

# ***Whirlygigs & Things that Spin***



**SOARING THROUGH SCIENCE EDUCATION**

**Grade Level(s): K-5th**

**Length of Time: 45-60min classes**

**Technology Lesson: No**

**Note: Teacher has option to opt out of introducing the lesson plan by merely playing the provided video. This video will touch base for Gravity, Mass, and Weight. If you do not think you have time to watch the introduction video then proceed with the lesson plan as follows. If you decide to use the video, ask the probing questions in Engagement and skip the Teacher and Student Activity until Exploration.**

## **CONCEPT STATEMENT:**

In this lesson plan students will learn about how air is an invisible force that creates drag on a flying object, whether that object is a plane, helicopter, or even a piece of paper. Students will learn about the importance of drag and its effect on different surfaces, shapes, and weights.

## **LESSON OBJECTIVES: Upon successful completion of this lesson, students will be able to...**

Identify that drag is the force that slows down a plane as it flies through the air. They are also able to acknowledge that air is an invisible force that you can feel but cannot see.

## **TEKS ADDRESSED:**

Kindergarten Math: 1:(B)(C)(D)(E), 6:(A)(F), 7:(A), 8:(A)(B)(C) Science: 2:(B)(C)(D)(E), 4:(A), 5:(A)

1ST Grade Math: 1:(A)(B)(C)(D)(E), 8:(A)(B)(C) Science: 2:(B)(C)(D)(E), 3:(B), 4:(A), 5:(A), 6:(B)

2ND Grade Math: 1:(A)(B)(C)(D)(E)(F)(G), 10:(B)(C)(D) Science: 2:(C)(D)(E)(F), 3:(B), 4:(A)

3RD Grade Math: 1:(B)(C)(D)(E)(F)(G), 8:(A)(B) Science: 2:(B)(C)(D)(E)(F), 3:(A), 4:(A), 6:(C)

4TH Grade Math: 1:(B)(C)(D)(E)(F)(G), 9:(A)(B) Science: 2:(A)(B)(C)(D)(E)(F), 3:(A), 4:(A), 6:(D)

5TH Grade Math: 1:(B)(C)(D)(E)(F)(G), 9:(A)(B)(C) Science: 2:(A)(B)(C)(D)(E)(F)(G), 3:(A), 4:(A), 6:(D)

## **RESOURCES, SUPPLIES, HANDOUTS:**

Scissors, paperclips, printout of whirligigs, cereal bowls, tape and/or butcher paper circles.

## **SAFETY CONSIDERATIONS:**

Scissors. Teachers if you are doing this with young children please precut the whirligigs for your students. Care to be taken if children stand up on chairs/stools in order to drop the helicopters from a greater height.

## **ENGAGEMENT**

### Teacher and Student Activity

Take a piece of paper and show it to the students. Ask them to predict what would happen if you were to throw it up in the air. Then, take a crumpled piece of paper and do the same thing. Throw both papers into the air to test student predictions.

Next, ask the students if they could predict where each piece of paper will land if thrown again. The crumpled piece of paper will be easy to predict, but the uncrumpled one will be harder.

- So what do you think is making the flat piece of paper take longer to hit the ground than the crumpled paper?
- The reason that the flat paper is falling slower is a thing called air resistance, or also known as Drag. So what do you think drag is?
- We know that it is air resistance but how does that affect a helicopter? Drag is the force that slows down things such as a plane or helicopter as they fly through the air. Drag puts up a fight as it travels through a liquid like water or even a gas like the air around us. The source of drag depends on the shape of the aircraft.

### Probing Questions, Answers, Misconceptions

How does a helicopter fly?

## **TRANSITION...**

Today we will be building a whirligig, or a paper helicopter. You will be testing them to see how Drag works in different ways.

## **EXPLORATION**

### Teacher and Student Activity

Place students into pairs. Distribute the copies of the Whirligigs and the supplies to the students. (I would give each group a large whirligig and a small one.) Allow students to cut them out. Walk them through folding the whirligigs and adding the paper clip. (Instructions are provided.) (NOTE: You will need to draw the circles on the newspaper so that all the circles are the same size. I would suggest using a Frisbee or other large circular object as a template.) Have the pair's team up against another pair of students. (You may choose them for the students or allow them to pick themselves.) Have the students measure and then place strips of masking tape 3 to 4 feet away from the newspaper. Place the cereal bowl in the center of the circle. Instruct the students to try to land the Whirligigs inside the cereal bowl.

If they land it in the cereal bowl they receive 3 points, if they land it in the circle they receive 2 points, and if they land it on the newspaper they receive 1 point. Have the students play 4 or 5 rounds and keep track of points.

### Probing Questions, Answers, Misconceptions

Teacher should walk around the room as students are working on getting the whirligig inside of the cereal bowls.

- Do you think the weight of an object effects how well it will fly?
- Does the shape of the wings matter?
- Why does the Whirligig spin?
- When the whirligig falls, air pushes up against the blades, bending them up just a little. When air pushes upward on the slanted blade, some of that pushes becomes a sideways, or horizontal, push.
- Why doesn't the whirligig simply move sideways through the air?
- That's because there are two blades, each getting the same push, but in opposite directions. The two opposing pushes work together to cause the toy to spin.

### **TRANSITION...**

While the students are playing, walk around the room asking questions such as, "Why do you think your whirligig is flying that way? What could be affecting its flight? Describe some changes to it that you may want to make." As you hear terms from students, write them on the board to review later.

### **EXPLANATION**

Teacher and Student Activity

After each round, have students write about what was occurring as they threw the whirligig. Have the pairs work together to come up with a plan make ONE change to their Whirligigs in order to help them in the next set of rounds. After they alter their copters, they will need to write about why they chose to do this and what results they expect. Then allow them to try another 5 rounds of flights.

Probing Questions, Answers, Misconceptions

What types of changes can you make to your whirligig?

What did they notice about the spins for each helicopter?

Did they spin clockwise or counter-clockwise?

How can you change the spin?

### **TRANSITION...**

What are a few things you have learned so far from testing out your whirligigs and trying to get them into the cereal bowl?

### **ELABORATION**

Teacher and Student Activity

When done, allow the students to work together to diagram their whirligig and how they could make another change to the copter to improve flights. Explain that they were only allowed to make ONE change because if they changed more than one variable, then they would not understand which variable affected the copter's flight. Go back to the words written on the board and have students explain why they used them and to explain the usage of them.

Probing Questions, Answers, Misconceptions

What changes made your whirligig fall slower?

What changes made your whirligig fall faster?

What made your whirligig spinner faster?

What changes did not affect your whirligig?

What changes left you control the flight path better?

### **EVALUATION**

Teacher and Student Activity

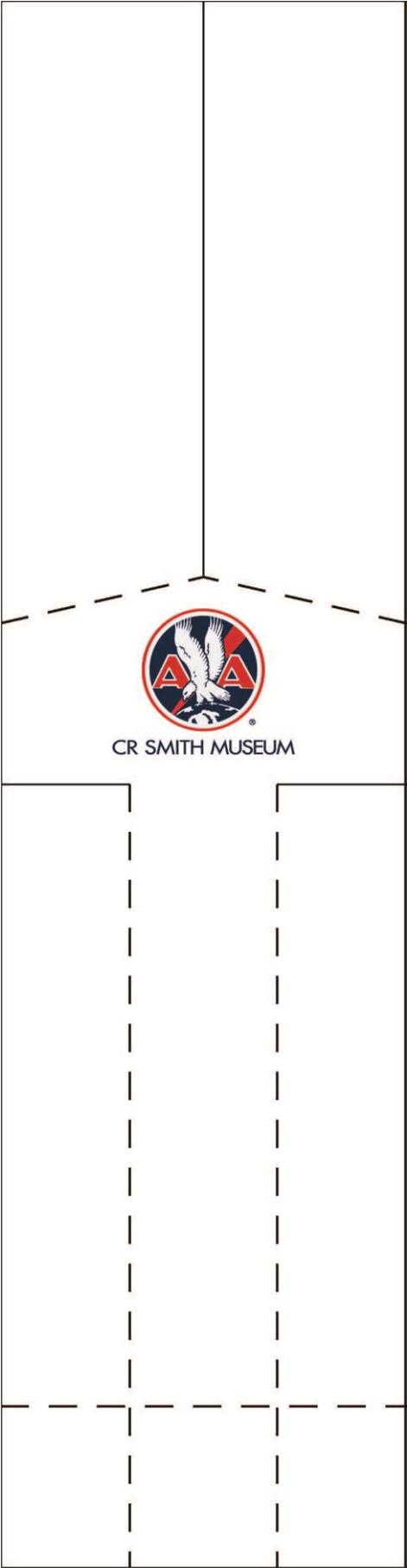
Allow students to share their modifications and whether or not they worked. Allow students to offer suggestions on modifications to try later. Have the students create a diagram of their Whirligig and describe where gravity and different forces were affecting the whirligigs.

# Whirligig Data Table

**Instructions:** In the table below on the left hand side write down a description and/or draw a model of your Whirligig. In each new table record the modification you and your team made to your original Model. On the right hand side record how many points you and your partner score each round, use Talley's to keep score of how many points you each earned.

<b>Helicopter Design</b>	<b>Score</b> Recorded in Talley's
Description of first Whirligig:	Round 1:  Round 2:  Round 3:  Round 4:
Modification 1:	Round 1:  Round 2:  Round 3:  Round 4:

Modification 2:	Round 1:  Round 2:  Round 3:  Round 4:
Modification 3:	Round 1:  Round 2:  Round 3:  Round 4:
Modification 4:	Round 1:  Round 2:  Round 3:  Round 4:



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