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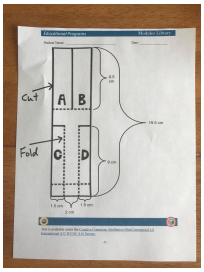
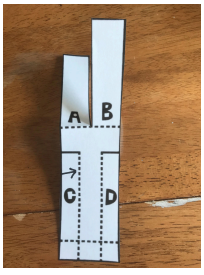
Activity Sheet

Paper Helicopter

Aim:
To find out if the size or mass of a helicopter affects how long it stays in the air.

Background:
Watch the video on how a paper helicopter works: https://www.youtube.com/watch?v=dTS5cY3XYZw&feature=emb_logo **Read the information on page 4 on why the paper helicopter spins.**

Materials:					
Paper	Scissors	Ruler	Pencil or Pen	Paperclip (optional)	Phone stopwatch

Method:		
1	Print out a copy of the helicopter template on page 5. If you cannot print out the template, you can create your own, using the measurements.	
2	Cut along the solid lines.	

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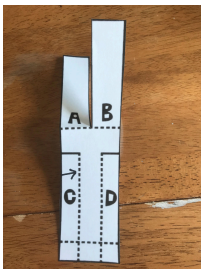
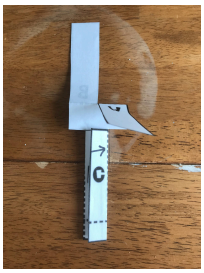
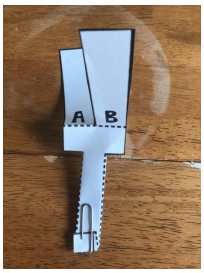
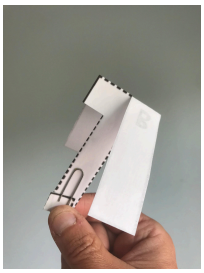
3	Fold along the dotted lines for A and B. Fold them in opposite directions.	
4	Fold C and D over each other so they overlap.	
5	Fold the bottom up. Add a paperclip (optional).	
6	Hold the helicopter by the bottom. Throw it like a baseball, as high and far as you can. It will spin to the floor. The higher up you are, the better it will fly. You can also try out other techniques for dropping the helicopter and choose the one that works best.	
7	Use the stopwatch on your phone to time how long it takes the paper helicopter to fall to the ground. Record your time in the results table.	
8	Repeat step 7 two more times. Record your results and calculate the average.	

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9	What changes could you make to your helicopter and how do you think it might affect the flight? These changes are called **variables**. Come up with at least two variables and hypothesize how they might affect the helicopter's flight. Write these in the section below.
10	Pick one variable and make two different helicopters.
11	Perform steps 6-8 for each of your new helicopters.
12	Look at your data and discuss what your results show. What do they tell you about how the variable affected the flight of the helicopter. Write this in the **conclusion**.

List of Variables	
Variable	**How it might affect the flight?**
eg: size of wings	**Larger wings will help it stay in the air longer**

Results Table				
	Time in Air (s)			
Helicopter	**Trial 1**	**Trial 2**	**Trial 3**	**Average**

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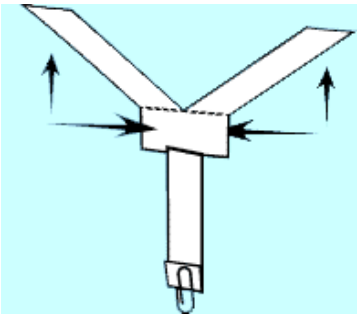
Conclusion

Why does the Roto-Copter spin?

When the Roto-Copter falls, air pushes up against the blades, bending them up just a little. When air pushes upward on the slanted blade, some of that thrust becomes a sideways, or horizontal, push. Why doesn't the copter 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 thrusts work together to cause the toy to spin.



Next time you drop your copter, notice which direction it spins as it falls. Is it clockwise or counterclockwise? Now bend the blades in opposite directions-if blade A was bent toward you and blade B was bent away, bend B toward you and A away. Drop the copter again. Now which way does it spin?

In the Spinning Blimp, air pushes up on the flat sides of the strip of paper. When the flat side of the paper strip is parallel to the ground, the blimp drifts down like a flat piece of paper. But if the blimp tilts so that the flat side of the strip is at an angle to the ground, the paper strip gets a sideways push, just like the blade of the copter, sending the blimp spinning. Each time the flat strip comes around, it gets another push and goes for another spin.

"Science Activity: Make a Mini-Helicopter From Paper!" *Exploratorium*, exploratorium.edu/science_explorer/roto-copter.html.

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