

Lesson Objectives:

- 1) Students will discover how some of the earliest theories of aerodynamics were tested
- 2) Students will make and test glider designs in a scientific way, identifying which aspects of their design will affect flight performance
- 3) Students will identify ways that these experiments and designs could be improved

Links to National Curriculum KS2 & 3

HISTORY

- Develop a chronologically secure knowledge and understanding of British, local and world history.
- Study of an aspect or theme in British history that extends pupils' chronological knowledge beyond 1066

DESIGN AND TECHNOLOGY

- Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities
- Analyse the work of past and present professionals and others to develop and broaden their understanding (*KS3 only*)
- Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work
- Understand how key events and individuals in design and technology have helped shape the world
- Understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists (*KS3 only*)

SCIENCE

- Working scientifically - taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate; using test results to make predictions to set up further comparative and fair tests
- Forces - identify the effects of air resistance and friction, that act between moving surfaces
- Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review (*KS3 only*)
- apply mathematical concepts and calculate results (*KS3 only*)
- evaluate data, showing awareness of potential sources of random and systematic error (*KS3 only*)
- Describing motion - speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) (*KS3 only*)

Resources

- Glider Powerpoint (Slides 15&16 can be printed to put location in context)
- Results sheets for each group/individual (Slide 14)
- Electric paper plane launcher eg <http://bit.ly/lialauncher> (Around £15 or could be made from 2 electric motors and rubber discs)
- Measuring tape (at least 15m)
- Stopwatches
- Paper, scissors, pencils, sellotape
- Glider templates pdf

Additional Notes

Prep

- Different materials like very thin card or lighter tracing paper can be used to compare lighter/heavier, stiffer designs, but thick card is not suitable for the launcher)
- Further designs can be seen <https://www.grc.nasa.gov/www/k-12/airplane/glidpaper.html> and <https://www.foldnfly.com>
- If students must stand close to the launcher, safety glasses should be used to prevent eye injury

Lesson Plan: See Teacher guidelines for full notes Time: 45 – 60 mins depending on class size

Introduction: slides 1 to 5

5 mins

1. Settle students down and have the Powerpoint ready to go.
Introduction on slide 2 – 30 seconds to try and identify inventions - reveal inventions and links to Fred Lanchester (see guidelines)
2. Slides 4 & 5 provide context about Lanchester and the archive

Context in history Slide 6

4 mins

3. Slide 6 – Provide context to his experiments in 1894. Ask class to discuss what they think the pictures refer to and what happened to them in 1894 – reveal (see guidelines)

Set scene for Lanchester's experiments Slides 7-12

6 mins

4. Provide the background to the experiments of the summer of 1894 including the location, shapes of wings, and scientific method

Glider activity Slide 13

15-20 mins

5. Outline challenge to build paper aeroplanes using available materials and templates thinking about forces and some of Fred's findings including winglets. Limit to 1 design each, more can be made, but students must select the best design for distance or height and be able to justify

Test gliders

10-15 mins

6. Test gliders using launcher – measure distances and time of flight if possible

Plenary

5 mins

7. Identify leading glider designs for distance and height. Get students to identify any similarities and differences. How would they improve their *designs* based on what they have seen? How would they improve the *experiment* if they had had more time? (Repeats etc)

Cross-curricular links:

ICT – If you school has access to Tablets then load our free [AR App](#) and download the AR targets from our website so students can see Fred's story come to life! Or use our free [Serious Games](#) to let students explore Fred's inventions and learn in a fun, dynamic way!

This lesson plan has been produced by The Lanchester Interactive Archive.

For more information please visit our [website](#).



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