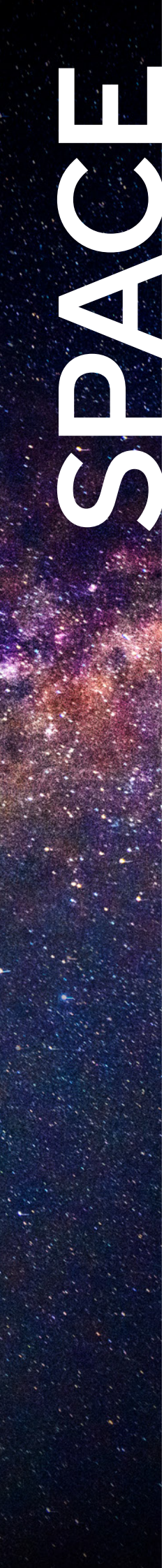


Schematic of orbital altitudes and coverage areas

GEO (Geostationary Equatorial Orbit) Altitude: 36,000km above Earth
GEO satellites stay above the same point on the ground because they follow the rotation of the Earth. They are used to help provide services like weather data or TV shows. They are quite far away though and therefore introduce latency into the network (latency is the time it takes for data to be sent from one machine to another, the smaller the better).

MEO (Medium Earth Orbit) Altitude: 5,000 - 20,000km above Earth
MEO satellites are sometimes referred to as the 'Goldilocks Orbit' because they're not too close and they're not too far away, they're just right! By being closer to Earth than GEO, MEO satellites have a lower latency and much better signal strength (more megabits per second). But by being a bit further away compared with LEO satellites, they can 'see' more of the globe, and therefore you don't need as many satellites to provide coverage to the entire planet. They've traditionally been used for things like GPS but are now starting to be used to supply internet connectivity to remote areas or places like cruise ships in the middle of the ocean!

LEO (Low Earth Orbit) Altitude: 500 - 2,000km above Earth
LEO satellites have the lowest latency, which is great, but because they orbit so much closer to Earth, they don't cover as much area and therefore you have to launch thousands of satellites into space to achieve full Earth coverage! By using these satellites in space, you can provide signal to rural areas where you otherwise wouldn't be able to connect to the internet, stream music or play your games console online!



We'd love to see pictures of you all getting involved with the activities. Show us your satellite models and definitely send in those Space badges you've designed!

Email these to us at computerscience@bt.com stating your school and key stage, or post on social media and mention @adastralpark with the hashtag #BSW23.

Links

Teacher Links:

- Royal Observatory Classroom Resources <https://atadastral.co.uk/go/bswspt01>
- National Space Centre Education: Free Downloadable Resources <https://atadastral.co.uk/go/bswspt02>
- UK Space Agency: Educational Resources <https://atadastral.co.uk/go/bswspt03>
- NASA STEM Engagement <https://atadastral.co.uk/go/bswspt04>
- The European Space Agency: Primary Classroom Resources <https://atadastral.co.uk/go/bswspt05>
- The European Space Agency: Secondary Classroom Resources <https://atadastral.co.uk/go/bswspt06>
- European Southern Observatory: Educational Material <https://atadastral.co.uk/go/bswspt07>
- The Royal Society: Teacher Resources <https://atadastral.co.uk/go/bswspt08>
- European Space Education Resource Office CPD & Resources <https://atadastral.co.uk/go/bswspt09>

Find Out More:

- Careers in Space <https://atadastral.co.uk/go/bswspf01>
- Tim Peake's Spacecraft <https://atadastral.co.uk/go/bswspf02>
- Drones <https://atadastral.co.uk/go/bswspf03>

Have A Go:

- Satellite Viewer <https://atadastral.co.uk/go/bswsph01>
- NASA Fun Activities To Do @Home <https://atadastral.co.uk/go/bswsph02>
- The Moon Adventure <https://atadastral.co.uk/go/bswsph03>
- No Pressure <https://atadastral.co.uk/go/bswsph04>
- Rugged Rovers <https://atadastral.co.uk/go/bswsph05>
- Institute of Physics Activity Packs <https://atadastral.co.uk/go/bswsph06>
- Astro Pi Challenge <https://atadastral.co.uk/go/bswsph07>

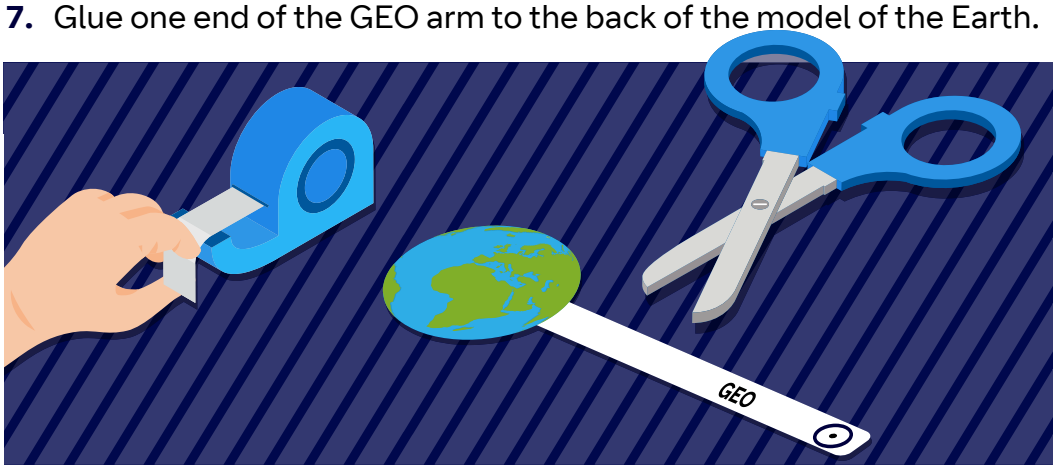
ACTIVITY 1

Kit List

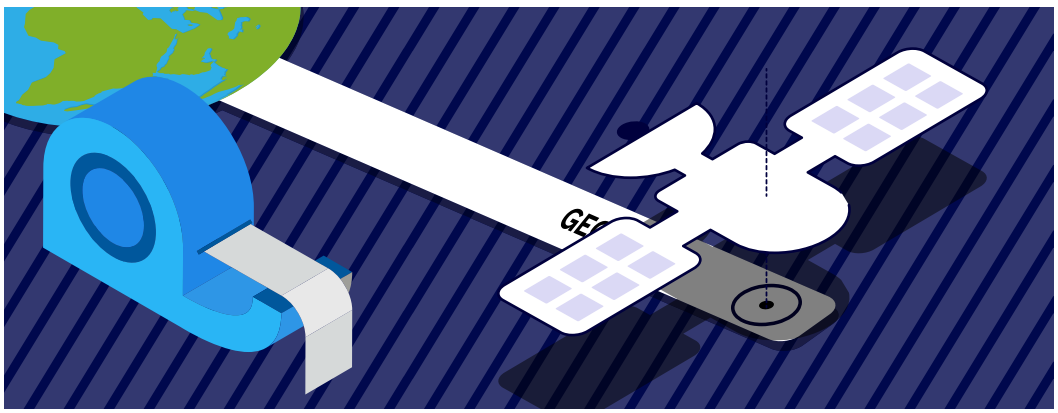
- Cardboard (cereal box, shoe box or any thin card)
- Scissors
- Printed Template 1 (page SP6)
- Pen or pencil
- Colouring pens or pencils
- Paper fasteners
- Glue
- Sellotape

Instructions:

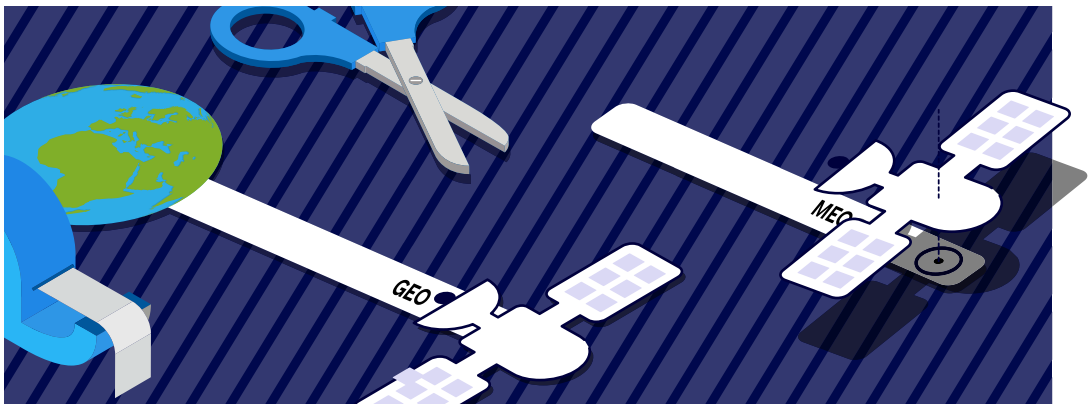
1. Cut out a piece of cardboard so it is the same size as a piece of A4 paper.
2. Print out the Template on page SP6 onto some A4 paper.
3. Stick this Template onto the piece of cardboard with some glue.
4. Using scissors, cut around the lines on the Template to give you the 7 parts needed to build this model.
5. On the three squares you have cut out, it's time to get creative! You need to design your own LEO, MEO & GEO satellites by drawing them in the correctly labelled square.
6. Once you've drawn them, colour them in and then cut them out.
7. Glue one end of the GEO arm to the back of the model of the Earth.



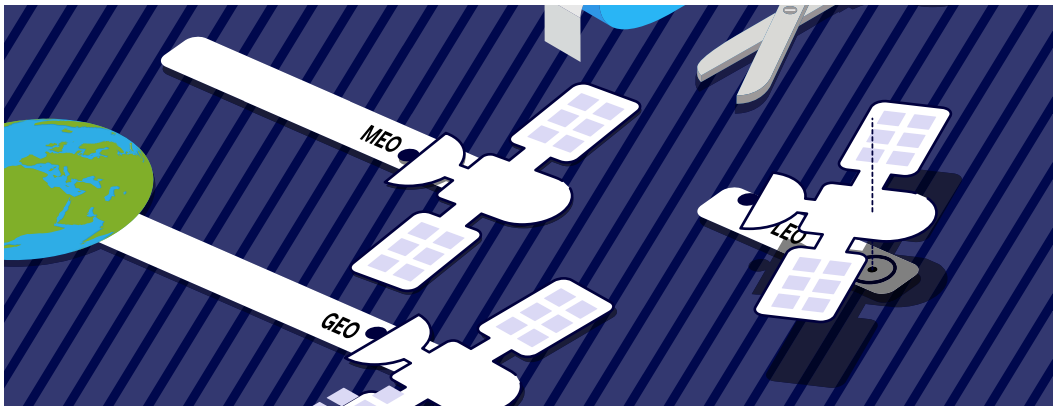
8. Glue or Sellotape one end of the GEO arm to the back of the Earth cut-out like this:



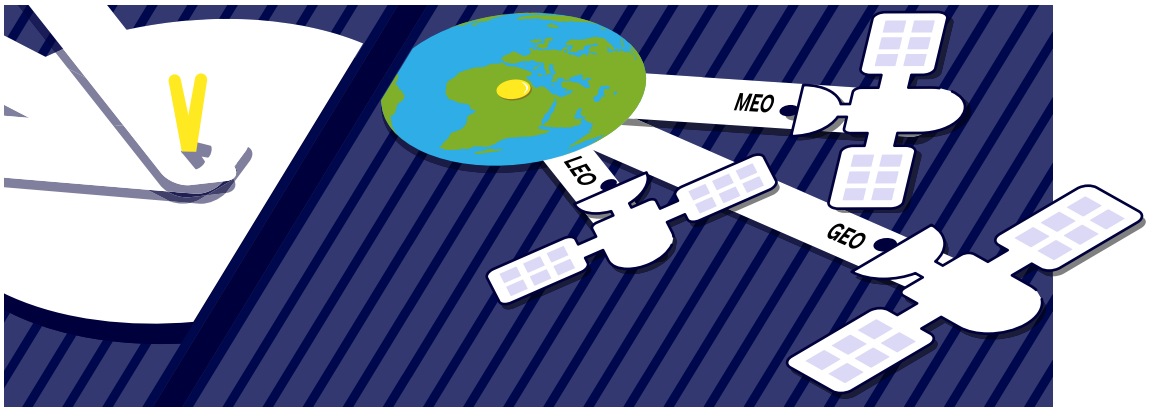
9. Using glue, Sellotape, or a paper fastener, attach the MEO satellite model you've designed to one end of the MEO arm:



10. Using glue, Sellotape, or a paper fastener, attach the LEO satellite model you've designed to one end of the LEO arm:



11. Using a paper fastener, attach the other ends of the MEO and LEO arms to the model of the Earth:



You can now move your LEO, MEO & GEO satellites around Earth to emulate how they orbit our planet in real life. Can you now see how the Geostationary equatorial satellites don't move position in relation to the Earth, as they follow the rotation of the globe? Can you also now visualise why so many more LEO satellites are needed in order to provide coverage to the entire planet?

Take a read about Starlink and OneWeb to see what cool things are being done right now with LEO satellites.

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Template 1

Cut along the dotted lines

Geostationary Equatorial Orbit (GEO)

Medium Earth Orbit (MEO)

Low Earth Orbit (LEO)

Design your own:
Medium Earth Orbit (MEO) satellite

Design your own:
Geostationary Equatorial Orbit (GEO) satellite

Design your own:
Low Earth Orbit (LEO) satellite

Build your own space badge

We know there are lots of passionate Space enthusiasts out there, it's such a vast, amazing topic… how can you not be interested? You may be part of a Space club; it might be your favourite thing to learn about at school or it might be your personal hobby. If so, you're part of the world Space community.

However, wouldn't it be great to have a visual identity for the Space community? To have a badge that identifies you and makes everyone feel part of one big Space team?

We've seen some amazing designs out there in real life by the likes of NASA, the US Space Command but also in movies too, such as the Star Trek Starfleet Command badge. So we'd really love you to create your own badge.

Get creative and design a 'World Space Community' badge! You can use pictures of rockets, satellites, antennas… anything space-related. Our only requirements are that it is:

- Creative
- Includes 'World Space Community' somewhere
- Looks great

Once you've created your badge, please share it with us by emailing it to computerscience@bt.com.