# Paper Plane Challenge
# Stage 2/3 Years 3 – 6

## Summary and Guiding Questions

Students will build and test 5 paper plane designs to establish which plane can fly the furthest, stay aloft the longest, and which is the most accurate. Which aspect of each plane's design affects distance, lift, and accuracy? Students will examine and explore the forces of aerodynamics - **thrust, lift, weight, and drag**.

## Objectives

That the children will:

- construct x 5 paper plane designs (with younger children this could be limited to 3)
- investigate and discuss how each paper plane flies
- test and measure the performance of each paper plane
- understand the forces involved in flight
- understand the scientific method and carrying out a fair test
- hypothesise based on prior knowledge
- draw conclusions based on the results of testing

# Australian Curriculum Links

## Strand: Science understanding

*Physical Sciences*

**Year 4:** Forces can be exerted by one object on another through direct contact or from a distance (ACSSU076)

## Strand: Science as a human endeavour

*Nature and development of science*

**Year 3-4:** Science involves making predictions and describing patterns and relationships (ACSHE050) & (ACSHE061)

**Year 5-6:** Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE081) & (ACSHE098)

## Strand: Science inquiry skills

*Questioning and predicting*:

**Year 3-4:** With guidance, identify questions in familiar contexts that can be investigated scientifically and make predictions based on prior knowledge (ACSIS053) & (ACSIS064)

**Year 5-6:** With guidance, pose clarifying questions and make predictions about scientific investigations (ACSIS231) & (ACSIS232)

*Planning and conducting:*

**Year 3-4:** With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate materials and equipment (ACSIS054) & (ACSIS065)

*Processing and analysing data and information:*

**Year 3-4:** Consider the elements of fair tests and use formal measurements and digital technologies as appropriate, to make and record observations accurately (ACSIS055) & (ACSIS066)

Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends (ACSIS057) & (ACSIS068)

Compare results with predictions, suggesting possible reasons for findings (ACSIS215) & (ACSIS216)

**Year 5-6:** Planning and Conducting: Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS086) & (ACSIS103)

Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (ACSIS087) & (ACSIS104)

Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS090) & (ACSIS107)

Compare data with predictions and use as evidence in developing explanations (ACSIS218) & (ACSIS221)

*Communicating:*

**Year 3-4:** Represent and communicate observations, ideas and findings using formal and informal representations (ACSIS060) & (ACSIS071)

**Year 5-6:** Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS093) & (ACSIS110)

*Evaluating:*

**Year 3-4:** Reflect on investigations, including whether a test was fair or not (ACSIS058) & (ACSIS069)

## Prior Knowledge

This lesson plan covers 4-year groups so the breadth of knowledge will vary from year group to year group and should be adjusted accordingly. However, knowledge/understanding/experience of some or all the following is expected:

- making paper planes
- measurement using metres/centimetres
- recording results
- identifying and designing fair tests
- forces - some understanding of thrust, lift, weight (gravity), drag
- some understanding of calculating averages

## Materials/Resources

- red paper/Get Onboard Paper Plane templates (one design type)
- websites/books showing design types
- scissors (for flaps)
- access to a school hall or large open space (preferably indoors)
- measuring tape (such as the kind used in athletics) or a trundle wheel to mark out metres on the ground.
- tape or markers to indicate where a plane has landed
- stop watches to record duration of flight
- chart to record distances of throws/duration of flight/accuracy of plane
- camera
- NASA website https://www.grc.nasa.gov/www/k-12/UEET/StudentSite/dynamicsofflight.html#forces
- https://paperplanemafia.com/

## Procedure/Instructions

1. Whole class discussion about how to fold a paper plane and how it flies. What are the forces that affect how the plane flies? Students will need to consider thrust, lift, gravity and drag. All of which affect the performance of a paper plane. Examine each of these forces in turn.
2. Explain that they will be making 5 different types of paper planes (teacher decides on these 5 types ahead of time) and testing them to see which one flies the furthest, which one can stay aloft for the longest, and which one is the most accurate.
3. Discuss the scientific method and what constitutes a 'fair test'. What variables will need to be constant to ensure the test is fair? Students should consider standardising the following: construction (the same size and weight of paper), same launch point, same person throwing, testing indoors to eliminate the effect of the wind, throwing each plane x 5 times to take an average score to eliminate anomalous results.
4. Students work in small groups to construct planes and make predictions with reasoning as to how they think they will perform in testing.
5. Students test each plane and record results for each criteria: distance, duration, and accuracy. Each group provides a hypothesis based on prior knowledge as to why each plane performed as it did. Were there any surprises?
6. Each group present their findings to the class and the class establishes which planes are best suited to each function: distance, lift, accuracy.
7. Results can be collated and presented as graphs.

Sample chart for recording data. The same chart can be used for each criteria with the heading changed. Another column could be added for a prediction/hypothesis.

| **Team Name:** | | | | | |
|---|---|---|---|---|---|
| **Distance** | | | | | |
| | Throw 1 | Throw 2 | Throw 3 | Throw 4 | Throw 5 |
| **Design 1** | | | | | |
| **Design 2** | | | | | |
| **Design 3** | | | | | |
| **Design 4** | | | | | |
| **Design 5** | | | | | |

## Assessment

A written report should not be the default assessment strategy. Students could work in groups to produce a written report following scientific procedures but understanding and conclusions can be better communicated via the following:

- Group presentations
- PowerPoint presentations
- Mind mapping
- Video or photo diary

Alternatively, the class could produce one report modelled and guided by the teacher with students making various contributions to each part such as diagrams, lists, charts, graphs etc according to student's strengths.

**These lesson plans have been devised by Code Read Dyslexia Network with reference to and inspiration from the following:**

https://www.sciencebuddies.org/science-fair-projects/project-ideas/Aero_p046/aerodynamics-hydrodynamics/how-far-will-paper-planes-fly

https://explorable.com/paper-airplane-experiment

http://www.greatpaperairplane.org/

https://www.nationalmuseum.af.mil/Portals/7/documents/education/paper_dart_airplane_lesson_plan.pdf