



# Exploring the Dambusters story at the RAF Museum

## **Information and Activity Pack**

KS2: Science, Maths and History

# Keywords Glossary

**Chronological Order** The order in which things happened, arranged from earliest to most recent

**Dam** A barrier that traps water in a particular area by stopping it from flowing

**Detonate** To make something explode

**Hydroelectric Power** Electricity created using the power of fast-flowing water

**Industry** The making of products in factories. In war time, industry was mostly used for making weapons and equipment needed for war, e.g. planes.

**Morale** Having confidence and hope

**Operation Chastise** The official name for the Dambusters Raid

**Reservoir** A large natural or man-made lake

# The Story of the Dambusters Raid

## Background

As soon as war with Germany seemed likely, the British government began trying to find ways to stop Germany's **industry**. They thought that if they could stop Germany from making supplies, their army would be weaker.

**What kind of products might have been made in German factories in the lead-up to the Second World War?** Record three ideas.

## What was the plan?

In February 1943, Dr Barnes Wallis shared his idea for 'air attacks on **dams**' to try and stop factories in Germany's Ruhr Valley area from making supplies. These factories used **hydroelectric** power from **reservoirs**.

Barnes Wallis' plan became known as '**Operation Chastise**' or the 'Dambusters raid' and would go down in history.



Target map and photo of the Eder **dam**, one of the three **dams** targeted during the mission.

**What might be the result of bombing a dam?** Record your ideas.

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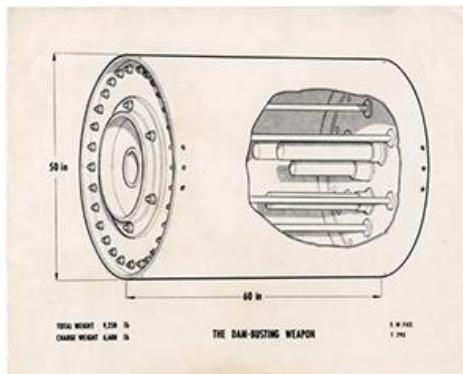
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## How did Barnes Wallis design the 'bouncing bomb'?

Wallis worked as an engineer and designer. This meant he had the knowledge and experience to develop new technology in weapons.

When Barnes Wallis began designing a bomb that could skip across water before hitting its target, he started by experimenting with simple objects. Wallis began skimming marbles across a water tub in his back garden using a catapult. His children helped by counting each 'bounce' of the marble across the water.



After lots of experiments, Wallis finally finished his design for 'bouncing bombs'. These were cylinder shaped (like a big tin can). They needed to be spun backwards at a speed of 500 rotations (spins) per minute inside the aircraft, before being dropped on to water at a precise height and speed. The bombs would then bounce over the strong nets in the **reservoir** before spinning down the dam and exploding.

Barnes Wallis' 'bouncing bomb' diagram

**Why did the bombs need to bounce?** Hint: what was hidden under the water to protect the dams?

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**What might make a 'bouncing bomb' difficult to detonate?** Record your ideas.

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#### Who led the mission?

RAF 617 Squadron was set up to carry out Operation Chastise. The squadron was made up of aircrew from Britain, Canada, Australia, New Zealand and the USA. They were led by Wing Commander Guy Gibson. He was only 24 years old at the time of the mission, but was chosen as he had already flown over 170 missions.

617 Squadron flew Avro Lancaster bomber aircraft for the mission, which had been adapted (changed) so they could carry and release the 'bouncing bombs'. The squadron had to do lots of dangerous low-level flying training as the bombs had to be dropped less than 18 metres above the water.



Wing Commander Guy Gibson



617 Squadron badge

**The motto for 617 Squadron is 'Apres moi le deluge'.**  
**Can you work out what this means in English?**

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**How does the picture in 617 Squadron badge link to their famous mission?**

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## Was the mission a success for the RAF?



Flooding of the Möhne Dam four hours after it was hit  
© IWM HU 4594 [www.iwm.org.uk/collections/item/object/205188037](http://www.iwm.org.uk/collections/item/object/205188037)

The mission took place on the night of 16–17 May 1943. 133 airmen of 617 Squadron set off from RAF Scampton in Lincolnshire in 19 Lancaster Bomber aircraft. They travelled in three 'waves' to bomb the dams. The first 'wave' successfully bombed the Möhne and Eder Dam, whilst the second and third waves focused on the Sorpe Dam, although this final dam stood strong.

The mission was partly successful for the RAF. 617 Squadron destroyed two of the **dams** and lightly damaged the third. This came at a great cost however, as eight of their aircraft were shot down during the mission and 53 of the 133 airmen were killed.

**Why do you think the Squadron carried out the mission at night?**

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## What was the impact of Operation Chastise?

The destruction of the dams caused flooding which slowed down the factories of the Ruhr, but sadly injured and killed many ordinary people who lived and worked in the area. This included Prisoners of War who had been captured by the German Army and put to work in the Ruhr area.

The disruption to factories didn't last as long as the RAF had hoped. They had expected months of delays, but it only took a few weeks to make the repairs.

Even though the disruption didn't last very long, the news of **Operation Chastise** was celebrated by the people of Britain, and provided a much-needed **morale** boost in the middle of the Second World War.

The surviving members of 617 Squadron became celebrities who were treated as great heroes.



Wing Commander Guy Gibson with members of his crew  
© IWM TR 1127 [www.iwm.org.uk/collections/item/object/205123900](http://www.iwm.org.uk/collections/item/object/205123900)

## What happened to 617 Squadron after the Dambusters raid?



The Tirpitz following an attack by Squadron 617  
Image credit: [www.thehistorypress.co.uk/articles/the-sinking-of-hitler-s-battleship-tirpitz/](http://www.thehistorypress.co.uk/articles/the-sinking-of-hitler-s-battleship-tirpitz/)

In autumn 1944, members of 617 Squadron joined together with 9 Squadron to attack a German battleship known as Tirpitz. This ship was a threat to the British war effort as it could block and destroy any supplies (such as food) being brought into the country.

The squadrons flew Lancaster bombers (as 617 Squadron had during the Dambusters raid) which were loaded with huge 'Tallboy' bombs. These bombs had been designed by Barnes Wallis, just like the famous 'bouncing bombs' of Dambusters.

The mission took several tries, but on 12 November they were successful. After two direct hits the ship was badly damaged and capsized (turned upside down), meaning it could no longer be used.

### Reflection

**Even though it wasn't a complete success, Operation Chastise is one of the most well-known events of the Second World War. Why do you think this is? Discuss with a partner/or explain your ideas below.**

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# Can you find these things in the Museum?

In Hangar 5 there are objects and aircraft linked to Operation Chastise (the Dambusters Raid). Try to find each one and answer the questions alongside them.

## Avro Lancaster MK1

Location: Hangar 5



**Why might the Lancaster have been chosen as the aircraft to carry the 'bouncing bombs' for the Dambusters Raid?**

Hint: Take a look at the size of the anti-dam mine in the 'Precision Strikes' area

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**How many operational sorties (missions) did the Lancaster complete?**

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**What was the average number of operational sorties carried about by Lancasters?**

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## Harold 'Micky' Martin's Medal Bar

Location: Hangar 5 (Precision Strikes)



**Which four aircraft did Micky fly during his time in RAF Bomber Command?**

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, and -----

**Which medal did Micky receive for 'gallant conduct' (being brave) in the Dambusters Raid?**

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## Benny Goodman's Medal Bar

Location: Hangar 5 (Precision Strikes)

How many operations did Benny Goodman complete during his time in RAF 617 Squadron?

Why was Benny at greater risk than most pilots during the Second World War?

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**Challenge:** Explain why this put him at risk

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## Anti-Dam Mine

Location: Hangar 5 (Precision Strikes)

What is the anti-dam mine more famously called?

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After hitting the wall of the dam, how deep would the mine have sank?

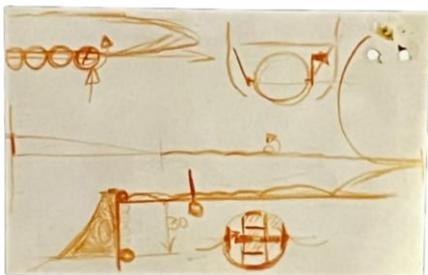
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What kind of explosive was the anti-dam mine filled with?

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## Barnes Wallis Sketch

Location: Hangar 5 (Precision Strikes)

What is shown in this sketch by Barnes Wallis?

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## **Set of Spheres**

Location: **Hangar 5 (Precision Strikes)**

**Who owned this set of spheres?**

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**What were they used for?**

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**Why might the owner have chosen spheres made of different types of materials, and with different textures?**

Explain your ideas

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## **Barnes Wallis Silhouette**

Location: **Hangar 5 (Precision Strikes)**

**What is Barnes Wallis 'regarded as' (thought of as)?**

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**Which three bombs did he design during the Second World War?**

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**and** -----



**Who said this about Barnes Wallis' bouncing bomb design in 1943?**

**'...yours is the finest individual technical achievement of the war'**

# What have you learned?

To test your memory of what you've learned about the Dambusters Raid, try to break the story down into five key moments, and create your own storyboard to show what happened. Draw a picture in each large box to show what happened and add a sentence or two to the smaller box as a caption. Your storyboard must be in **chronological order**. Box one is already filled in as an example.

 <p>1</p> <p>We must weaken Germany's industry so they won't be prepared if a war is started!</p>	<p>2</p> <p></p>
<p>As soon as war with Germany seemed likely, Neville Chamberlain and his government tried to find ways to weaken Germany's industry.</p>	<p></p>
<p>3</p> <p></p>	<p>4</p> <p></p>
<p></p>	<p></p>
<p>5</p> <p></p>	<p>6</p> <p></p>
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# Follow up Activities

## Bouncing Bombs Experiment

When British scientist and engineer Barnes Wallis began designing a bomb that could skip across water, he started by experimenting with simple objects.

He developed his idea for the 'bouncing bombs' that were eventually used during the Dambusters Raid by experimenting with marbles and a large water tub in his back garden. He began skimming the marbles across the water tub by throwing sideways (as you would with stones in the sea or a lake) and got his children to count the number of times the marble bounced.

**Why not recreate this experiment to see what he discovered?**

### Materials needed

- 2-3 marbles of different sizes
- A large, shallow container with around 15 cm of water inside
- A tape measure or ruler (or plot measurements on base of your container before filling it)
- Pen/pencil and paper

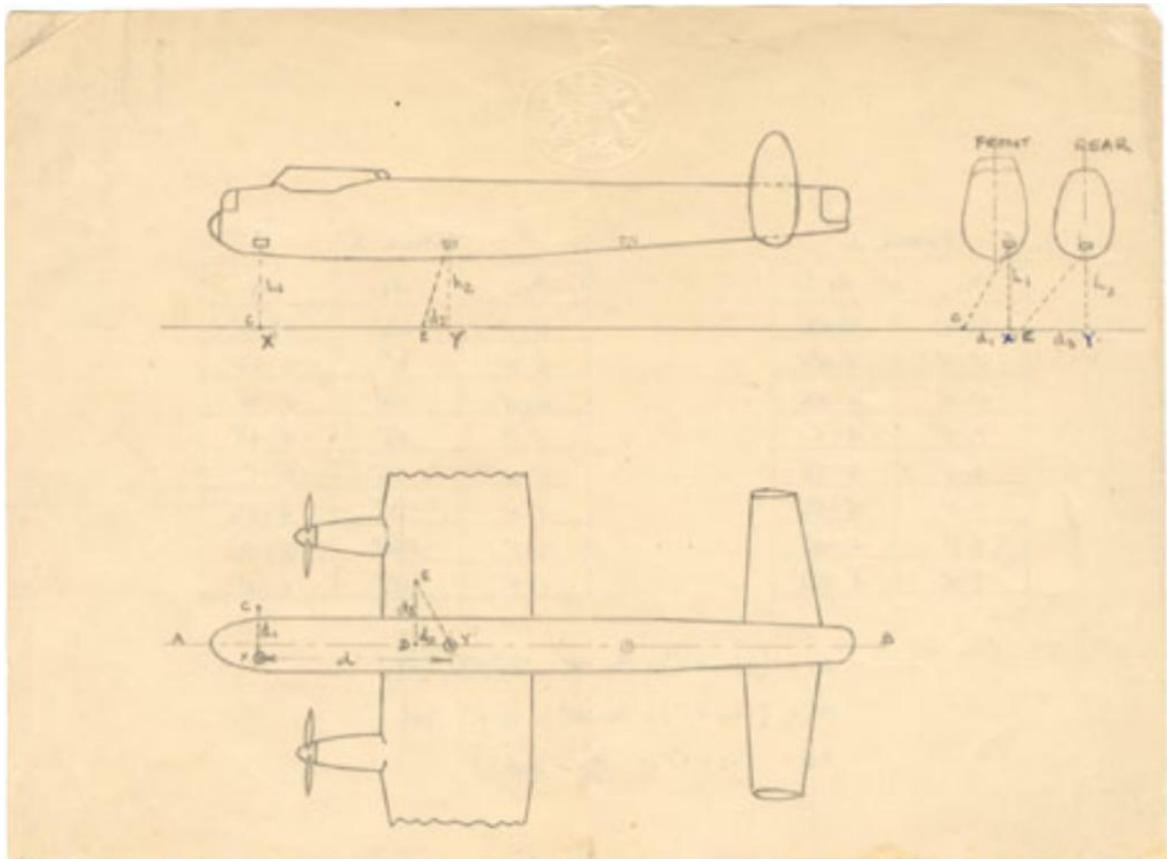
### Method

1. Try to skim each marble across the water. Each time you do, jot down how far it travels and how many times it bounces.
2. Experiment by changing how far away you throw your marble from, the angle you throw from, and how hard you throw it. Keep recording your findings until you find the best method of making your marble skim or 'bounce' across the water. It should ideally bounce three times.
3. Evaluate: During your experiment, did you notice a pattern? For example, did the larger, heavier marbles react differently to the smaller, lighter ones when thrown? Did the force you used when throwing the marbles have an impact? Write a short report to explain how to achieve the perfect 'bounce', just as Barnes Wallis' team would have done when testing the bouncing bombs.



Dr Barnes Wallis holding a model of a deep-penetration bomb  
© IWM HU 92134 <https://www.iwm.org.uk/collections/item/object/205127110>

# Dambusters Maths Challenge



## Spotlights: Low-Altitude Flying Modification

Drawing showing the spotlights used to judge the height of the aircraft. When the two beams met on the surface the aircraft was at 60 feet.

To make sure that the Lancaster Bomber aircraft was flying at the correct height to drop the bouncing bombs, lamps were fitted to the front and middle of the plane, 32 feet (almost 10 metres) apart. The angle of the middle lamp was adjusted so that when the plane was flying at 60 feet (around 18 metres), the beams of light from the lamps would join together. When the lights met, it was time to drop the bomb on the dam.

There was no fancy electronic equipment available to help work out these important calculations during the Second World War, so engineers used some simple mathematics. Can you help by working out the answers to these questions? You will be using old imperial measurements in these tasks, as that's what Barnes Wallis and his team would have used.

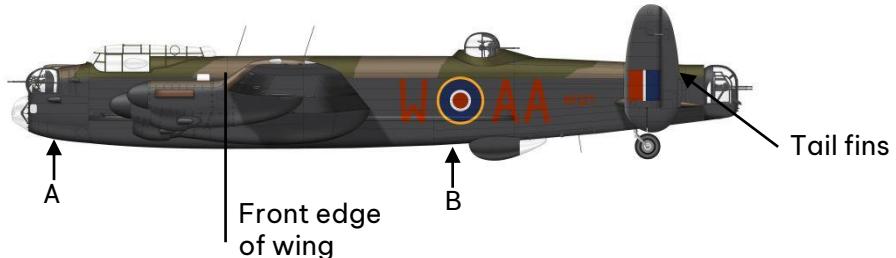
### Materials needed

- Pencil
- Ruler
- Protractor
- Scrap paper or exercise book for calculations
- Optional: calculator

## Pilot's Brief

1. Your job is to fly the Lancaster at 60 feet above the ground.
2. To do this you will need to change the angle of the lamps (A and B) so that their beams of light meet at 60 feet below the front edge of the wing.

**Important:** The scale of the Lancaster is 1 cm to 7 feet



## Pilot's Calculations

1. Draw a straight vertical down from the front edge of the wing to the ground.
2. Now draw a straight horizontal line to represent ground level.

Remember the scale is 1 cm to 7 feet, and your Lancaster is flying at 60 feet.

**Hint:** To begin, you will need to divide 60 by 7 to get your cm measurement.

Now fill in the answers for each question. **Tip:** You can round your cm measurements to the nearest whole number before multiplying to get feet measurements.

1. The Lancaster is ..... feet long
2. The tail fins are ..... feet high
3. The lamps are ..... feet apart

## Lamp Angles

1. Draw two lines, one between Lamp A and the ground, and one between Lamp B and the same point on the ground. This should look like an upside-down triangle.
2. Imagine that each of the lines that you have just drawn is a beam of light. Measure the angle of each beam from the line representing the front edge of the wing.
3. Lamp A is angled at ..... °
4. Lamp B is angled at ..... °

## Bomb Aimer's Brief

Your job is to plot the position of the Lancaster Bomber aircraft when the bouncing bomb is to be dropped. This will help you to aim.

It should be 450 yards from the dam, at an equal distance between each tower.



The Mohne Dam Image credit: The National Archives, catalogue reference: AIR 20/4367

### Important

1 yard = 3 feet

Use the diagram below. The scale of this plan is 1cm to 100 feet.

Fill in the answers for each question. **Tip:** You can round your cm measurements to the nearest whole number before multiplying to get feet measurements.

1. The distance between the towers (T1 and T2) is ..... feet
2. The dam is ..... feet wide.

Now plot the position of the Lancaster Bomber when the bouncing bomb is to be released. Follow these steps:

1. Find the centre of the dam by measuring with a ruler. Draw a horizontal line to mark this middle point
2. Your Lancaster Bomber needs to be positioned 450 **yards** from the dam when the bomb is dropped. You need to convert 450 yards into feet. 450 yards = ..... feet
3. Now convert the feet into centimetres (divide by 100) ..... feet = ..... cm
4. Plot the position of the Lancaster Bomber along the horizontal line you drew in step 1 with an X

Optional: Draw a plane silhouette over the top of your X (making sure the middle of your plane).

