



Paper Plane Challenge

Stage 4+ - Years 7 – 10

Summary and Guiding Questions

Students will design a fair test to establish how the designs of 3 standard paper planes can be adapted to improve distance, lift and accuracy. Students will use the scientific method to evaluate and test hypothesis and draw conclusions and relate their findings to the design of aircraft. Students will decide which variables to control, how to record results and how to report results.

Australian Curriculum Links

Strand: Science understanding

Physical Sciences

- Year 7:** Change to an object's motion is caused by unbalanced forces, including Earth's gravitational attraction, acting on the object (ACSSU117)
- Year 8:** Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155)
- Year 9:** Energy transfer through different mediums can be explained using wave and particle models (ACSSU182)
- Year 10:** Energy conservation in a system can be explained by describing energy transfers and transformations (ACSSU190)
The motion of objects can be described and predicted using the laws of physics (ACSSU229)

Strand: Science inquiry skills

Questioning and predicting:

- Year 7-8:** Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACIS124) & (ACIS139)

Year 9-10: Formulate questions or hypotheses that can be investigated scientifically (AC SIS164) & (AC SIS198)

Planning and conducting:

Year 7-8: Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (AC SIS125) & (AC SIS140)

Measure and control variables, select equipment appropriate to the task and collect data with accuracy (AC SIS126) & (AC SIS141)

Year 9-10: Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (AC SIS166) & (AC SIS200)

Processing and analysing data and information:

Year 7-8: Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (AC SIS129) & (AC SIS144)

Year 9-10: Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (AC SIS169) & (AC SIS203)

Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (AC SIS170) & (AC SIS204)

Communicating:

Year 7-8: Communicate ideas, findings and evidence-based solutions to problems using scientific language, and representations, using digital technologies as appropriate (AC SIS133) & (AC SIS148)

Year 9-10: Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (AC SIS174) & (AC SIS208)

Evaluating:

Year 7-8: Reflect on scientific investigations including evaluating the quality of the data collected, and identifying improvements (AC SIS131) & (AC SIS146)

Use scientific knowledge and findings from investigations to evaluate claims based on evidence (AC SIS132) & (AC SIS234)

Year 9-10: Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (AC SIS171) & (AC SIS205)

Prior Knowledge

Depth of knowledge will vary greatly but some understanding/experience of the following is expected:

- Aerodynamics of flight - thrust, lift, weight and drag
- designing a fair test
- controlling variables
- measurement
- recording results
- interpreting and evaluating results
- graphing results
- calculating adjusted averages

Materials/Resources

- red paper/Get Onboard Paper Plane templates (one design type)
- 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
- hoops to hang or targets
- chart to record distances of throws/duration of flight/accuracy of plane
- calculators for calculating averages
- graph paper
- camera
- NASA website <https://www.grc.nasa.gov/www/k-12/airplane/lift1.html>
- <https://paperplanemafia.com/>

Procedure/Instructions

1. Whole class discussion about aerodynamics and the forces involved in flight.
2. Students will be working in groups to design a fair test showing how 3 standard paper planes can be adapted or modified to improve performance. Students will test for distance, duration of flight and accuracy.
3. Students will be expected to use the scientific method to devise and carry out their test and present their findings to the class.

<https://www.sciencebuddies.org/science-fair-projects/science-fair/steps-of-the-scientific-method>

Title	A concise description of the project.
Aim	A formal statement of the purpose of the investigation.
Hypothesis	A formal testable statement or prediction of the expected outcome of the investigation.
Equipment	A list of all equipment or apparatus used in the investigation.
Risk assessment (if using hazardous or dangerous substances)	A document which outlines the identification, assessment and control of risks in the investigation.
Method	A procedure which describes the process of the investigation. There is scope to include a scientific diagram or a photo of the investigation set-up.
Results	Presented as a series of tables or graphs to represent the data from the investigation. There should be an analysis of the data including trends. The results can include photos.
Conclusion	A summary based on the investigation results and how it matches the hypothesis stated.
Discussion	An in-depth discussion of the scientific significance of the results. The discussion also provides an area to evaluate the investigation, including limitations, sources of error and bias.

Assessment

A written report should not be the default assessment strategy. Students can 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

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