

## Roto-Copter

Thank you for downloading the science and mathematics activity packet! Below you will find a list of contents with a brief description of each of the items. This activity packet contains all the information (including any handouts) you will need to run this activity in your own classroom or at a science festival.

Please note: some activities might require the need for a facilitator to be present to oversee the activity. Activities that require a facilitator will be clearly noted.

-Community Resources for Science



## ACTIVITY PACKET CONTENTS

1. Organizer instructions
  - Print suggestion: 1 for the facilitator
  - Includes information for setup prior to the event (e.g., materials prep)
2. Background Information
  - Extra information for the organizer/facilitator to better understand and explain the science behind the activity
3. What's Going On? (tabletop sign/printout)
  - Print suggestion: 1 to put in a plastic sign holder
  - Explains the science and background information behind the activity
4. Participant instructions (tabletop sign/printout)
  - Print suggestion: 1-2 to put in a plastic sign holder
5. Activity Printout(s) for participants
  - Print suggestion: number of expected participants, plus any extras for participants to take home
  - Printouts needed for participants to do the activity (e.g., cutout templates)
6. Take home activity sheet for participants
  - Print suggestion: number of expected participants
  - Easy-to-follow materials list and instructions for participants to try the activity at their homes



# Roto-Coptor

## ORGANIZER INSTRUCTIONS

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

**Standard connections:**

- **CCSS.Math.Practice 5:** Use appropriate tools strategically

**Next Generation Science Standards:** Science and Engineering Practices

- **Constructing Explanations and Designing Solutions** Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem

**Objective:** Build Roto-Copters and have them land within a target

**Materials:**

- Photocopy of the Roto-Copter pattern or white paper that you can use for tracing
- Pencil (for tracing)
- Scissors
- Paper clips
- Crayons or markers
- Newspaper
- Cereal bowl

**Setup:**

1. Set out all materials on a table along with instructions and background handouts
2. If you have time, build a Roto-Copter as an example

**Suggested Prep:** Draw out the target field in advance for the Roto-Copter game

1. Use a marker to draw a 1-foot circle on a piece of newspaper
2. Put a cereal bowl in the middle of the circle
3. The circle is the target area and the cereal bowl is the bull's-eye
4. Participants get 3 points for a bull's-eye, 2 points for a copter inside the circle, and one point for just hitting the newspaper

[https://www.exploratorium.edu/science\\_explorer/roto-copter.htm](https://www.exploratorium.edu/science_explorer/roto-copter.htm)



## BACKGROUND INFORMATION

Igor Sikorsky designed the first successful helicopter in the late 1930s. His inspiration came from drawings of an aircraft with a spinning wing, drawn by Leonardo da Vinci nearly five hundred years before.

### 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.



## What's Going On?

### 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 counter clockwise? Now bend the blades in opposite directions—if blade A was bent towards you and blade B was bent away, bend B towards you and A away. Drop the copter again. *Now which way does it spin?*

### Instructions

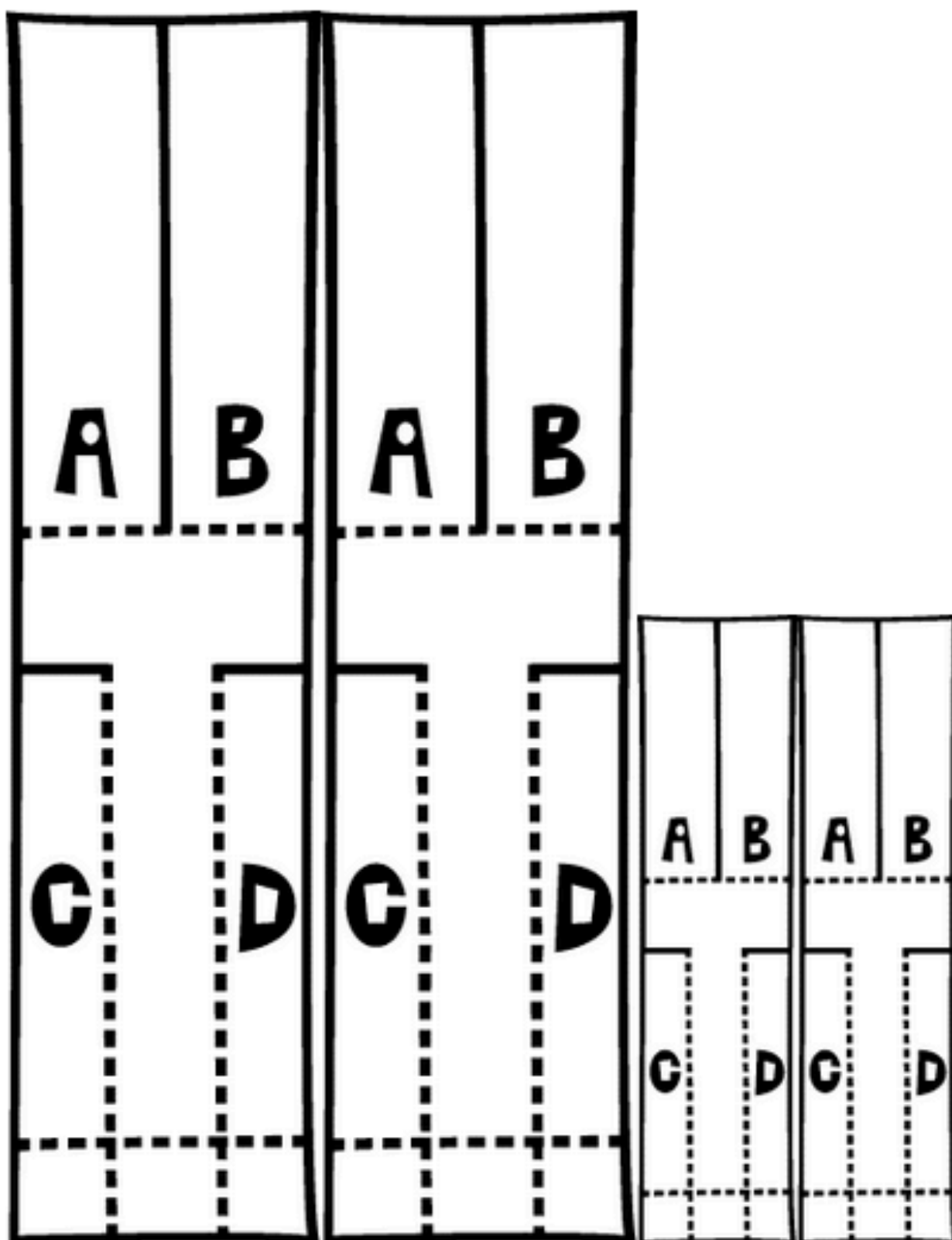
1. If you want, you can color your Roto-Copter before you fold it
2. Cut along the solid lines only of the Roto-Copter
3. Fold on the dotted lines
4. Fold A towards you
5. Fold B away from you
6. Fold C and D over each other so they overlap
7. Fold the bottom up and put a paper clip on it
8. Hold the Roto-Copter by the paper clip and throw it like a baseball, as high and far as you can and watch it spin to the floor!

### Roto-Target Game

Try to drop your Roto-Copter in the middle of the target! The circle is the target area and the bowl is the bull's-eye. Take turns standing at the edge of the newspaper and dropping your Roto-Copters.

You get 3 points for a bull's-eye, 2 points for a copter inside the circle, and one point for just hitting the newspaper.

## Roto-Copter



## Roto-Coptor

### TRY IT AT HOME!

#### What you'll need:

- Roto-Copter printout
- Scissors
- Paper clips
- Crayons or markers

#### Instructions:

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2. Cut along the solid lines only of the Roto-Copter
3. Fold on the dotted lines
4. Fold A towards you
5. Fold B away from you
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7. Fold the bottom up and put a paper clip on it
8. Hold the Roto-Copter by the paper clip and throw it like a baseball, as high and far as you can and watch it spin to the floor

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