

Teacher notes – KS3 Glider Design for Accessibility

This unit builds students' ability to develop creative, technical and practical expertise. The class will identify potential areas where accessibility can be improved in a glider cockpit and investigate and develop possible solutions to improve accessibility.

National curriculum areas addressed include identifying and solving design problems, developing a specification, researching appropriate materials and other designs, communicating design ideas and if suitable equipment is available, making and evaluating the resulting design.

Introduction

Gliding is a great sport for people in a wide age and size range as well as with disability issues or restricted mobility as, once in the cockpit, it requires only limited physical strength – although it is mentally quite intense! The main video starts with footage showing how awesome gliding can be, then Paul, a wheelchair-using glider pilot (and a chemistry teacher!), takes students through the glider's controls and some of the issues arising for those who have restricted mobility. Other modifications to consider might be if the pilot:

- is too light – this is a problem as the CofG must be within certain design limits, and forward of the centre of lift for stable flight
- cannot comfortably reach the instrument panel to set instruments once securely strapped into the seat. Not all gliders have adjustable seats – how else could you achieve a secure adjustment to seating position? It must not move in flight!
- has limited neck mobility and is therefore not able to carry out the usual range of head movement essential to maintain a good lookout
- can move the controls easily but not grip them
- is unable to climb into the glider easily. Can the proposed solution allow for emergency parachute exit?

GLIDER CERTIFICATION & MODIFICATION

As with all aircraft, modifications to gliders are tightly regulated, so any modification must be assessed and approved by the design authority. Gliders are designed and tested to ensure they meet internationally agreed regulations.

If issues arise in service, an Airworthiness Directive (AD) is issued for modification or maintenance to prevent an issue becoming a serious problem. Gliders have an annual check, a bit like an MOT, called an Airworthiness Review Certificate (ARC). At the ARC inspection, all parts of the glider are checked and annual maintenance completed, along with a check to ensure any ADs affecting the model are implemented.

Hand-rudder controls or other modifications must be approved individually for each glider type such as the K21 that Paul is flying. The K21 is a very popular training glider, built by Alexander Schleicher in Germany with several adapted models in the UK and Europe. One of the Polish National Gliding team is a wheelchair user, so it's no bar to glider racing success!

GO GLIDING

With around 80 sites from Scotland to the SW of England, wherever you live you're never far from a Gliding Club. Learn more about gliding at any of the links below, and find your nearest club on the British Gliding Association BGA website at www.gliding.co.uk/club-finder/

3 AWESOME FACTS ABOUT GLIDING

- you can fly a glider solo at **age 14!!** There is **NO** upper limit.
- the world distance record is **3008km**
- the world height record is **76,000'**

Student activity

The video takes the students through a structured design activity. Pause as appropriate.

Post experiment activity

In the group discussion, can the students share ideas for further improvements?

After the students have made their designs, why not watch the optional video to see a wing test in progress. The wing easily achieves the design criteria – you can see the load figures in the video – and the twist in the tail is that the test rig breaks before the wing does! This gives students an idea of the rigour with which designs are tested before being allowed into service. Surf 'JS1 wing test' or see Jonkers Sailplanes Youtube <https://www.youtube.com/watch?v=M6VBqsrD4F>

Fun fact: crisp packets explode at height and fizzy drinks squirt everywhere!

This is because air pressure decreases as you climb. Pilots fly for perhaps 6 hours or more at a time, and food and drink are vital to maintain physical ability and mental concentration. Cockpit temperatures might vary from -10C to +30C, so what might be sensible in-cockpit refreshments? See what the world's top racing pilots use as snacks in this report from the recent Women's World Gliding Championship <https://youtu.be/aaw1yAyld4M> or see Grid Snacks in the STEM playlist.

Drinking also results in other needs !! for which pilots use a wide range of adaptations from nappies via 'Shewee' style funnels to external catheters.

Extension tasks

There are many options for extension tasks researching glider materials, designs and glider adaptations.

Go Gliding!

The Go Gliding project is the British Gliding Association's programme of events and schools resources using gliding as a practical gateway to inspiring a love of STEM and aviation. Find out more at <https://gogliding.uk/>

Students can find lots of information on flying with and without an engine and the people who fly at:

- womengliding.co.uk - a brilliant community and source of inspiration for female pilots
- gliding.co.uk - the British Gliding Association website
- members.gliding.co.uk/junior-gliding – links to Junior Gliding pages, vids and resources
- airleague.co.uk – information on all forms of aviation

Aviation is not just about being a pilot!

There's information about the huge range of careers in aviation and aerospace at stem.caa.co.uk/careers-in-aviation-and-aerospace as well as on the Air League site and at www.careersinaerospace.com

We hope you found this useful and a fun way to encourage young people into the world of STEM. We're particularly keen to encourage more girls to discover a love of flying and STEM subjects. Inspire them with videos of our STEM role models along with more fun and exciting gliding-based STEM resources covering elements of the National Curriculum at <https://gogliding.uk//STEM/>

Student notes are shown overleaf.

KS3 Design and Technology Glider Design for Accessibility



Context: The cockpits of gliders have a number of accessibility limits, as a young and upcoming designer, you have been asked to investigate adaptations which could be made to make gliding available to people with disabilities.



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Task 1: Watch the video and make notes on anything you see that someone with a disability may struggle with when gliding.



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Now you have watched the video, discuss your thoughts in groups



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Task 2: Choose one thing you are going to adapt and write a brief statement of what you intend to do.

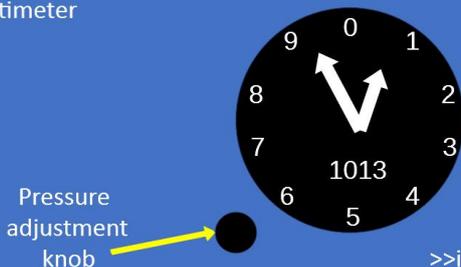
e.g. *I will design an adaptation to the instrument panel controls to make them easier to use for people with limited fine motor control.*

This is called a Design Brief

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Task 3: Spend 5 minutes drawing the part of the glider you are hoping to adapt in the middle of a new page.

Altimeter



You set the altimeter to zero before you take off as it will change with the barometric pressure on the day

>>it's round and hard to adjust



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Task 4: Now draw the same part again 4 times, each time changing one aspect each time trying to improve the functionality each time.

Draw your improved designs!!



We hope you enjoyed making gliders more accessible! Want to find out more?

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Find out more about GLIDING at the links below, all types of AVIATION at airleague.co.uk & CAREERS at stem.caa.co.uk/careers-in-aviation-and-aerospace