



# Who builds satellites?

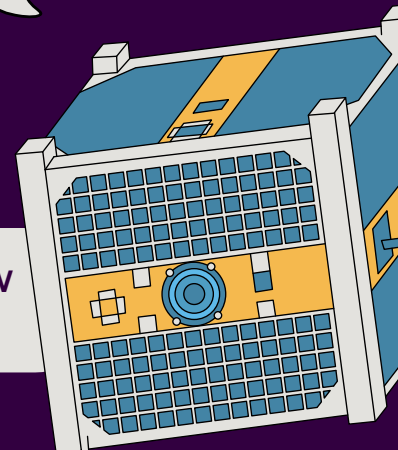
## How can you work in space?



Did you know there are satellites the size of rhinos?



And ones as small as ducks?



Well now you do!

Whether large, medium, micro or nano, satellites can track polar bears, test new equipment, and take detailed photos of Earth. With so many satellites and so many different uses for them, it's no wonder the UK's small satellite industry is booming with jobs.



For school



For home

## Activity

In this activity you'll dive into the world of small satellites (also known as CubeSats) – what they're used for, what they're made of, how they're built and who builds them. CubeSats may be small but it takes a mighty effort to build them and get them into space. Let's learn about all jobs involved in building and launching CubeSats here in the UK.

# Guidance for teachers, parents and guardians



During this activity children will learn about the process of building, and launching a small satellite (i.e. design, manufacturing, testing and launch) from a UK spaceport by making one themselves.

Activity: Design your own CubeSat.

Approximate time: 60 minutes.

Target age: 11-14 year old, KS3.

## Specific Learning Outcomes:

- I can explain what a CubeSat is and how it is built.
- I can name some of the job roles and people involved in building and launching satellites from the UK.
- I can explain why you don't need to be a rocket scientist to have a career in space.

## Activity Resources/ materials

- Computer with internet access **to show video material** (noted in instructions).
- Activity sheet with CubeSat template – **one printout for each child.**
- Pencils and markers.
- A variety of different 'building' materials like paper, cardboard, foil, string, glue sticks.



# Extra guidance for those in the classroom

All activities are focused on raising awareness of the varied careers in the UK space industry and are tailored to a specific age group. The aim is to inspire students towards an interest in further STEAM activities and relevant careers.

## Curriculum subjects

- Science: Physics
- Space

This resource will help you to equip students “with the scientific knowledge required to understand the uses and implications of science, today and for the future.”

Some **crossover curricula** links include: English, Maths, Art and Design and Computing.

Children will engage in **skills** such as: independent research, designing, organising material, written transcription and composition, exploring ideas, using new vocabulary, creative thinking and making formal presentations.

## Activity resources /materials

- Projector and computer with internet access and sound – **to show whole class videos** (noted in instructions).
- Computers with internet access – all children will need access to a computer for research.
- Activity sheet with CubeSat template – **one printout for each child.**
- Pencils and markers – enough to go around the class.
- A variety of different ‘building’ materials like paper, cardboard, foil, string, glue sticks – **enough to go around the class.**
- Please note that children will need to be sat in groups of 2 or 3.

# Instructions



## Starter

1. Define what a small satellite (CubeSat) is using this cool [video](#).
2. Introduce the four **types of CubeSat missions**, as listed below, and ask students to think of uses for each one (use the 'four types of CubeSat missions' table [on this page](#) to help you guide the children)
  - a. Technology demonstrations = testing a new camera which will go to the International Space Station.
  - b. Science experiments = collecting information on black holes.
  - c. Educational projects = students use them to track the movements of animals.
  - d. Commercial activities = taking high quality photos of Earth to sell to others.

## Main Lesson

1. **Discuss the basic elements of a CubeSat** – use the 'Intro' part of [this game](#) to show children the seven things every CubeSat needs: a computer, power, communications device, steering system, navigation, propulsion and a payload.
2. Introduce some more specific components (use [page 2](#) of this PDF to help guide the discussion) and ask children to guess what they are e.g.
  - a. A gravity probe: measures gravity.
  - b. Solar cells: collects energy from the sun to power the CubeSat.
  - c. High-gain communication antenna: receives commands from Earth and returns data to us.



# Instructions

## Activity

1. Give each child an activity sheet, which has a CubeSat template on it.
2. In **Task 1** ask the children to label the 5 components on the CubeSat template from the short list on the page.
3. Get children into groups of 2 or 3 and ask them to research one component on the computer: solar panels. They need to find out which job roles are responsible for designing or building it – give them a 10 minute time limit – and ask children to write some of the roles down for **Task 2** e.g.
  - a. Solar panels are made up of 6 basic components (see basic image and info [here](#)): frame, glass, encapsulant, solar cells, backsheet and junction box.
  - b. Solar engineers design the solar cells (Photovoltaic); manufacturers fabricate and build the solar panels; QA (Quality Assurance) analysts monitor the quality of the products throughout the build process.
  - c. This is to make them aware of the processes and roles involved in each step of satellite building.
4. In the final **Task 3** ask the groups to build their own CubeSat models using materials such as cardboard, foil and paper.
5. If there is time once built, ask a few of the groups to show their model and point out a few components (glass, junction box...) and who makes them.

# Resources for teachers or parents/guardians

Here you will find all the links and background information you will need to support you, plus further resources if time/interest allows.

## Setup resources

### What is a CubeSat?

- Play this quick 1 minute [video](#) to introduce CubeSats; their size, why they're so popular in the space industry and their uses.

### CubeSats in a nutshell

- [This webpage](#) explores CubeSats in a bit more detail: how they're launched into space, the pros and cons of using small satellites, who uses them (schools, governments and industry).

### What are the basic elements of a CubeSat?

- The introduction section of this interactive [NASA game](#) is a good tool to show children the basic elements of a CubeSat.
- If there is time at the end of the lesson, children could play the game.

### Building a satellite

- On page 2 of this PDF [from NASA](#) there is a list of a few of the instruments/components that make up a satellite and their uses.

### Components of a solar panel

- Use this image at the top of [this page](#) to show children if they need help getting started on the research. They can then look up each of the 6 components and work out who is responsible for the design/build/ manufacturing.



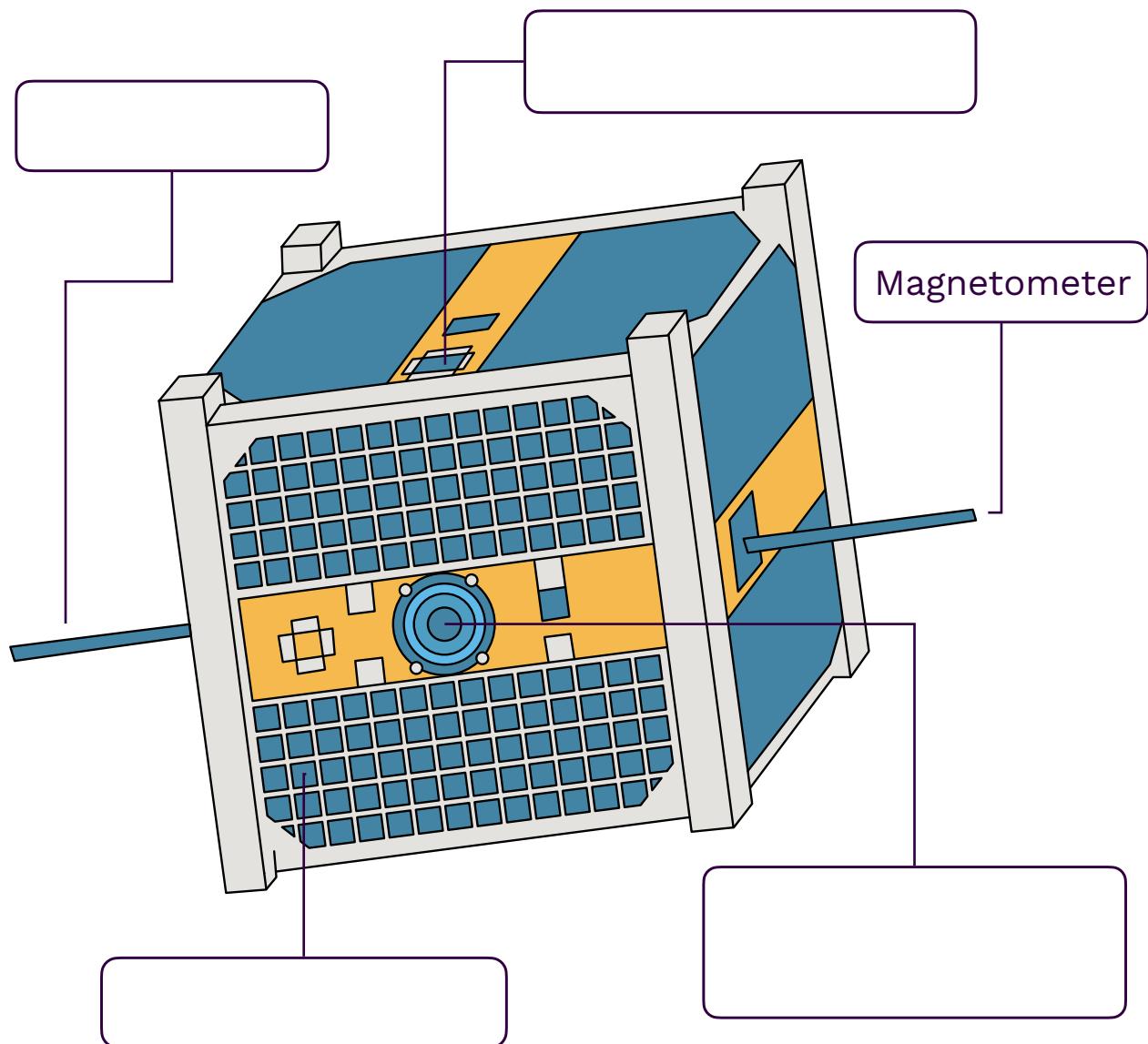
# Activity sheet

## Who builds satellites?

### Task 1: What is a CubeSat?

Can you label the CubeSat with the right instruments?  
The first one is already done for you.

- Magnetometer.
- Antenna.
- Gravity probe.
- Solar panels.
- High resolution camera.



## Task 2: Solar panels on a satellite

1. There are six basic components of a solar panel.  
Can you find out and write down the names of four of them?
2. Do you know who is responsible for making each of the four components? Find out and write your answers down below.

**Component 1:**

**Who is responsible for making it?**

**Component 2:**

**Who is responsible for making it?**





**Component 3:**

**Who is responsible for making it?**



**Component 4:**

**Who is responsible for making it?**



**Task 3: It's time...to build your own satellite!**

Grab some pens, paper, cardboard and foil and start building your CubeSat!

Use the diagram in Task 1 to help you and don't forget to include things like the antenna or camera

