

Get Me Into Orbit – Video 3 – The Future of Satellites

Hi everyone! I'm Zara from Glasgow Science Festival. Can you believe we're almost at the end of Get Me into Orbit?!

But, it's not over yet... this week, we're looking into.... The future!

We've learned a lot over the past couple of weeks about different kinds of satellites, what they're used for and how to launch them.

But what's next for the world of satellites? Which ones are being built now, and when will they launch? How will they affect life on Earth? Let's go ask some space scientists...

(Tom) I think there's going to be a lot more satellites. Obviously we're a satellite company, we build satellites, our goal is to increase production to the point that we're doing satellites every week, that would be the goal – maybe even daily eventually. I think there's going to be a lot of constellations, so networks of satellites launched and they're going to service new uses that people are still trying to get their heads around. I think generally satellites will get smaller and more commercial and there'll be a lot more of them.

(Hina) Well actually I think things are changing quite rapidly over the last few years and in the next 5-10 years. Up until now we've really concentrated on the much larger satellites and they're very expensive and difficult to get into orbit. We talked about the Sentinel satellites – those are huge satellites that we were talking about but actually what's happening now is that we're moving to much smaller satellites. One of the key important points that we would want to use small satellites for is that we can replace them very quickly. Most people have a mobile phone and the technology that we have on a mobile phone, we'd like to make sure that it's the best information, that it's the best quality data that we have on there. But you think about the Rosetta satellite, it has instrumentation that was built in the mid 1990s. So if you think of the technology that went on board that satellite, which then landed on a comet, the data coming down is limited by the amount of information that it can store. So we want to be able to get the best information using the best technology and we can't do that when satellites are taking 10-20 years to be developed in the missions lab. So the smaller satellites allow us to have far more accurate engineering quality and far better data products on there, and then we can replenish them much quickly so we get the better data coming out.

(Giovanna) I'm speaking about CubeSats. I know that NASA is working on a project, they are trying to assemble a CubeSat with the propulsion model. And sending the CubeSat to other planets outside the atmosphere. So this is a big change in the technology of CubeSats, it's something completely new.

At the moment where do the CubeSats go, are they mostly quite close to planet Earth?

Usually they are on the low orbit so they are between 500 and 1000km far from the Earth. So it's a huge change considering the small dimensions and the other requirements of the CubeSat.

Which planet do you think they'll go to first?

My feeling is that Mars could be the first. Mars, that's quite far away but it could happen! Maybe.

Let's summarise our predictions for the future. In the future there might be more satellites; constellations or networks of satellites; smaller satellites that are more easily replaced; and satellites like CubeSats might reach other planets, like Mars.

Now, let's look at some of the future missions.

With me now is Kevin, hello Kevin. What will satellites be used for in the future?

There are a number of different missions planned, I'll give you some examples so that you can get an idea. So, the Picasso mission is led by a collaboration that include Clyde Space here in Glasgow. The mission is going to use CubeSats to measure the distribution of ozone in the atmosphere as well as other measurements like temperature. It's due to be launched at the end of 2019. Not long!

Another mission is the JUICE Mission or the Jupiter Icy Moons Explorer. It will be launched in 2022 and explore Jupiter and its icy moon, Ganymede. Because of the distance from the sun, the spacecraft will need really big solar panels. We're looking at a surface area of approximately 100 square metres. It will be equipped with special instruments like radar sensors that can have got the ability to see through ice.

We've also got the FLEX Mission which is a European Space Agency mission that will launch, again in 2022. The FLEX satellite will monitor the health of the Earth's vegetation by measuring the faint glow that plants give off when they convert sunlight and carbon dioxide energy into energy.

These are just a few examples – there are lots of other possibilities on the horizon. Satellites could be used to spot mine fields in countries like Afghanistan. They could help give the world global broadband coverage. Some companies are looking to use 3D printing to build their satellites on the ground as well as in space, because if you can build the satellite in space you don't need to launch it there.

I think we can agree, it's an exciting time to be working on satellites.

We've talked about some of the satellites that will be in orbit in the future. But where will we launch them from? Well, there's a good chance that one day satellites will launch from the UK. There are plans for spaceports to be in operation by 2020. So far, 8 sites have been suggested as possible spaceports, with 6 of them in Scotland. Last week, we talked about what makes a good space port. Can you remember? Pause the video and feedback to your teacher.

Spaceports need to be in areas of low population density, have long runways and good transport links. So... where in the UK might we be launching from in the future? Let's take a look at one of the Scottish candidates: Prestwick Airport! Prestwick is the only place in the UK where rock 'n' roll star Elvis Presley set foot, back in 1960. Nowadays, the airport is popular for holiday getaways. But in the future, it could become a launch site for satellites.

Prestwick has a 2,986 metre-long runway. Instead of launching vertically, the spacecraft would launch horizontally. A long runway means that the spacecraft would pick up enough speed to take-off.

Prestwick also has excellent transport links - and it's only a 40 minute drive from Glasgow which, as we know, is one of Europe's biggest satellite-building cities. Prestwick would be a lot handier than the Kazakhstan desert.

Kevin, if Prestwick does opens as a spaceport, how will this affect the industry?

Having a space port that close to Glasgow where we've already got a hub of satellite manufacturers would be really good because all of a sudden you don't have to transport all the way to Kazakhstan, you can just transport down the M8 and that's you, you're there. So you've got this space port,

round about that space port new companies will form such as Orbital Access who are looking at air launch systems for different ways of getting satellites into space. You've then got the port services round that, that will look at new ways of using the space port, looking at new ways of developing satellites, looking at new ways of using the data from satellites and of course all of this, will create more jobs.

Speaking of jobs, the UK is hoping to create 100,000 space sector jobs by 2030. Here's a quick run down of the huge number of opportunities in the space sector.

Number 1, Astrobiologist. Is there life on other planets? Ask an astrobiologist! These are scientists who study what life needs to survive. They visit places on Earth that are the most similar to those in space - like deserts and oceans - and they study what lives there. And they do experiments to see what survives in different environments.

Number 2, Astronaut - I'm sure you've all heard of astronauts! These are the people who actually go into space. The first British astronaut to go into space was Helen Sharman in 1991. Tim Peake went to space in 2015. Astronauts do special experiments in space to help further our understanding of science. To be an astronaut, you have to be very mentally and physically fit and exercise for several hours a day to prevent your bones from losing density.

Number 3, Astronomer - astronomers - or astrophysicists - study the objects in our universe, from the planets in our solar system to galaxies, the sun and other stars. They use equipment like telescopes to observe space and computers to analyse data and make calculations.

Number 4, Engineer - there are lots of different kinds of engineer working in the space sector. They design and build all kinds of things. Kevin - who we met earlier - has been working on a drill for taking samples on Mars. Other engineers design things like spacecraft, launchers and computer software.

Number 5, Space medical professional - these are scientists and doctors who study the effects of space on the human body. Space is a harsh, dangerous place. Astronauts are exposed to radiation from the sun, and the low gravity means that their bones and muscles begin to break down. Space medical professionals do experiments to find out more about these processes and how to prevent or treat them.

You can find out more about these jobs at spacecareers.uk.

In the next video, scientists and engineers will be answering your questions about space and what it's like to work on satellites.

So... who's going to design and build satellites in the future? Or plan missions to outer space? Or build the rockets and space planes to get us there?

The answer is of course.... You! The scientists and engineers of the future are sitting in this room.

Over the past few weeks we've learned about the huge range of satellites and the amazing things that they can tell us about Earth and space. We've experimented with rockets and explored old and new places to launch our satellites from.

Now, it's time to use what you've learned for a special challenge. We'd like YOU to design your own space mission.

What satellite and rocket will you use? Where will you launch? And what's the mission for? It's totally up to you! We're looking forward to seeing what you come up with.

And we've another challenge for you. We want you to use satellite data to help Debbie locate whales in our oceans. Good luck, and we look forward to hearing about your missions!