

AIMING FOR
AWESOME

2018

1918

Speed record

Student
Booklet

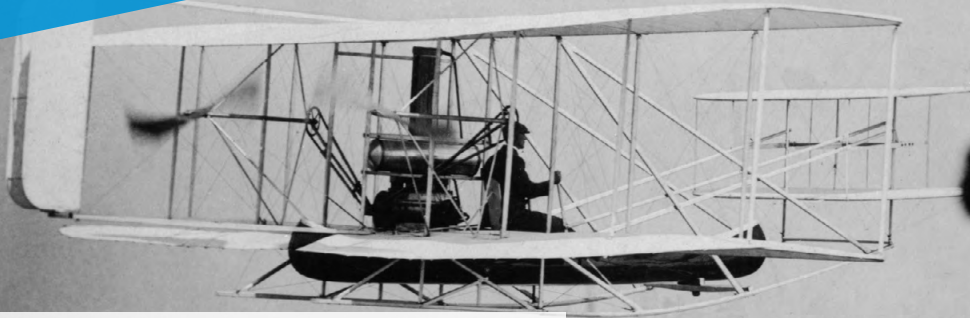


Royal Academy
of Engineering

THIS IS
ENGINEERING

ROYAL
AIR FORCE
Youth STEM

The aim of this resource is to give students the opportunity to investigate the impact of science, technology, engineering and mathematics (STEM) on the air speed record.



Speed record

The first air speed record was set by Wilbur Wright in 1903 at 6.82mph during one of the first powered flights.

Since that first flight, the massive advancement of aircraft technology meant that the airspeed record is continually being broken; in 100 years, the record has gone from 6.82 mph to over 2,000 mph.

During the 1940s, the airspeed record was broken twice by Royal Air Force (RAF) pilots.

On November 7 1945, Group Captain H J Wilson achieved the first officially confirmed speed record for a jet aircraft at 606.25 mph while flying the **Gloster Meteor**, Britain's first jet fighter.

Ten months later, on September 7 1946, Group Captain E M Donaldson set a new world speed record of 615.81 mph, also in a **Meteor IV** aircraft.

The speed of sound

The term sound barrier came into use during the Second World War. Many people thought it would not be possible to go faster than the speed of sound despite many aircraft reaching speeds close to it in the 1940s.

The speed of an aircraft is sometimes described using the Mach number. The Mach number is the ratio between the speed of the object and the speed of sound. Aircraft travelling faster than the speed of sound, or Mach 1, are called supersonic. The speed of sound is 340 miles per second.

The sound barrier was eventually broken by aircraft in 1947. When aircraft travel faster than the speed of sound, you can hear a sonic boom.





TIME TO CALCULATE

The speed of an aircraft tells you how fast or slow it is moving. To find the speed of an aircraft you need to know:

- » The distance travelled.
- » The time taken to travel that distance.

You can calculate speed using this equation:

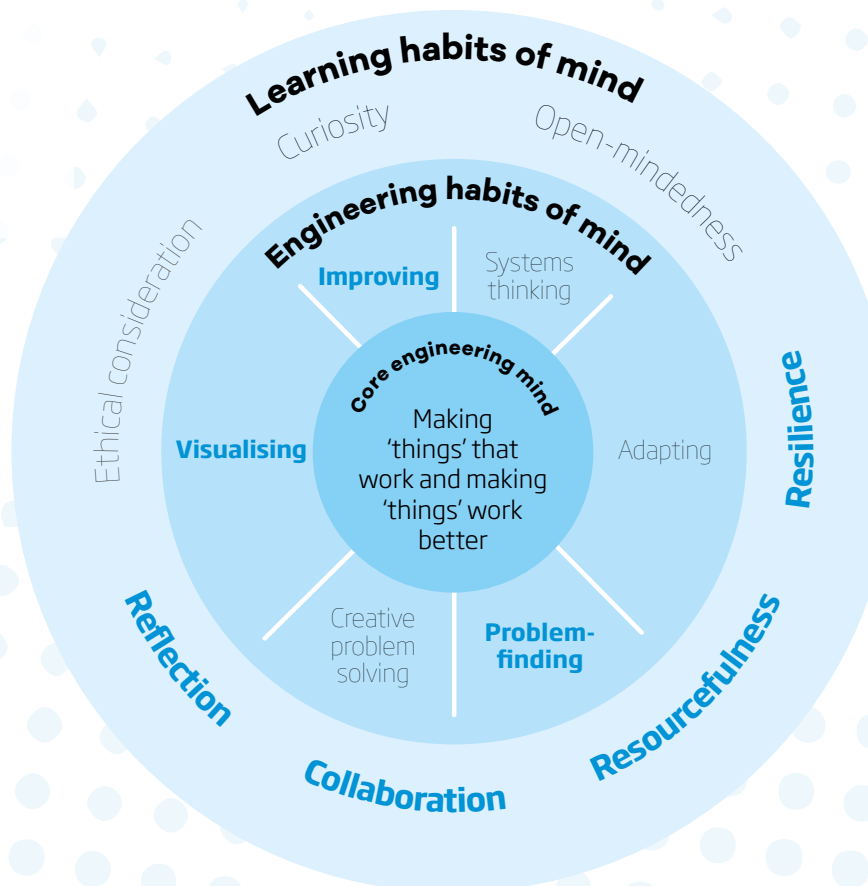
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

Calculate the speed of the following aircraft:

- » The **Albemarle aircraft** flew 120 miles in 30 minutes (0.5 hours).
- » The **de Havilland Hornet** flew a record 121 miles in just 15 minutes.

STRETCH AND CHALLENGE

How far could the spitfire travel in 45 minutes at its top speed of 330mph?



Vortex

A vortex is a region in a liquid or gas that is spinning, or rotating, around an axis.

When an aircraft flies, a vortex is created around the wing.

When a wing generates lift, the air on the top surface has lower pressure compared to the bottom surface. Air flows from below the wing and out around the tip to the top of the wing in a circular fashion.



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TIME TO MAKE

To make a cannon, you will need:

- » Plastic bottle
- » Scissors
- » Balloon
- » Tape

1 First, cut the bottom off the plastic bottle.



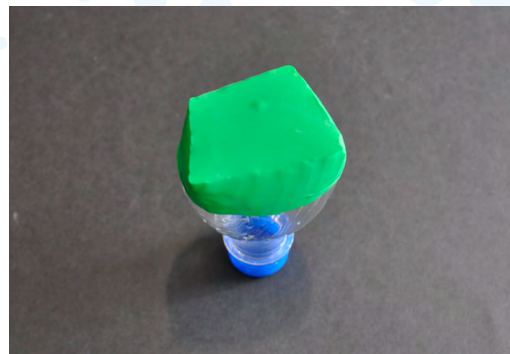
2 Then cut the balloon so that you have a piece large enough to cover the bottom of bottle.



3 Use tape to secure the balloon to the bottle.



4 Finally, stretch the balloon and release.





TIME TO INVESTIGATE

Investigate how the distance the vortex travels affects its strength.

To do this, light a candle with a lighter or splint.

Hold the vortex cannon one metre away from the candle and create a vortex.

Move the cannon 10 centimetres closer to the candle and test again.

» How close do you have to be to the candle to blow out the candle with a vortex?

To ensure your results are repeatable, you should conduct the investigation at least three times. How can you ensure you have conducted a fair test?





Royal Academy of Engineering

The Royal Academy of Engineering is harnessing the power of engineering to build a sustainable society and an inclusive economy that works for everyone.

In collaboration with our Fellows and partners, we're growing talent and developing skills for the future, driving innovation and building global partnerships, and influencing policy and engaging the public.

Together we're working to tackle the greatest challenges of our age.

What we do

Talent & diversity

We're growing talent by training, supporting, mentoring and funding the most talented and creative researchers, innovators and leaders from across the engineering profession.

We're developing skills for the future by identifying the challenges of an ever-changing world and developing the skills and approaches we need to build a resilient and diverse engineering profession.

Innovation

We're driving innovation by investing in some of the country's most creative and exciting engineering ideas and businesses.

We're building global partnerships that bring the world's best engineers from industry, entrepreneurship and academia together to collaborate on creative innovations that address the greatest global challenges of our age.

Policy & engagement

We're influencing policy through the National Engineering Policy Centre – providing independent expert support to policymakers on issues of importance.

We're engaging the public by opening their eyes to the wonders of engineering and inspiring young people to become the next generation of engineers.



The RAF Youth STEM programme is designed to engage and inspire young people by building their interest in engineering and technical career pathways.

From cyber specialists to aerospace, aviation, electronics, and mechanical disciplines, the RAF is committed to widening participation in STEM, extending opportunities to all, and encouraging greater diversity in this critical area of national skills shortages.

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