



# Principles of Flight



## Lesson Plan: Do You Have the “Wright” Stuff?

**Grade Level:** 5-7

**Subject Area:** Math and Science

**Time Required:** *Preparation:* 2 hours (maximum)  
*Activity:* 5 sessions (45 minutes per session)

**National Standards  
Correlation:**

**Science (grades 5-8)**

- Science as Inquiry Standard: Abilities necessary to do scientific inquiry.
- History and Nature of Science Standard: Nature of Science
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**Math (grades 3-5)**

- Measurement Standard: Apply appropriate techniques, tools, and formulas to determine measurements.

**Math (grades 6-8)**

- Communication Standard: Use the language of mathematics to express mathematical ideas precisely.
- Communication Standard: Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

**Summary:** Students will be introduced to the four concepts of flight: lift, drag, gravity, and thrust, and make his/her own paper dart airplane to investigate the flight distance and demonstrate an understanding of the forces of flight. The class will analyze and compare their data using line plots and bar graphs created on the computer.

**Objectives:** Students will:

- Identify and learn the four forces of flight: lift, drag, thrust, and gravity.
- Construct a paper dart airplane as directed.
- Measure the flight duration and length.
- Record and communicate data to create line plots and bar graphs.
- Apply and understand the math concepts of mode, mean, and range.

**Background:** There are four forces of flight:  
Lift – the force that pushes the object up.  
Gravity – force that pulls the object down (opposite of lift).  
Thrust – the force that pushes the object forward.  
Drag – the force that pushes against the object (opposite of thrust).

**Materials:** You will need:

- Copy paper
- Paper airplane models with instructions (dart paper airplane)
- Tape
- Scissors
- Graph paper
- Meter sticks or measuring tape



- Lined paper (notebook paper)
- Chart paper
- Markers
- Sticky-back notes
- Model airplane for demonstration of force of flight concepts

**Safety Instructions:** Do not fly model planes directly at another person. Use caution when flying the models. Create a single direction flight zone. Students should face launched airplanes and watch carefully. Be sure that students stop flying their airplanes when others are retrieving airplanes that have already landed.

**Procedure:**

**A. Warm-up**

1. Use a model airplane to demonstrate the principles of flight. Ask the question: “What makes this model fly?”
2. Have the class “Think, Pair, and Share” (Kagan Cooperative Learning Structure). Each student will think to him/her-self an answer to the question. The students will then have 30 seconds to pair up and share his/her answer with the person next to them.
3. Elicit possible answers by calling on pairs to share their ideas.
4. Record student responses on chart paper.

**B. Activity I**

1. Show the students The Discovery Channel video “Flight.”
2. Discuss key concepts on the four forces of flight.
3. Give each student two sheets of notebook paper. Provide verbal instructions as students work in pairs:
  - Hold the papers side by side in front of your face.
  - Gently blow air between the pieces of paper.
  - Observe what happens.
  - Discuss observations.

**C. Activity I Wrap-up**

Preview the next day’s activity: building a paper airplane.

**D. Warm-up**

1. Throw a previously constructed paper airplane “Dart” across the room.
2. Review vocabulary/concepts from Session One. Ask: “What made this paper airplane fly?”

**E. Activity II**

1. Formally introduce the Four Forces of Flight.
2. Use chart paper or dry erase board to write the definitions of drag, gravity, thrust and lift, and instruct students to copy these terms/definitions into their lab books.
3. Hand out dart paper airplane worksheet.



4. Demonstrate and lead the construction of the paper dart airplane.
5. Review safety instruction with the class.
6. Allow students to practice flying the paper dart. For safety, the students will stand in a single file line to throw their paper darts.

#### ***F. Activity II Wrap-up***

Discuss the four forces of flight. (What is the thrust for your plane? What is the drag? What is the resistant force? What is lifting the plane?)

#### ***G. Warm-up***

1. Lead a short review of Session 2.
2. Have students create a new dart paper airplane to be used for a paper airplane contest.
3. Explain the contest: The students will participate in a contest to measure the distance each plane travels.
4. Each student will predict the distance they think their plane will fly. Record student predictions on a class roster of names.
5. Review safety instruction with the class.

#### ***H. Activity III***

The contest can be done in the gym, outside, or in the classroom.

1. Students will be given two attempts to throw their paper airplane. They will measure and record both distances on the class roster next to the predictions.
2. Create a class line plot (numbers line) and allow each student to post their best distance on the line with a sticky-back note. Make sure they write their name and distance on the note.
3. Instruct students to carefully save their airplane and airplane plans for a future activity.

#### ***I. Warm-up***

Use the following questions to discuss class results:

1. Whose plane flew the farthest?
2. Whose plane flew the shortest distance?
3. Who came closest to their prediction?

#### ***J. Wrap-up***

1. Discuss the four forces of flight: lift, drag, thrust, and gravity.
2. Discussion questions:
  - Why did your paper airplane fly well?
  - Why did your paper airplane not fly too well?
  - How can you improve your plane?



**K. Activity V**

1. Using the line plot, review the concepts of mode, mean and range.
2. Using graph paper, instruct students to create a bar graph showing the results for the entire class.

**L. Warm-up**

Inform students that they will have an opportunity to create another paper airplane, and that they are to be thinking of ways to improve their plane or create a new design.

**M. Wrap-up**

1. Review the four forces of flight: lift, drag, thrust, and gravity.
2. Have students look at their dart paper airplanes that they used for the contest. Ask: “What improvements could you make to the airplane?”

**N. Activity VI**

1. The students will have the choice to either improve the dart airplane by constructing a new one, try a new design provided by the teacher, or create an entirely new plane.
2. Give students time to fly their planes. Follow the same procedure for the paper airplane contest.
3. Students record their results, and create a new class line plot. Small groups of children will be asked to find the mode, mean and range of distances.

**O. Wrap-up**

In a class discussion, discuss why “improvements” to their airplanes were/were not successful.

**Evaluation/  
Assessment:**

Students should be evaluated on participation, accuracy of calculations, and ability to describe/observe/apply the four forces of flight.

**Extensions:**

1. Write a summary of the results of their paper airplanes flight capabilities.
2. Write a set of directions on how to construct their paper airplane model.
3. Calculate the average distance flown for the class using a calculator.
4. Measure the time the planes are in flight using stopwatches, and create line plots and bar graphs to show the results.
5. Compare and contrast their two planes in a short essay.

