GREAT GLIDER SHARE

What difference does the position of the ballast weight have on the distance a glider travels?

AGE RANGE: 11-14 years

OVERVIEW

Pupils will be inspired by aerospace engineer, Dr Ben Parslew, as he shares information about his research and introduces key physics ideas about the glider, linking to key curriculum concepts. Following an introduction to the glider, Ben introduces the scientific question **What difference does the position of the ballast weight have on the distance a glider flies?**

Enquiry intro video

Is flight sustainable? video

LEARNING OBJECTIVES

- To recognise that forces are needed to cause objects to start or stop moving, change their speed or change their direction.
- To use force arrows in diagrams, adding forces in one dimension and recognising balanced and unbalanced forces
- To apply ideas about gravity (non-contact) and air resistance (contact) to a glider.
- To apply ideas about moments of a force to the position of ballast weight on a glider in relation to its centre of gravity.

WORKING SCIENTIFICALLY FOCUS

- To make predictions using scientific knowledge and understanding.
- To select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
- To present observations and data using appropriate methods, including tables and graphs
- To interpret observations and data, including identifying patterns and using observations, measurements, and data to draw conclusions

RESOURCES

FOR EACH GROUP (2/3 pupils)

- 1x glider frame made from foamboard or cardboard
- templates for gliders
- construction material
- 2 x rubber bands per group
- glue gun
- cutting board
- craft knife
- 1 x launcher
- measuring equipment: metre rulers, trundle wheel/measuring tape

TO SUPPORT TEACHING

- Video – 11-14 enquiry
- Supporting teaching slides deck
- Video - Is flight sustainable in the future?

Use recycled materials for your gliders. Collect cereal boxes, shoe boxes and other materials

Share your science
www.greatscienceshare.org

SKILLS DEVELOPMENT

Engage the pupils using the enquiry introduction video, where the concepts of flight and ballast are explained. Ben challenges pupils to think about the factors that could affect how the glider travels and to think about control variables (see the 11-14 teaching slides deck).

Pupils work in teams to make a glider using the **glider template.** Teachers should elicit pupils' understanding about the centre of gravity through discussion about the gliders. Ask pupils to mark the position of gravity with a pencil. Using the idea of ballast, challenge pupils to think about how changing the position of ballast might affect how the glider travels. Encourage pupils to develop and explain their own predictions.

Pupils plan a comparative test where they change the distance of the ballast weight from the centre of gravity. They measure the distance travelled by the glider and should control all other variables. Encourage them to decide on the range and number of readings and to design recording tables for measurements.

Note: To launch the gliders use a large space, e.g. school hall, or outdoors.

Pupils gather and record data. They should consider how their launches of the glider may affect their results, using scientific language to explain what is happening. See slide 8 for further insight about launch forces, angles and air conditions.

Pupils can calculate the mean average distance travelled for their data sets and plot graphs, e.g. line graphs. They use the graph to identify a causal relationship, describing trends and patterns in their measurements.

Pupils draw conclusions to answer the enquiry question: **What difference does the position of ballast weight have on the distance a glider travels?** Pupils should use the data evidence to justify ideas and develop a well-reasoned conclusion that links their ideas to scientific concepts to explain their findings.

Provide time for pupils to share their investigation and conclusions with new audiences. Pupils could write to Ben to inform him about their investigation, or they may prefer to do a:

- presentation in class
- video for your school website
- Tweet **@GreatSciShare** #GSSfS2023

Extend the enquiry by encouraging pupils to talk with their families and carers about their investigation with the gliders. What other questions could lead to an enquiry? What factors affect the speed of a glider?

Encourage pupils to think about the future of flight in a world where sustainability needs to be considered. In **this video** hear from Ben about how aerospace engineers are working to tackle this issue.

Pupils may be interested in finding out more about engineering careers using **Careers in engineering from BBC Bitesize** and **A Day in the Life of a University of Manchester engineering student**