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| **Paper Aeroplane Design** |
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| A project to make and find out how far a paper plane can fly |
| **Subject(s):** Design & Technology, Engineering**Approx. time:** 30 - 60 minutes |  | **Key words / Topics:** * Aerodynamics
* Gravity
* Drag
* Thrust
* Lift
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| **Suggested Learning Outcomes**  |  |  |
| * To understand what is meant by ‘aerodynamics’
* To be able to make a paper aeroplane to test to see how well it will fly
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| **Introduction** |  |  |
| This is one of a set of resources designed to allow learners to use seasonal themes to develop their knowledge and skills in Design & Technology, Engineering and Mathematics. This resource is part of a group for the Summer that could be carried out either in school or at home. It focuses on making a paper aeroplane and testing how far it will fly and time it stays aloft. |
| **Purpose of this activity**In this activity learners will make a paper plane to help them understand aerodynamics in action. They will also test it to see how far it will fly and the time it stays in the air.This activity could be used as a main lesson activity to teach learners about modelling and prototyping, or part of a wider scheme of learning covering manufacturing processes and techniques. It could also be used as part of an introduction to aerodynamics. |
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| **Activity** |  | **Teacher notes** |
| **Introduction (5-10 minutes)**Teacher to explain that learners are going to make a paper aeroplane and test to see how far it will fly. Teacher to introduce key principles of aerodynamics.**Demonstration of what is required (10-15 minutes)**Teacher to demonstrate the steps shown in the presentation to produce an example paper aeroplane, using the activity sheet. Carry out the folds in numerical order. Ensure the creases are flat before folding.**Making and testing the paper aeroplane (10-25 minutes)**Learners to make their own paper aeroplanes using the handout. Test the paper aeroplanes as described in step 6.**Plenary (5-10 minutes)**After testing the paper aeroplane designs, identify their good features and what could be improved. |  | **Steps to make the paper aeroplane**Print out the paper aeroplane handout sheet and follow steps 1 to 5 on the presentation.When the learners have a working paper aeroplane, test the planes based on step 6 on the presentation, distance and time aloft being the main test criteria. This could be carried out on a competitive basis.When testing the paper aeroplanes, learners should throw them in a safe slight zone to ensure that no one will get hit. This could be carried out in the school hall or, if there is low wind, outside areas. If time allows learners may make other paper aeroplane designs and test them. |
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| **Differentiation** |  |  |
| **Basic** |  | **Extension** |
| * Have a pre-manufactured exemplar available
* Learners could use pre-folded paper aeroplanes.
 |  | * Learners could visit [www.foldnfly.com](http://www.foldnfly.com) and try out other paper aeroplane designs.
* Learners to record how different aeroplane design differ in terms of distance and time aloft.
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| **Resources** |  | **Required files** icon-docicon-pdficon-ppt |
| * A4 printed paper aeroplane templates
* Stopwatches (to measure flight time during testing)
 |  | icon-ppt Teacher presentation – paper aeroplane design Paper aeroplane handout |
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| **Additional websites** |  |  |
| * **YouTube:** How do planes fly? - https://www.youtube.com/watch?v=wFTHh-6jIT8
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| **Related activities (to build a full lesson)** |  |  |
| **Starters** (Options) * Watch video, how do planes fly? - https://www.youtube.com/watch?v=wFTHh-6jIT8
 | **Extension** (Options)* Learners could visit [www.foldnfly.com](http://www.foldnfly.com) and try out other paper aeroplane designs.

Learners to record how different aeroplane design differ in terms of distance and time aloft.**Plenary*** After testing the paper aeroplane designs, identify their good features and what could be improved.
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| **The Engineering Context** film |
| Engineers make models and prototypes to test ideas and see how they will work. For example, they will put a model of an aeroplane or a wing in a wind tunnel to see how aerodynamic the design is. This helps to make designs that use the minimum amount of fuel. |

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| **Curriculum links** |
| **England: National Curriculum**Design & Technology * KS3 1e, 2a

**GCSE D&T**AQA D&T* 3.2.5, 3.2.8, 3.3.4, 3.3.5, 3.3.6

Edexcel D&T* 1.17.1a,b,e, 1.17.2, 3.6.1b, 3.7.1, 3.7.2, 3.7.3

Eduqas D&T* Papers and boards: 5, 6

OCR D&T* 4.1a, 7.1, 7.2a

GCSE Engineering* 3.4.3, 3.6
 | **Northern Ireland Curriculum**Technology & Design* KS3 Knowledge, understanding and skills: Manufacturing – selecting and using materials fit for purpose; safe use of a range of tools and processes appropriate to materials, demonstrating accuracy and quality of outcome
* KS3 Knowledge, understanding and skills: Design – identifying problems; investigating, generating, developing, modelling, and evaluating design proposals; giving consideration to form, function and safety.
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| **Scotland: Curriculum for Excellence**Technologies* TCH 3-09a, TCH 3-11a, TCH 3-12a
 | **Wales: National Curriculum** Design and Technology* KS3 Skills: Making 1, 2
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| **Assessment opportunities** |
| * Informal teacher assessment of practical skills through observation of learners.
* Formal teacher assessment of the paper plane aerodynamics by testing flight distance and time aloft.
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