

Building A Helicopter



Purpose: To determine how weight affects the speed of rotation of a paper helicopter.

Arkansas Science Standards:

PS. 6.6.5. Understand why objects have weight.

PS. 6.6.6. Compare and contrast weight and mass.

PS. 6.6.7. Describe the effects of force:

- Move a stationary object
- Speed up, slow down or change the direction of motion
- Change the shape of objects

PS. 6.6.8. Conduct investigations to demonstrate change in direction caused by force.

Materials:

Outline of helicopter

Paper clips

Stop watch

Scissors

Activities:

1. Have each pair of students cut out a helicopter pattern. The students need to cut along the solid line and fold along the dotted line.
2. Ask the students the following scientific question: How does number of paperclips added to the base of the helicopter affect the speed of the helicopter (or, if you don't have access to stop watches, the number of rotations of the propeller) as the helicopter falls? Have the students discuss and write their hypothesis statements.

WARNING: The helicopter rotates very quickly. While counting the number of rotations may be hard, students will be able to tell how number of paperclips affects the number of spins.

3. Have students create a data chart such as the one below to record their information.

How Does Number of Paperclips Affect Number of Rotations?

# of paperclips	Trial One	Trial 2	Trial 3	Average
1				
2				
3				
4				

4. Students work in pairs to complete the experiment. Remind them that the only variable they are changing would be the number of paper clips. Everything else must be the same for each test. For example, height from which it is dropped, direction of the paper flaps, etc.

5. Students share their findings with the rest of the class. The teacher collects the averaged data from each group and completes a class average. The class can graph the results and answer the scientific question. Be sure to ask questions that lead the students to tell you that building an aircraft with more weight will affect how it falls.

Why Teach This Before the Exhibit? To ensure that children have some practice with the affects of wind resistance, gravity, and mass on an object before visiting the “Race to Planet X” exhibit.

Expected Results: The rotation speed increases as the weight increases. However, at a

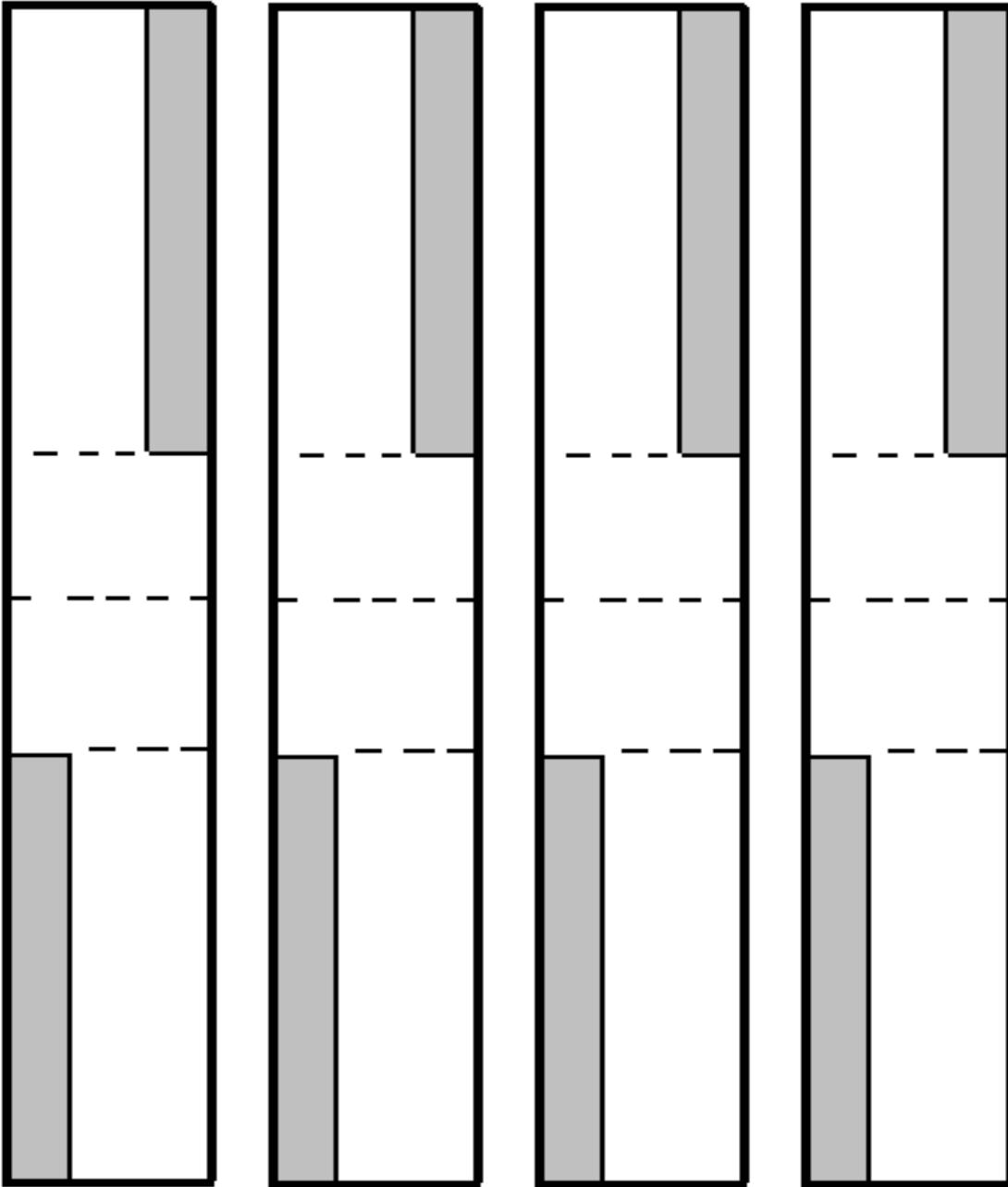
certain point the weight pulls down with such force that the wings move upward and the helicopter falls like any falling object.

Background Information: As the paper falls, air rushes out from under the wings in all directions. The air hits against the body of the craft, causing it to rotate. Increasing the weight by adding paper clips causes the helicopter to fall faster, and the amount of air hitting the craft's body increases. This increase in air movement under the wings increases the rotation speed.

Extension: Repeat the preceding experiment with the following scientific question. How does direction of the flaps affect the direction the helicopter will rotate as it falls? To do this, students will need to take off the paperclip, fold the entire helicopter on the reverse side of the paper. In other words, if the dotted lines are on the outside of the fold, turn them so they are on the inside of the fold. One direction should rotate clockwise and one paper direction should rotate counter-clockwise.

Helicopter Patterns

Fold on the dotted lines and cut on the solid lines. Cut off the gray area.



Adapted from VanCleave, J. 200 Goopy, Slippery, Slimy, Weird & Fun Experiments. New York, NY: John Wiley & Sons, Inc. 1993.