

# RUBBERBAND HELICOPTERS

ADAPTED FROM CAMP GALILEO'S SCIENCE CURRICULUM

**Age Range:** 1st grade and up

**Estimated Time:** 20 minutes

## MATERIALS AND TOOLS

- 6" hook nose propellers\*
- Craft sticks
- Paperclips
- Rubberbands
- Cardstock
- Clear or masking tape
- Scissors

\*propellers can be found at [www.kelvin.com](http://www.kelvin.com)

## INNOVATOR'S MINDSET FOCUS

### BE DETERMINED

- I persevere until I achieve my goal.
- I recognize setbacks as opportunities to learn.
- I know that innovation and mastery require effort.

### STEP 1: PROPELLER



Fit the 6" hook nose propeller snugly onto a small craft stick.

### STEP 2: PAPER CLIP



1. Pull the inside bent piece apart from the rest of the paper clip.

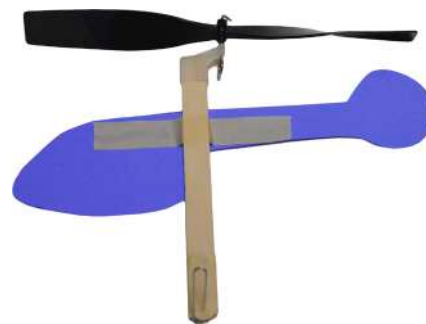


2. Hold the paperclip flat against the craft stick with the tip of the thumb, then tightly wrap a piece of tape

### STEP 3: PAPER CUTOUT



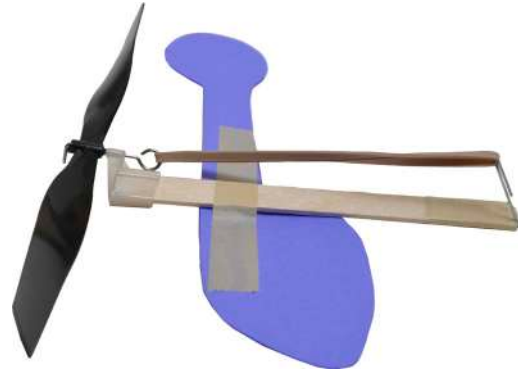
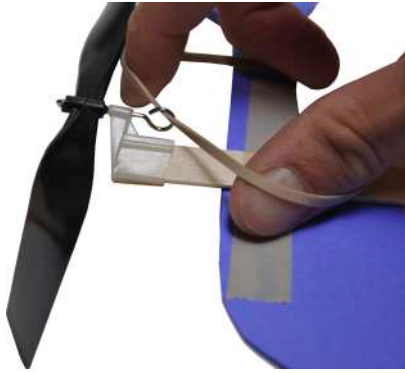
1. The paper cutout is crucial; it's what makes the copter work. Cutouts that are about 1.5" by 7" made from cardstock work really well. Challenge yourself to give your helicopter's body some flair - maybe a butterfly, or other unusual shape.



2. Attach the cutout on the opposite side of the exposed paperclip - this will help ensure that the rubberband won't rub against it. **CONTINUE TO STEP 4...**



## STEP 4: ATTACH RUBBERBANDS



Put your fingers inside 2 rubberbands and stretch them. The taught rubberbands should easily slip into the propeller hook and paperclip.

## STEP 5: HOW TO FLY THE HELICOPTER



For some, flying the helicopter is more challenging than building it. First of all, the helicopter must be wound up enough. Twist the rubberband until it becomes completely coiled, and keep going. You'll notice that the rubberband begins to form a second set of twists that are bulkier - it looks like tight bundles of knotted rubberband. If you fill up the whole length of the rubberband with double-twisted rubberband, then it probably has enough energy.

To fly, hold the top of the propeller and the bottom of the craft stick near the paperclip. For a stable and high-reaching flight, you must let go of the top first and then the bottom within half of a second of each other. A helpful trick is to say, "tick tock," as you let go of the top and then the bottom of the helicopter.

You can also fly the helicopter sideways following the same procedure.

## INNOVATOR'S KNOWLEDGE: HOW IT WORKS

- Energy is stored in the rubberband by winding the propeller.
- When flown, the rubberband rapidly releases its energy by unwinding, which turns both the propeller blade and the paper cutout.
- The paper cutout pushes against the surrounding air, which creates horizontal air resistance, or drag. This makes it harder for the cutout to spin. Because the cutout does not spin as easily, more energy from the rubberband is released into the propeller, which is much easier to turn. In this way, the paper acts like the rear rotor of a real helicopter.
- As the propeller spins rapidly, it begins to create lift by pushing air downward. With enough energy, the helicopter will fly in whatever direction it is pointing.



# GALILEO INNOVATION APPROACH

**We're on a mission to develop innovators who envision and create a better world.**

The Galileo Innovation Approach (GIA) is our guiding principle. The GIA is at the core of every activity your kids do at camp, from pre-K all the way to 8th grade. Having a Galileo Innovator's Mindset, Process and Knowledge makes a lasting impact on the way children think, explore and create.

## MINDSET: How do Galileo Innovators approach their work?

### BE VISIONARY

- I envision a better world
- I imagine things that don't yet exist
- I believe that it is my place to turn ideas into reality

### BE COURAGEOUS

- I freely share my creative thoughts
- I stretch myself to try new things
- I embrace challenges

### BE COLLABORATIVE

- I value the unique perspectives of others
- I build on the ideas of others
- I use my strengths to support the work of others

### BE DETERMINED

- I persevere until I achieve my goal
- I recognize setbacks as opportunities to learn
- I know that innovation and mastery require effort

### BE REFLECTIVE

- I take time to think about what is and isn't working in my design
- I think about how my work impacts other people and the world
- I seek feedback to improve myself and my work

## KNOWLEDGE: What do Galileo Innovators need to understand?

### CONCEPTS AND FACTS

The big ideas, principles and facts relevant to their work

### HISTORICAL CONTEXT

The contributions of relevant movements, artists, scientists, designers and other experts who came before them

### SKILLS AND TECHNIQUES

How to use the materials, tools and technology that allow them to effectively create, test and share their ideas

### AUDIENCE AND ENVIRONMENT

The needs and circumstances of their users and the physical context in which their work will be received

## PROCESS: How do Galileo Innovators innovate?

