

Engineering the Battle of Britain

Workshop Overview

Workshop statement

Find out how STEM played a major part in the Battle of Britain by looking at different job roles of the 'Many' and the 'Few'. This engaging, hands-on workshop involves discussion, games and a creative STEM based challenge to get your students thinking on their feet!

Curriculum links

Mathematics

- Calculation strategies to solve increasingly complex problems.
- Number – use standard units of mass, length, time, money and other measures, including with decimal quantities.
- Statistics – describe simple mathematical relationships between two variables.

Science

- Experimental skills and investigations.
- Analysis and evaluation.
- Physics - Motion and Forces.

Design and Technology

- Evaluate – Test, evaluate and refine their ideas and products against a specification.
- Technical knowledge – Understand and use the properties of materials and the performance of structural elements to achieve functioning solutions.

History

- challenges for Britain, Europe and the wider world 1901 to the present day.
- A local study.

Supplies list

Pencils

Tape

Safety Scissors
(www.amazon.co.uk)

Assorted tissue paper
(www.glsed.co.uk)

Tape measure
(www.zoro.co.uk)

Blue paperclips
www.reichelt.com
www.amazon.co.uk

Thick cotton
(www.myfabrics.co.uk)

Laminated items:

- A3 stained glass windows.
- Charade cards (4 sets to be provided by Muddy Publishing).
- Design a Parachute Intro x 8 (1 per group of 4/5 students).

Printed worksheets:

(One per student)

- Design a parachute page 1.
- Design a parachute page 2.

Engineering the Battle of Britain

Lesson Plan + Delivery Information

You will need:

- Laminated stained glass windows
- A pack of charade cards for each table
- A parachute materials pack for each table
- One 'Design a Parachute Intro' laminated sheet for each group
- One 'Design a Parachute Worksheet' for each student
- Pencils for each student
- Tape measures or long rulers

Each parachute materials pack should contain:

Two A3 sheets of tissue paper, a roll of tape, a spool of thick cotton, two pairs of safety scissors, two blue paper-clips, one tape measure.

Learning outcomes

Become aware of a range of STEM based job roles at Biggin Hill during the Second World War

Use teamwork, creativity and logical thinking to design a paper parachute.

1. Welcome and introduction (5 minutes):

Q: What do we mean by the 'Battle of Britain'?

Germany had already taken control of many parts of Europe, but Hitler knew that to defeat Britain the Luftwaffe needed to take on the RAF. There was a series of huge battles fought in the air between July and October 1940.

Despite being initially outnumbered, the RAF managed to fend off the attack and the Nazis were forced to change tactic, boosting British morale and ensuring we stayed in the war.

Q: What factors helped Britain?

1. Britain managed to dramatically increase production of new aircraft, by October the RAF had more fighter planes than the Luftwaffe.

2. The RAF planes were a good match for Luftwaffe aircraft. Spitfires were highly manoeuvrable and armed with eight machine guns.

3. British were defending their own turf; they had the home advantage. It gave pilots the confidence that they would not be taken captive if shot down and repairs could be made quickly. The Luftwaffe on the other hand, had to be more cautious. Their limited fuel supplies meant that they had to get back to base as fast as possible.

4. A strong radar network – Britain had a chain of radar stations situated along the south and east coast. This was very modern technology at the time and gave advanced warning of incoming enemy planes.

5. The RAF used the Dowding System – a connected network of communication lines that provided a detailed picture of UK airspace. This allowed for more effective defence and response.

6. Substantial ground-crew teams were in place to support the pilots. Each fighter plane had a dedicated two man ground-crew who were responsible for repairing, rearming and refuelling it.

“ The success of the Battle of Britain was not just down to the pilots' unwavering determination and fighting skills but a combined team effort from all staff involved including Ground Crew, Army Personnel and Rescue Services.

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Lesson Plan + Delivery Information

2. Job charades (10 minutes):

“ Let’s take a look at some of the different job roles that people had at Biggin Hill.

Action

Arrange students into 4 teams. Give out one pack of charade cards to each team. Encourage a staff member to supervise each table.

“ Staying in your teams we are going to play a game of ‘job charades’. Dedicate one person in your team to be the **charade performer**. They will act out the job role without speaking. The rest of the group are going to guess the name of the job role on the card.



3. Parachute design (Discussion 5 minutes, activity 40 minutes):

“ You can see some different job roles in our chapel stained glass windows. Let’s take a look at the Parachute Packer.

Q: Why were parachutes important during the Battle of Britain?

Parachutes were vital as an escape route if the pilot ran into difficulty.

Q: What considerations would you need to make when designing a parachute for the Battle of Britain pilots?

There was not a lot of room in the cockpit for a bulky backpack and extra weight added to the fuel consumption of the plane.

Certain materials were difficult to get hold of during the war. It was hard to import silk from enemy countries like Japan and German U-boats were destroying cargo ships. Nylon, a relatively new invention, replaced silk.

Q: What forces are acting on the parachute as it falls to the ground?

Gravity and air resistance/drag.

Q: Which force is greatest?

Gravity, otherwise the parachute would stay in the air.

Q: How can we effect the rate at which the parachute falls to the ground?

Increase resistance.

“ In teams of 4 or 5 we are going to investigate parachute design by getting a ‘paper-clip pilot’ safely and gently to the ground.

Your team is going to investigate just one design feature by creating two slightly different parachute designs. You will test which parachute works best and then compete against all the other parachutes in your class

Action

Give out a laminated ‘Design a Parachute Intro’ to each group and a double-sided ‘Design a Parachute Worksheet’ to each student.

Design a Parachute Intro

In teams, you will investigate **parachute designs** in order to get a 'paper-clip pilot' gently to the ground.

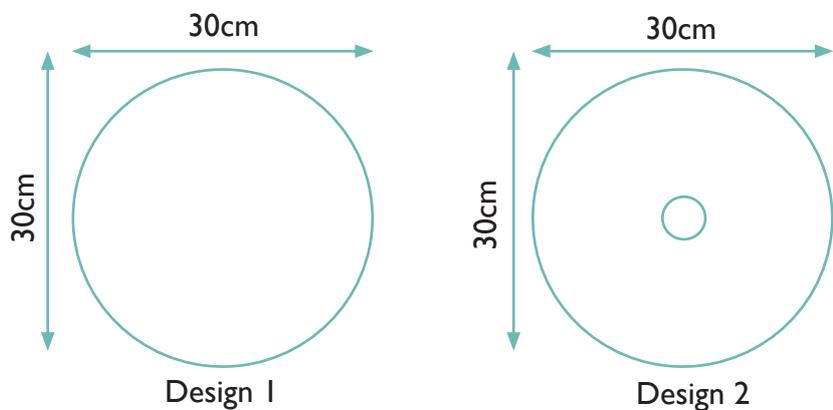


Things to think about...

Your team is going to create and test **two** different parachutes.

In order to accurately compare your two parachutes, only one design feature should be different. This could be the shape of the canopy, size of canopy, air vents/holes in the canopy, layers of material, suspension string length or even the number of suspension strings.

Example canopy **air vent** investigation:



Design a Parachute Worksheet - Page 1

Which design element are you going to investigate? (Please tick)

<input type="checkbox"/> Canopy shape	<input type="checkbox"/> Canopy surface area	<input type="checkbox"/> Air vents	<input type="checkbox"/> Canopy layers
<input type="checkbox"/> Canopy seams/pleats	<input type="checkbox"/> Suspension string length	<input type="checkbox"/> Number of strings	<input type="checkbox"/> Other

Use this space to describe the **method** for your experiment and add a **drawing**.



How will you make it a fair test?

What do you predict the results will be?

Design a Parachute Worksheet - Page 2

Record your results in the chart below. You will repeat the test three times to provide a **mean** result. This will improve the accuracy of your experiment.

Note: The 'winner' is the parachute that takes the longest time to fall to the ground.

	Drop height	Drop test 1 winner	Drop test 2 winner	Drop test 3 winner	Overall winner
Parachute design 1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Parachute design 2		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What conclusions can you make from the experiment, how could you make the test better?

What improvements could you make to the winning design? List the improvements here and then make adaptations to your design.

Now it's time to test out your best parachute design against the rest of the class. Which parachute will be the overall winner?

Charade Card



Ambulance Driver

Transported injured pilots to nearby hospitals.

Charade Card



Ground Crew Engineer

Responsible for repairing, rearming and re-fueling aircraft.

Charade Card



Pilot

Flew fighter aircraft like Spitfires and Hurricanes at Biggin Hill.

Charade Card



Meteorologist (Weather Watcher)

Collect and evaluate data from the weather station and predict weather changes.

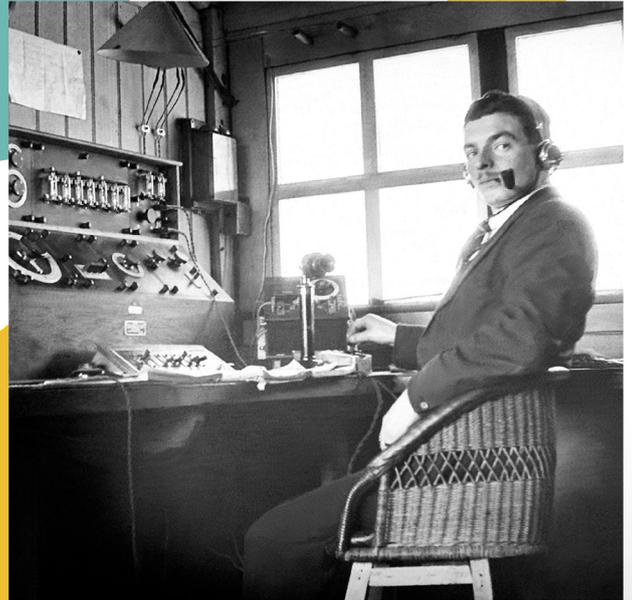
Charade Card



Intelligence Officer

Kept track of enemy activities.

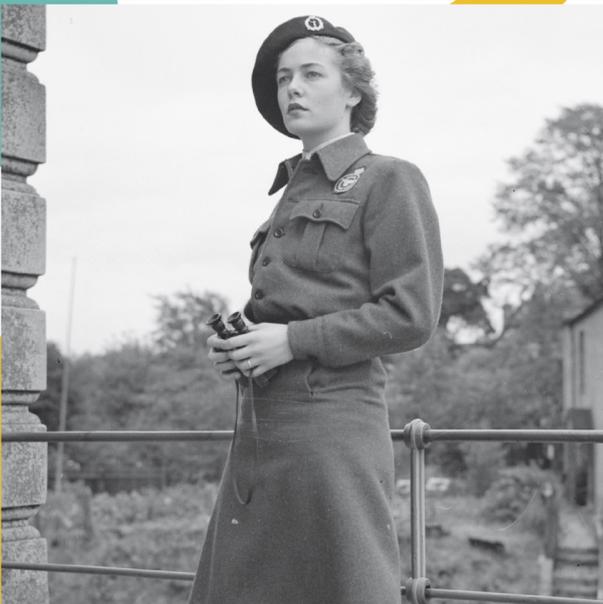
Charade Card



Wireless Officer

Looked after radio telephony to support communication at the air base.

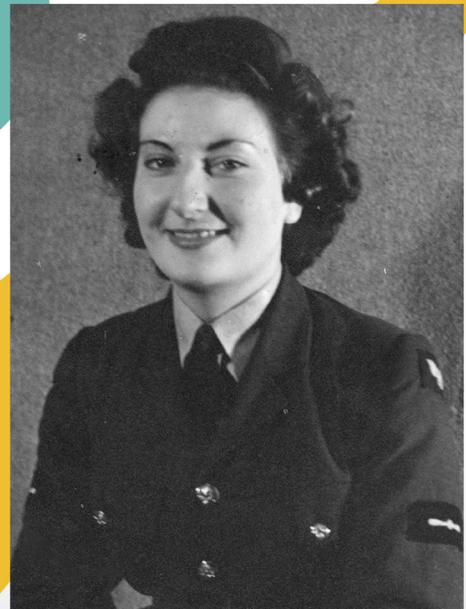
Charade Card



Spotter

Responsible for the visual detection, identification, tracking and reporting of aircraft.

Charade Card



Plotter

Marked positions of aircraft on a large map using poles and counters.





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