Activity #10

Spin it

Flick!

MythBusters: The Explosive Exhibition Component:
Killer Card Toss
**WONDER**

How does the shape of paper effect how it flies through the air?

**RESEARCH**

The air around us – even if we can't really see it – is made up of atoms and takes up space. Try waving your arms back and forth – you can feel it as your arms collide with the air molecules around them. You are experiencing a force called air resistance – the opposition to an object’s motion through the air.

Size and shape are two factors that affect air resistance. The more surface area an object has, the more air resistance it will encounter. Imagine dropping two pieces of paper – one flat and one crumpled into a ball. The crumpled one falls faster because there is less air resistance acting on the paper.

**TEST AND DISCOVER**

**MATERIALS**

- Helicopter Template
- Scissors
- Small paper clips
- Stopwatch (optional)
- Blueprint

**SAFETY FIRST!**

Stepping into the shoes of a MythBuster should not mean sacrificing your safety. Keep these guidelines in mind for each activity:

1. Read or listen carefully to all the directions before you start the experiment.
2. Use the equipment and materials only as instructed.
3. Keep your work area clean and organized.
4. Take care when using scissors, or restrict their use to adults.
5. Use plastic instead of glass wherever possible.

*Special Notes: Children should not climb on objects to drop helicopters.*

**PROCEDURE**

1. Download and print helicopter template.
2. Use the helicopter template to cut out your flyer. Cut only on the solid lines.
3. Fold flap C up. Hold your helicopter up high and drop it. Observe what happens.
4. Fold flaps D and E in opposite direction to form the blades. Fold flap D towards you and flap E away from you. Hold your helicopter up high and drop it again. Observe what happens.
5. Cut out a new flyer and experiment with the design. What happens when you:
   - Add a paper clip to the stem? Two paper clips?
   - Fold the stem to make it shorter?
   - Cut the blades shorter?
   - Cut jagged edges on the blades, or make the blades rounded?
   - Bend the blades another way?
6. Describe or draw your fastest and slowest designs on your Blueprint. Include arrows to indicate where you think the helicopter is encountering air resistance.
THINK ABOUT IT

What makes the helicopter fall to the ground the fastest? Slowest? How can you explain the difference?

RESULTS

As the helicopter falls, air molecules colliding with it cause an opposing force that slows the helicopter down. The pressure of the air pushes the blades up into a slanted position. Because there is no forward movement, gravity pulls the helicopter downward, but the moving winds act against this force. The air under one blade is pushing one way and the air under the other blade is pushing the opposite way. These two forces of air push the blades around and make it spin. The faster the blades spin, the less the air can get by and the slower the helicopter falls.

By experimenting with the weight, shape and position of the blades, you can change how fast and how much air is pushed out of the way. In other words, you’re changing how the air resistance is hitting your helicopter. This affects how it moves.

TIPS FOR TEACHERS

Have students find the average flight time after three trials. Analyze data from different types of helicopters to create the best helicopter.

KEEP DISCOVERING!

Investigate how changing one variable at a time impacts the flight of your helicopter. For example, what if you add one paperclip to the base, but keep everything else the same? What if you add another paperclip, but keep everything else the same? Use a stopwatch to accurately measure the flight times and record your results.
WANT TO LEARN MORE?

ADAM AND JAMIE TACKLE CARD TOSSING.
http://player.discoveryeducation.com/?guidAssetId=186b635e-2ad8-432a-b6cf-138fc21cd230

CHECK OUT A CHAMPION CARD TOSSER – IN SLOW MOTION!
http://player.discoveryeducation.com/index.cfm?guidAssetId=B4817D80-3A5B-4239-8F6F-7241A356CFE5&b
lnFromSearch=1&productcode=US

INVESTIGATE THE BIOMECHANICS OF THROWING – WHETHER IT’S BASEBALLS OR PLAYING CARDS.
http://player.discoveryeducation.com/index.cfm?guidAssetId=F158B3F4-E32C-4A83-B258-4695A9445311&bl
nFromSearch=1&productcode=US

WHAT’S THE BEST WAY TO TOSS A PUMPKIN?
http://science.discovery.com/tv/punkin-chunkin/game/

WHAT ARE PLAYING CARDS MADE OF?

NATIONAL SCIENCE EDUCATION STANDARDS

Grades 5-8, Standard A: Abilities necessary to do scientific inquiry
Grades 5-8, Standard A: Understandings about scientific inquiry
Grades 5-8, Standard B: Motions and Forces
Grades 5-8, Standard E: Abilities of technological design
Grades 5-8, Standard E: Understanding about science and technology
Grades 5-8, Standard G: Nature of Science

This guide has been developed for use by educators, group leaders and families for use in connection with “Mythbusters: The Explosive Exhibition” (the “Educators”). The activities described in this guide are potentially dangerous and could result in injury or damage. This guide is provided on an ‘AS IS’ basis and the Museum of Science and Industry disclaims all warranties, express or implied, regarding the guide. Use of this guide is done at the risk of the Educators. By using this guide, you release the Museum of Science and Industry, its officers, employees, directors, trustees, agents and volunteers from and against any and all liability, claims, actions, costs, expenses, damages, attorney fees, breach of contract actions and all causes of actions whatsoever, that you may now have or may acquire in the future, arising out of or relating to any loss, damage or injury that may be sustained by you, the people you are educating, or to any property belonging to you or the people you are educating, as a result of the use of the guide.
1. Use the helicopter template to cut out your flyer. Cut only on the solid lines.
2. Fold flap C up. Hold your helicopter up high and drop it. Observe what happens.
3. Fold flaps D and E in opposite direction to form the blades. Fold flap D towards you and flap E away from you. Hold your helicopter up high and drop it again. Observe what happens.
Which design fell the fastest? Describe or draw it below, using arrows to indicate where you think the helicopter in encountering air resistance:

Which design fell the slowest? Describe or draw it below, using arrows to indicate where you think the helicopter in encountering air resistance:

Why do you think certain designs fall faster or more slowly?