

Get into Space with Engineering

How is engineering used in space?

It is true that physics has enabled us to understand more about the universe around us, but without engineering – the application of maths and physics – we would not have been able to build the satellites and spacecraft that have made it possible. It wasn't rocket scientists who sent the first rockets into space, it was engineers!

Engineering is different to the sciences in that there is a clear focus around practical solutions and there is often an objective to build or design an object. This means that in addition to have excellent knowledge of maths and physics, engineers are very creative and innovative in their approach to problem solving.

Spacecraft

The first spacecraft were launched in the 1950s and 1960s by the Americans and Russians. Some of these designs were based on weapons of mass destruction: they essentially put a capsule to contain passengers on the top of the rocket instead of a detonator. The approach was successful as the Russians were the first to put a man in space – Yuri Gagarin and the Americans followed that feat less than a decade later when Neil Armstrong became the first person to walk on the moon.

Today we still build craft to send humans into space, but we have recently restricted ourselves to orbit and the International Space Station. Instead of governments being the only ones to fly humans into space, we have seen several commercial companies begin building, designing and testing their own spacecraft for launch. There are several different approaches, one successful UK company has designed a spaceplane called [Skylon](#) which will launch and land just like a normal aircraft, but can still fly to space. The engineers at Reaction Engines have designed this spaceplane so that it can use the same engines in the atmosphere and in space, a wonderful achievement.

There are many different kinds of engineering required to build a spacecraft, regardless of whether there are any human passengers. For example, aerospace engineering supports the design of the structure and shape of the craft whilst areas such as aeronautical engineering develop the electrical systems used to make the spacecraft operational. Then there are those who are responsible for launching the spacecraft. A separate team will develop the rocket which will be used to send the craft into space. There is no shortage of tasks for an engineer on a space mission.

Satellites

We have many different uses for satellites and they are an important part of the space sector. The UK builds a large proportion of the world's satellites. Engineers are required to design and build these instruments. Often this can mean developing an entirely new kind of satellite from the power system to the shape and size or it can mean adapting an existing model.

The instruments that are sent on satellites are sometimes built by the same company that designs and builds the satellite or the instrument can be provided to them by a partner organisation or client. There are many different modules that make up a spacecraft and different engineers will be responsible for their design. A wide range of expertise is often required to build a successful satellite. The satellite needs to be able to communicate with the ground, so a means for it to talk to us has to be designed and installed. This can mean installing a dish or a radio antenna. It also needs memory storage for all of the data it will collect and this will also contain its operating system. This needs to be able to operate in a harsh external environment with extremely high and low temperatures. Satellites will also have engines on board to allow them to manoeuvre into a different position or to get out of the way of space debris.

There are many aspects that have not been mentioned. Why not explore this topic for yourself?

See what you can discover!

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How do I get into space?

Subject options for your A-levels, Highers or International Baccalaureate are very important as they influence what courses and career options you have in the future. Mathematics is a very important subject for universities. Further Maths (for A-level applicants) is not necessarily a requirement, but it is worth looking at university entry requirements when making your subject choices. This is good advice, regardless of the type of qualifications you are taking. Physics is a requirement for the majority of engineering courses, but some universities may be flexible on this as you will be taught the subject as part of your degree.

There are thousands of engineering course options that include combined courses and those with industrial placements or a “sandwich” year. Spending time researching the different types of engineering is very important. Each strand of engineering has a professional body that represents the subject. They are a good place to find advice.

If you want to experience engineering whilst at school or college, the professional bodies and universities offer education programmes where you can visit a company, attend a careers talk or spend a day at a university attending lectures and classes.

What can I do in space?

By completing qualifications in physics, there will be many employment opportunities open to you. Physicists have excellent problem solving, analytical and mathematical abilities. Communication skills are also very important. Below is a small selection of employment areas. More options can be found at www.futuremorph.org and salary information is sourced from www.prospects.ac.uk

Aerospace Engineer | Minimum requirements: university degrees | Starting salary: £20,000 - 25,000

There are many different aspects to this job and aerospace engineers can have responsibility for many different areas of a spacecraft. This could be the design of a propulsion system or testing new materials for use in the spacecraft. Often aerospace engineers will specialise in a particular area.

Mechanical Engineer | Minimum requirements: university degrees | Starting salary: £20,000 - 28,000

This role is focussed on the processes and procedures of building a satellite or spacecraft. Mechanical Engineers will work to implement a tested design along with engineering colleagues, manufacturers and clients. In the case of satellites, this can mean building a supply chain and robust manufacturing process for a number of satellites.

Electronic Engineer | Minimum requirements: university degrees | Starting salary: £18,000 – 29,000

If a system involves the use of electricity, then an Electronic Engineer will be involved throughout the design and build stages of a project. This could be the development of a new power source in a spacecraft or improving on the design of previous components.

Useful links

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| Institute of Mechanical Engineering | www.imeche.org |
| Institute of Engineering and Technology | www.theiet.org |
| Royal Aeronautical Society | http://aerosociety.com/ |
| Royal Academy of Engineering | http://www.raeng.org.uk/ |
| Futuremorph | www.futuremorph.org/my-future-finder/space |
| UK Space Agency | www.bis.gov.uk/ukspaceagency |
| ESERO: the UK Space Education Office | www.esero.org.uk |
| UCAS | www.ucas.ac.uk |