

WW2

Airplane Experiment



Curriculum Links

Scotland

By investigating forces on toys and other objects, I can predict the effect on the shape or motion of objects.

SCN 1-07a

UK

Identify the effects of air resistance, water resistance and friction, that act between moving surfaces

Key Concept

I can explore how the shape and design of an airplane affect its flight by testing different paper airplane models.

4
QUALITY
EDUCATION



9
INDUSTRY, INNOVATION
AND INFRASTRUCTURE



Background

In this lesson, students will learn about the forces involved in flight—lift, thrust, drag, and gravity—by designing, building, and testing paper airplanes. They will experiment with different airplane designs to see how these forces affect distance, speed, and stability. This activity introduces students to basic principles of aerodynamics in a hands-on, interactive way.

Resources

- A variety of paper (e.g., standard printer paper, construction paper)
- Rulers and tape for measuring distances
- Clipboards, pencils, and paper for recording predictions and results
- Optional: Stopwatches for timing flights, additional weights (like paperclips) for testing balance

Wider Skills

- Scientific Inquiry: Observing, predicting, testing, and analyzing results.
- Math and Measurement: Measuring flight distances and recording results for analysis.
- Problem-Solving and Creativity: Adjusting designs based on performance and discussing improvements.
- Physical Activity and Coordination: Throwing, aiming, and observing the planes in flight.

Lesson

Introduction (10 minutes):

Introduce the concept of aerodynamics and the four forces acting on an airplane: lift, thrust, drag, and gravity. Explain that students will be testing paper airplanes to see how design changes impact their flight. Demonstrate how to fold a simple paper airplane and discuss how elements like wingspan and nose shape might affect its performance.

Introduce vocabulary:

- Lift: The force that pushes the airplane up.
- Thrust: The force that moves the airplane forward.
- Drag: The resistance that slows the airplane down.
- Gravity: The force that pulls the airplane downward.

2. Building and Designing Paper Airplanes (15 minutes):

1. Divide into Teams: Split students into small teams and give each team several sheets of paper to design and build their airplanes. Each team will create at least two different airplane designs, experimenting with variations in wingspan, wing shape, and nose shape.
2. Making Predictions: Each team should predict how their airplane designs will perform in terms of distance, speed, and stability. They can hypothesize which design will fly the farthest, which will stay airborne the longest, and which will be the most stable.

3. Testing the Airplanes (15 minutes):

1. Set Up a Test Area: Designate a starting line for throwing and mark a “landing zone” using cones or markers where students will aim to land their planes.
2. Conducting the Test Flights:
 - Have each team throw their airplanes from the starting line, one at a time.
 - Measure the distance each plane travels from the starting line to its landing point, and record the distance.
 - Optional: Time how long each plane stays in the air and note any wobbles or spins, indicating stability.
3. Repeat with Variations:
 - After the initial test flights, allow teams to make adjustments to their planes, such as adding paperclips for balance or modifying wing shape.
 - Test the airplanes again and record the results, comparing them to the first set of flights.

Lesson

4. Reflection and Discussion (10 minutes):

Gather students together to discuss their findings. Use questions to guide reflection:

- Which airplane design flew the farthest? Why do you think that was?
- How did changing the wings or adding weights affect the flight?
- What surprised you about the way your airplane flew?
- How do you think real airplane designers use these same principles when designing aircraft?

Encourage students to share what they learned about the impact of design changes on flight and how these principles relate to real-life aerodynamics.

Assessment

Observation of Engagement and Creativity:

- **Task Engagement:** Monitor students' involvement in folding, testing, and adjusting their planes.
- **Creativity and Design:** Assess the creativity and thoughtfulness of their designs, noting how they adapt based on results.

Reflection Responses:

- **Understanding of Aerodynamics:** Listen for students' ability to explain how changes in design impacted flight performance, showing an understanding of basic aerodynamics.
- **Problem-Solving Skills:** Observe how students discuss the changes they made and why, as well as what they might try next to improve their design.

Recording Accuracy and Results Comparison:

- **Results Recording:** Check that students are recording distances and observations accurately.
- **Comparing Trials:** Ensure they compare results from initial and adjusted trials, demonstrating an understanding of how design changes affect outcomes.

This paper airplane experiment introduces students to the principles of aerodynamics, encouraging critical thinking and creativity through hands-on testing and iterative design.

Younger Classes

For Younger Children (3-5 years old):

Simplify the activity by focusing on the basics of throwing and observing how the planes fly.

- **Simple Airplane Models:** Provide simple airplane templates that are easy to fold. Let young children observe how their planes fly with different throws.
- **Basic Observations:** Focus on basic questions like Did the plane fly far or close? and Was it fast or slow? to introduce them to concepts without complexity.

Older Classes

Introduce more advanced design concepts and allow for deeper experimentation.

- **Experiment with Different Materials:** Allow older students to use heavier paper types or add small weights to test balance.
- **Detailed Analysis:** Encourage older students to calculate average distances across multiple trials and analyze their results to determine the best design.







