

Impact of Drag in the Distance of Flight in Paper Aeroplanes

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Background Information:

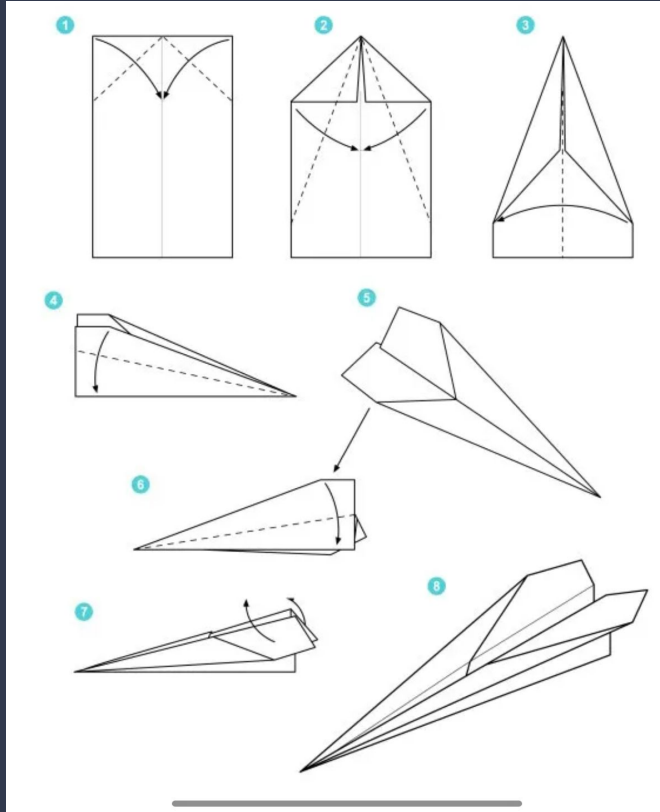
- Early paper gliders most likely first appeared in China and Japan around 500 BC
- Paper airplanes were used to test theories by pioneers of modern aviation
- Popularized in the 1930s and 1940s, the modern paper airplane is a fun version of these early flight experiments (Clark, 2017)

Introduction:



- **Purpose:** Build and test paper planes with different drags to identify its effects on the flight of the plane.
- **Provide:** The knowledge about the aerodynamics of a plane.
- **Manipulated variable:** Increase the drag of the paper plane by changing its basic design to see if this changes how far the paper plane flies.

Materials



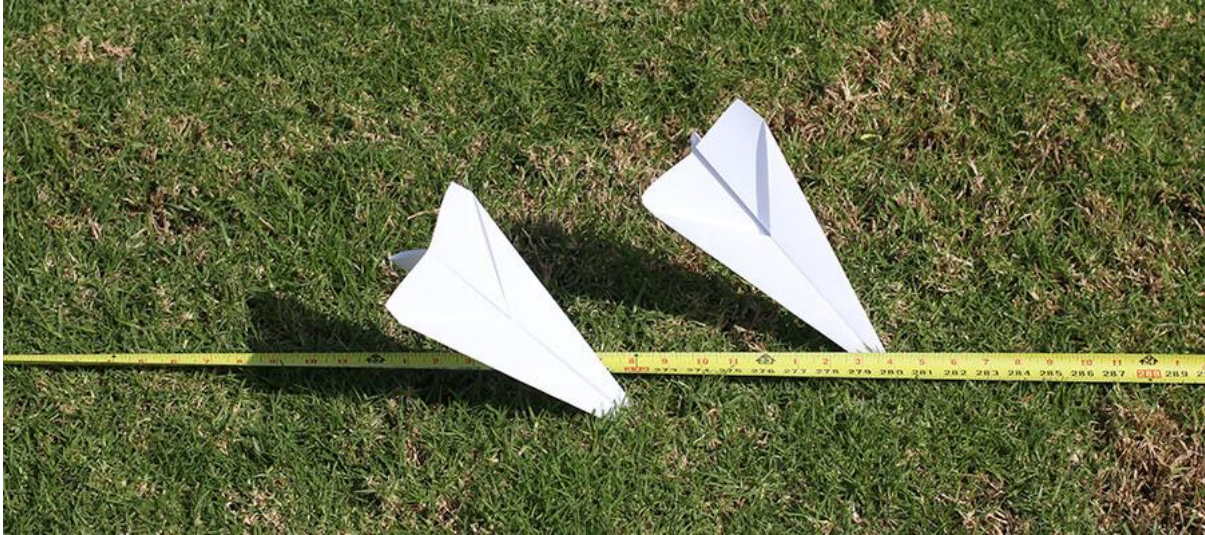
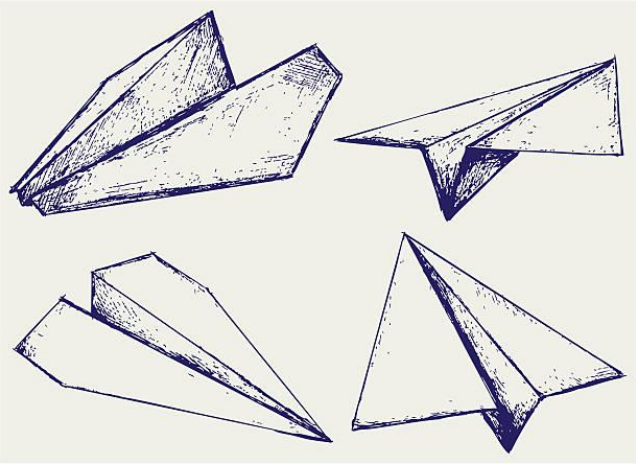
| Material | Quantity | Cost(USD) | Purpose |
|---------------|--------------------|----------------|---|
| Printer Paper | 1 pack(100 sheets) | \$3.00 | 8.5x11" paper to fold paper airplanes for testing. |
| Ruler | 1 | \$1.50 | Used to draw straight lines to fold and cut accurately. |
| Masking Tape | 1 roll | \$2.00 | Used to mark the starting line on the ground. |
| Tape measure | 1 | \$5.00 | 5-10 meters long to measure how far each plane flies. |
| Scissors | 1 | \$2.00 | Scissors to cut flaps on the planes to increase drag. |
| Notebook | 1 | \$2.00 | Sketch plane designs and record flight distances with observations. |
| Graphing tool | N/A | Free | Used to create bar graphs of average flight distances. |
| Total | | \$15.50 | |

Methods

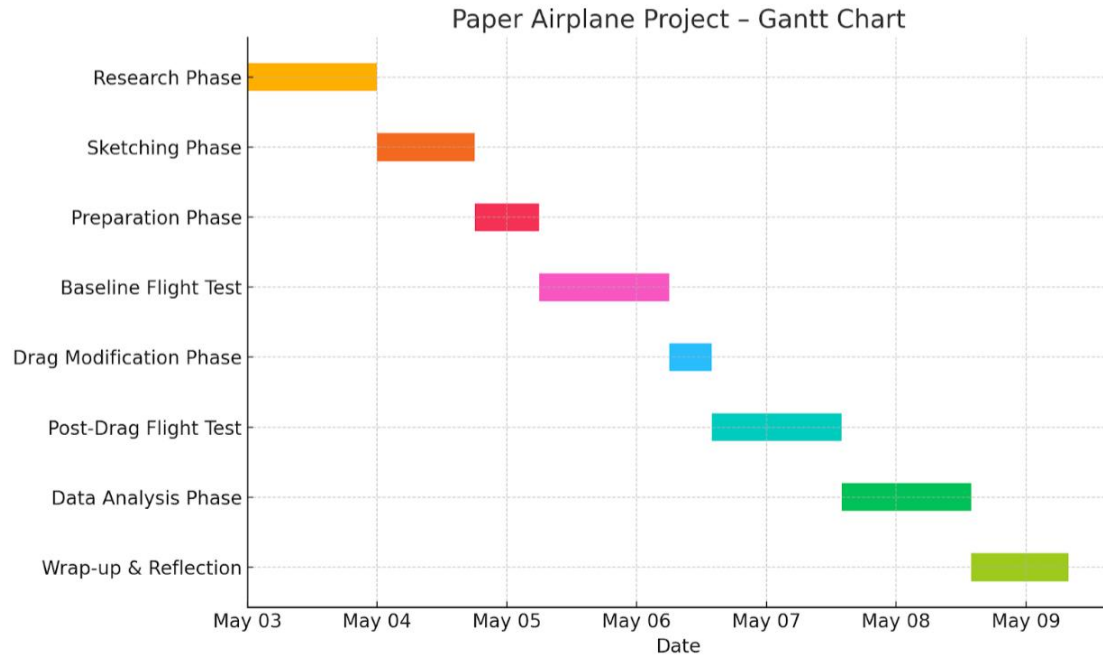
Method Summary:

- Built 5 paper airplanes using a standard design.
- Modified only the wingspan of each plane
- Planes labeled from 1 to 5 based on increasing wingspan.
- Consistent launch technique maintained across all trails.
- Indoor space used to eliminate wind and maintain control.
- Each plane thrown 5 times for consistent data collection.

| Phase | Tasks |
|------------------------|--|
| Research | Learn about lift, thrust, drag, and weight. Research paper plane designs. Research wing designs and the influence of drag. |
| Sketch | Sketch 5 airplane designs. Label important features. Decide on one standard design to use. |
| Preparation | Gather materials (paper, ruler, scissors, tape). Build the planned paper planes. Create a data table and track flight results (how far the plane had flown). |
| Baseline Flight | Find a place with stable weather and no wind. Mark a starting line with tape. Fly each plane 5 times and record all results. |
| Modification | Modify each plane to alter drag. |
| Testing | Fly each modified plane 5 times in the same location. Measure and record each flight's distance. Record this data. |
| Data Analysis | Compare the data and graph it. |



Timeline



Procedure



1. Choose a design for all planes.
2. Modify the wingspans.
3. Number the planes from Plane 1 (smallest) to Plane 5 (largest wingspan).
4. Set up the testing area. Use indoor hallway with marked starting line.
5. Launch each plane from behind the starting line, using the same angle and motion for every throw.
6. Measure distance using measuring tape from the start to where the plane lands.
7. Repeat the trials for all 5 planes.
8. Analyze the data.
9. Determine the result, how drag (wingspan) affects flight distance.

Results

Planes (Listed from smallest to largest wingspan)

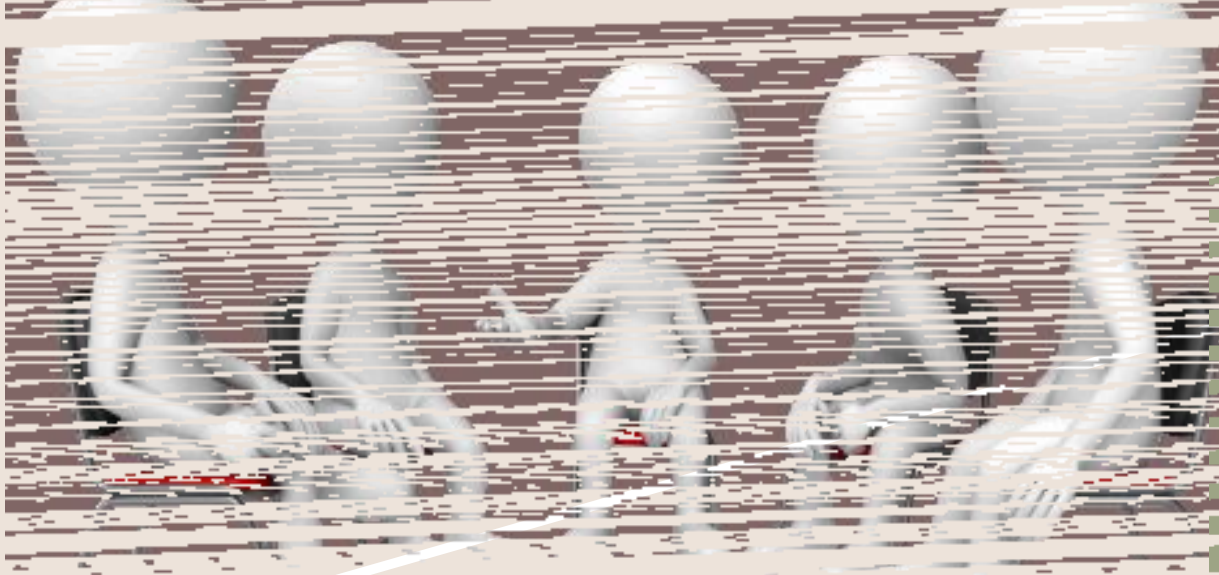
Average distance traveled after 5 trials (meters)

| | |
|----------------|------------|
| Plane 1 | 3.8 |
| Plane 2 | 3.1 |
| Plane 3 | 2.4 |
| Plane 4 | 2.6 |
| Plane 5 | 2.0 |

Our measurements supports the idea that increase wingspan/drag of a paper airplane results in shorter flight distances.



Discussion time



How can this experiment be applied?

Real-world concepts like aerodynamics and flight stability, as well as problem-solving and innovation, may all be understood through this paper airplane experiment.

Audience engagement

Let's learn to make a paper aeroplane

[video on how to make a paper airplane in 60 seconds](#)



Thank you
for
listening...

The End