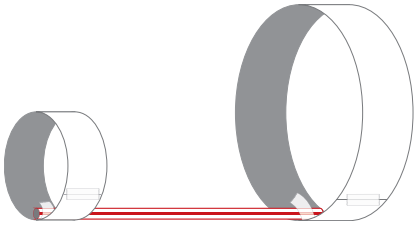
Start with a Book: Read. Talk. Explore.

Summer Science: Flight

Find lots more activities + fiction & nonfiction booklists + cool apps & websites at www.startwithabook.org



Wing It! Make a Loopy Plane

Can an airplane without wings really fly? Test your answer with this "loopy" model.

Supplies: heavy paper, drinking straw, scissors, tape, measuring tape or ruler, stopwatch (optional).

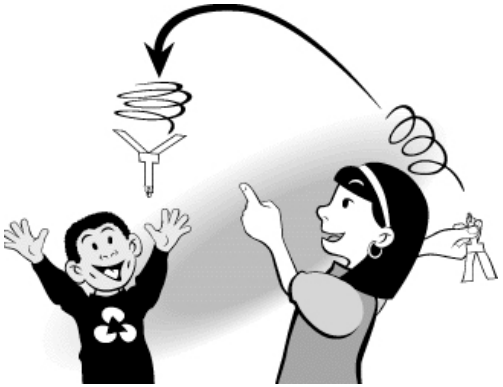
See PDF for instructions (and links to more paper airplanes).

Sky Diver

Design a parachute that floats safely to the ground — no crash landings allowed!

Supplies: plastic bags of different weights, tissue paper, notebook paper, string or thread, scissors, tape, paper clips.

See PDF for instructions.



Rotocopters

Build some copters and race them. The winner hits the ground LAST. Look out below!

Supplies: a few sheets of paper, scissors, paper clips (one large, one small)

See PDF for instructions.

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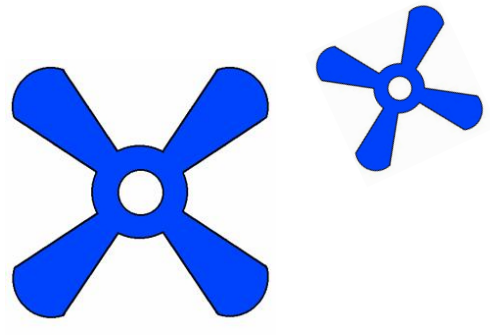
Clipped Wings

Create your own comic about living in a world without flight. Learn how to make a simple comic, using The Adventures of Sparrowboy as a model.

See PDF for instructions.



4-Wing Boomerang

Simple boomerangs don't just fly, they turn around and come back to where they started!

Supplies: cereal box or other heavy-weight paper, pencil, scissors.

See PDF for instructions.

Cool Apps and Websites

APPS

- Airport Mania: First Flight
- Paper Pilot
- Rocket Math

WEBSITES

- Flight Adventure's Flight School
- How Things Fly (Smithsonian)

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Fiction Books

Abuela by Arthur Dorros

The Adventures of Sparrowboy by Brian Pinkney

Air Show by Treat Williams

Amelia and Eleanor Go for a Ride by Pam Muñoz Ryan

Give Me Wings by Lee Bennett Hopkins

Kite Flying by Grace Lin

Owly: Flying Lessons by Andy Runton

Tar Beach by Faith Ringgold

The Wing Shop by Elvira Woodruff

Wings by Christopher Myers

Nonfiction Books

The Adventures of Sparrowboy by Brian Pinkney

Flight by Ian Graham

Flight (Time-Life Books) by Donald S. Lopez

Flight: The Journey of Charles Lindbergh by Robert Burleigh

Fly High! The Story of Bessie Coleman by Louise Borden

Flying Machine (Eyewitness Books) by Andrew Nahum

Kids' Paper Airplane Book by Ken Blackburn

Sky High: The True Story of Maggie Gee by Marissa Moss

The Smithsonian National Air and Space Museum Book of Flight by Judith E. Rinard

Wind Flyers by Angela Johnson

Wings by Sneed Collard

With support from the Park Foundation, Inc.

wing it

Early flight involved a lot of experimentation. While you and your child can't use household items to build a craft to actually fly in, you can make test flights right in your living room or back yard with paper airplanes.

Supplies

>> heavy paper

>> drinking straw

>> scissors and tape

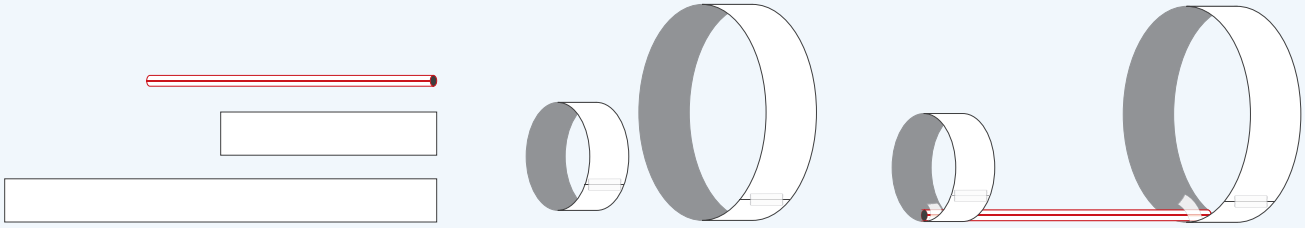
>> measuring tape or ruler and a timer or stopwatch

Getting started

There are many variations of the folded paper airplane. You and your child can work out your own way of folding paper or try following the instructional videos at www.paperairplanes.co.uk. Test lots of different styles and run trials to see which planes fly the highest, longest, and fastest.

Probably all the planes you and your child make have wings. Ask your child if he can remember any flying machines in the nonfiction book you read that didn't have wings. What made these machines fly? Does he think that an airplane without wings could fly? Test his answer with this "loopy" model:

Cut two strips of heavy paper: one that measures 1x 5 inches and one that is 1x 10 inches. Form each strip into a circle, slightly overlapping the ends of the paper. Tape each loop closed. Take a drinking straw and lay one end of it in the middle of a piece of tape. Lay the end of the straw inside your larger loop and press the tape down so that the straw is secured. Repeat this with the smaller loop at the other end of the straw. Time to fly!



Was your child surprised that the loop plane could fly? Ask him why he thinks it can fly. Does it have something to do with the differences in the sizes of the loops and how the forces of flight act on this design? Have a competition between the loop plane and your other paper planes and talk about the differences in these designs. You can also experiment with the loop plane design. What happens if you add more loops or make it longer by taping straws together?

Other ways to fly without leaving the ground

Try an online flight simulator
www.aviation-for-kids.com/flight-simulators.html

Watch the music videos for "Jet Pack" and "Flying" and dance along with Recess Monkey at
www.recessmonkeytown.com

You'll get carried away with laughter with these jokes about flight
http://pbskids.org/wayback/flight/jokespace.html

Sky Diver

Design a parachute that floats safely to the ground—no crash landings allowed!

1 Get what you need.

• 10" squares of: lightweight plastic (like clear bags from the grocery store) • heavyweight plastic (like thick trash bags) • tissue paper • notebook or copier paper • 8" pieces of string or thread (4 per parachute) • scissors • clear tape • large paper clips

2 Test your materials.

Compare the different types of materials and pick the one you think will make the best parachute. What are some tests you can do to decide which material to use?

3 Make a parachute.

Tape string to each corner of the parachute—try to use even lengths of string. Then tape the ends together around a large paper clip.

4 Float it.

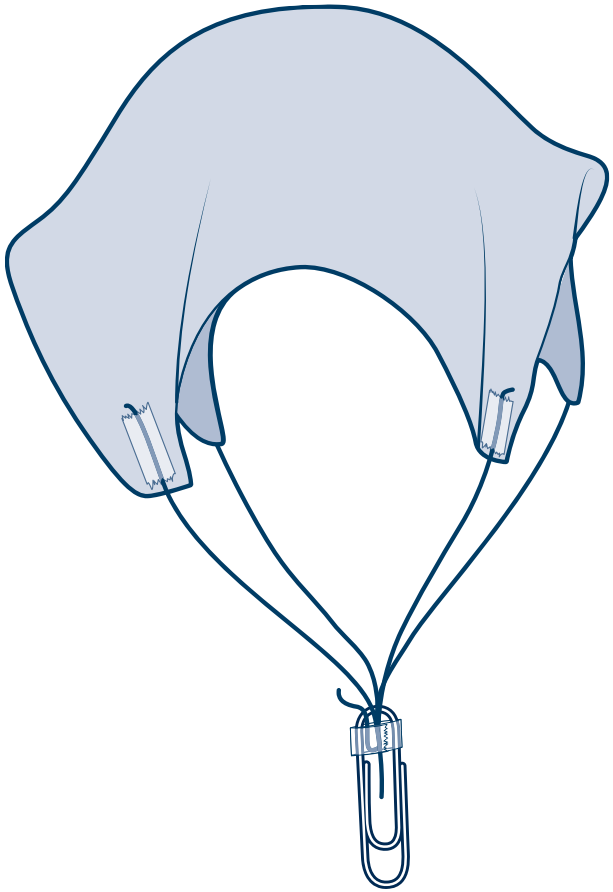
Hold up your parachute and drop it. What happens as it falls to the ground?

5 Design and test another parachute.

Select a different material and make another parachute. Compare how it falls with the parachute you made earlier.

6 Make it big!

Make a parachute at least double the size of the others you made. What adjustments do you need to make to get the bigger parachute to work?



Chew on This!

When you throw something into the air, it falls because gravity pulls it to the ground. As a parachute falls, the part that fills with air is called the canopy. A parachute works because air gets trapped in the canopy and slows its fall. This is the result of air resistance—the force of the air against the canopy.

Dig Deeper

Take it outside. Test your parachute on a windy day. What difference does the wind make?

Super-size it! Can you make a really big parachute—so big, it's super-sized? Using what you know about making a parachute, make one that's big enough to float safely when dropped from a significant height, like in an open stairwell or out a window. If necessary, get permission first before dropping your extra-large parachute!

Did You Know?

In August 1960, Joseph Kittinger set the record for the highest parachute jump. He jumped from a height of 102,800 feet—three times higher than most planes fly! He was so high up, he had to wear a special pressurized suit to stay safe. As he fell, Kittinger hit a top speed of 614 mph! He landed safely in a desert in New Mexico and his record still stands today.

PBS KIDS GO!®

Watch FETCH! on PBS KIDS GO! (check local listings) and visit the FETCH! Web site at pbskidsgo.org/fetch.

WGBH PBS

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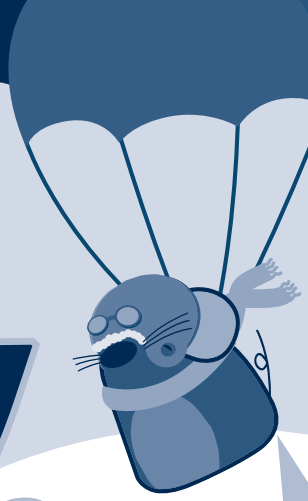
Fold

FETCH!



Sky Diver

Chet's last hobby was fire ant juggling—he lost a few whiskers in that experiment! Now he wants to try sky diving, and there's no stopping him! Can you design a parachute to keep my little buddy safe?

GOOO FETCH!

Sky Diver

Activity 2

Parachutes fall slowly because of air resistance—the force of air against the open parachute. In this activity, kids make a parachute that shows how air resistance makes for a soft landing.

Prepare Ahead

- Try making a parachute yourself, so you can anticipate where kids may get stuck or need guidance.
- Cut out 10" squares of the following:
  - lightweight plastic—use thin garbage, grocery, or dry-cleaning bags
  - heavyweight plastic—use lawn or heavy-duty trash bags
  - tissue paper
  - regular-weight paper—use notebook or copier paper
  - also have uncut sheets of these materials available for when kids make larger parachutes. If using trash or dry-cleaner bags, cut them open along one side and the bottom seam to make a flat sheet
- Cut 8" lengths of string for the first round of parachute making. Kids can cut their own for the second round, using a ruler to check the length.
- On the day of the activity, set up work areas with several squares of each of the materials per group—light- and heavy-weight plastics, tissue paper, and regular paper—along with string or thread, scissors, tape, paper clips, and a ruler.

Lead the Activity

1 Introduce Ruff's challenge. (10 minutes)
Tell kids that today's challenge is to design and build a parachute that will make a soft landing.

Discuss why and how things fall. Crumple a sheet of paper into a ball and hold it up. Pick up a flat sheet of paper in your other hand. Ask:

- When I drop these, do you think they will hit the ground at the same time? Why or why not?

Drop the balled paper and sheet at the same time.

- What happened? (*The ball fell faster and straight down, while the flat sheet drifted.*)
- Why did they fall differently? (*The flat sheet of paper has more surface area that's supported by the air beneath it.*)

Discuss parachutes. Ask:

- How does a parachute work? (*Air fills it, slowing its descent.)*
- What does a parachute have to do to make a safe landing? *(It must fill with air and fall slowly and steadily to the ground.*)

Materials

- activity sheet for each kid
- parachute materials (see "Prepare Ahead"): lightweight plastic, heavyweight plastic, tissue paper, and notebook or copier paper
- 8" pieces of string or thread (4 pieces per kid)
- ball of string or a spool of thread (1 per group)
- scissors (1 per group)
- clear tape (1 roll per group)
- large paper clips
- ruler (optional)

National Science Education Standards

Grades K–4
Science as Inquiry: abilities necessary to do scientific inquiry; understanding about scientific inquiry

Physical Science: properties of objects and materials; position and motion of objects

Science and Technology: abilities of technological design

Grades 5–8
Science as Inquiry: abilities necessary to do scientific inquiry

Physical Science: properties and changes of properties in matter; motions and forces

Science and Technology: abilities of technological design

2 Make predictions and test materials. (5 minutes) Hand out the activity sheets. Tell kids that scientists and engineers often test individual materials to determine which will work best in a design. Ask them to predict which of the squares will make the best parachute; then have them test the materials.

3 Make parachutes. (10 minutes) After deciding which material will work best, kids should attach the string and paper clips to make their parachutes.

4 Float them. (5 minutes) Have kids test the performance of their parachutes by dropping them. If they tip in the air, check that the strings are the same length and the paper clip is centered on the parachute.

5 Make another parachute. (5 minutes) Kids will now make another parachute using a different material. Encourage them to test the new parachute against their original to see which works best.

6 Size it up. If time permits, kids may want to make a bigger parachute by cutting out a square of material twice the size (20" x 20"). They'll need to figure out how to modify the design to make the bigger parachute work (longer strings, more weight at the bottom, etc.).

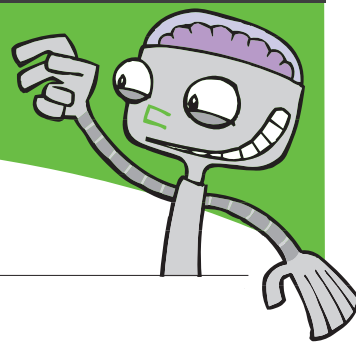
7 Discuss what happened. (5 minutes) Bring the group back together. Allow kids to show off their parachutes. Ask:

- What did you use to make your first parachute? (You may want to take a tally to see which material was the most popular.)
- Which material worked well? Which didn't work as well? (*The lighter materials—lightweight plastic and tissue paper—worked best.*)
- What problems did you have with your parachute and how did you fix them? (*Answers will vary.*)

8 Award points. (5 minutes) Time to rack up some points! Review the activity's key ideas by asking the following questions, worth 50 points each.

1. How does a parachute work? (*Air fills up the parachute as it falls, slowing down its landing.*)
2. Name another material that would make a good parachute and explain why. (*Answers will vary.*)
3. What would you have to change to make a bigger parachute work? (*Increase the length of the strings; add more weight to the bottom.*)
4. The part of a parachute that fills with air is called the canopy. Which do you think would make the slowest, safest landing—a parachute with a small canopy or large canopy? Why? (*The large canopy—it has more surface area, so more air can fill it, slowing it down.*)
5. How are a parachute and a kite similar? (*Air pushing on the kite keeps it in the air, while the force of air filling the falling parachute slows down its descent.*)

HELICOPTER TWIRL



WHAT YOU'LL NEED

- Printout of this activity for copter blades
- Paper clip
- Scissors

WHAT TO DO

1 Cut out copter blades along dark solid edge lines marked with scissors.

2 Fold along long dotted lines in the direction of the arrows.

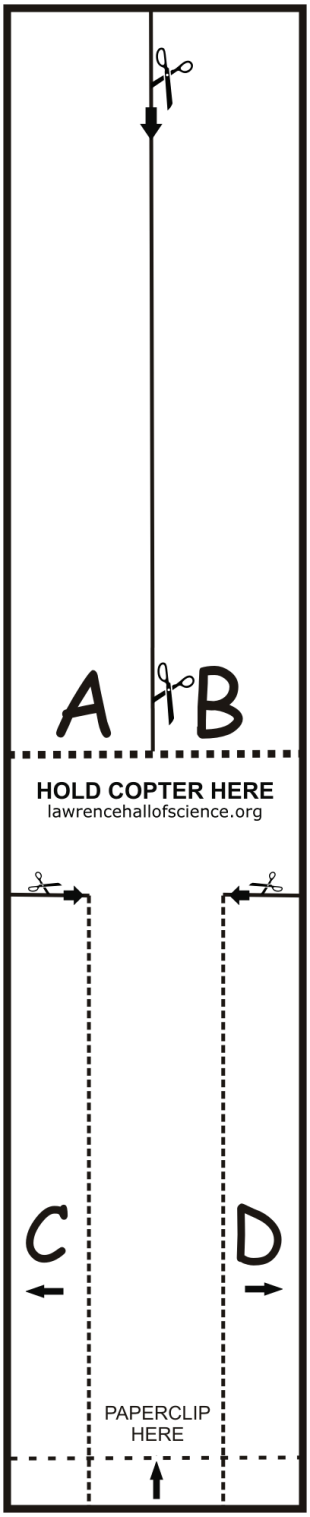
Fold line A one way, and line B the opposite way.

Fold flap at bottom along short dotted line (in direction of arrow).
Slide a paperclip onto the bottom to keep the short flap folded.

ACTIVITY CONTINUED ON NEXT PAGE

This activity was adapted from the Lawrence Hall of Science IDEA LAB Paper Copters activity.

HELICOPTER TWIRL (ACTIVITY CONTINUED)



This activity was adapted from the Lawrence Hall of Science IDEA LAB Paper Copters activity.

HELICOPTER TWIRL (ACTIVITY CONTINUED)

3 Hold the copter as high as you can. Grip where it says “Hold copter here.” Now let the copter drop.

It may take a few tries before your copter flies the way you want. Keep trying!

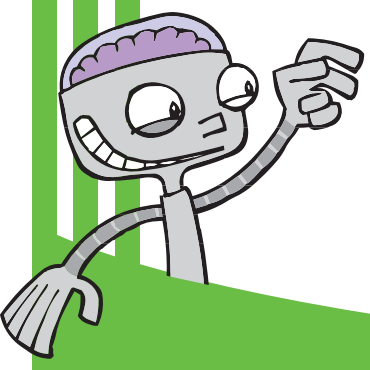
What happens if...

You twirl your fingers in the direction you want the copter to fly, as you let go?

You make the copter blades shorter, or longer?

You add more paper clips, or use no paper clip?

You use only 1 copter blade, or more than 2 blades?



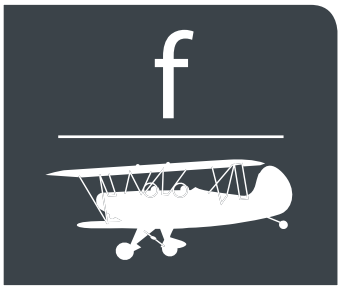
DID YOU KNOW?

- Artist and inventor Leonardo da Vinci had the idea for a copter-type machine hundreds of years before the modern helicopter was invented.

This activity was adapted from the Lawrence Hall of Science IDEA LAB Paper Copters activity.

IMAGINATION ACTIVITY : **FLIGHT**

clipped wings



Even if your child has never been on an airplane, air travel is an important part of his life. In this writing activity, your child will create a comic about living in a world without flight.

Supplies

>> writing and drawing supplies—paper, pencil, markers, ruler

>> the comics section from your local newspaper, comic books or access to online comics

>> tracing paper (optional)

Getting started

Talk with your child about all the ways air travel affects him. Have him make a list of what is possible thanks to aviation, such as fresh fruits flown from distant countries or visits to relatives who live long distances away. Ask him to think too about how flight has affected lifestyles and culture. For example, if humans never took to the skies, would George Lucas have made *Star Wars*? Would there be more travel by train or boat?

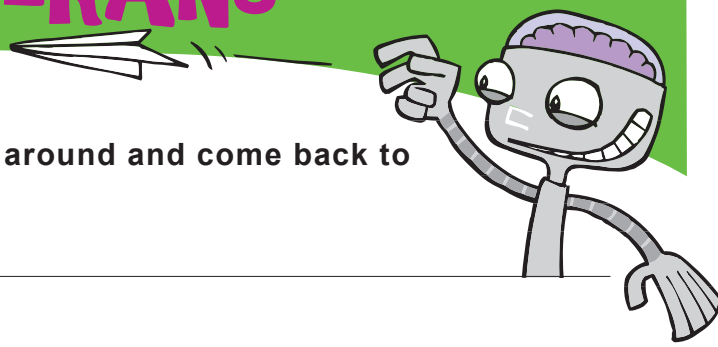
With that list in mind, have your child start a new list that will help him shape his comic. Suggest headings where he can organize his thoughts about characters, their problems, the actions they take, and the setting. To help him focus, you may want to help him narrow ideas or devise a specific prompt, such as a favorite professional sports team missing an important away game because they couldn't fly there and had to travel by much slower means.

When he's ready to draw his comic, have him first create a six-panel grid on his paper. This is easy to do without measuring if he first folds the paper lengthwise and then in thirds. Unfold it and he will have six boxes to draw and write in. He may need more than one sheet depending on the length of his story. Some tips for helping his comic flow:

- The first panel can be for the title of the comic.
- Remind him that comics often have captions, written details that help explain a comic panel, included in a frame at the bottom or top of a panel.
- Your child can ask for help! Comics involve a lot of repetitive drawing. Tracing is allowed and you or a friend or family member can help with the comic.
- If a character is speaking in a panel, write what he's saying first and then draw the speech bubble around it. If your child draws a speech or thought bubble first, he may get frustrated if his words don't fit in it.
- Sometimes the best way to tell any story is in graphic form. Comics don't have to be funny.

When your child is ready to start filling in his comic panels, have him take a look at other comics and compare them to the artwork in *The Adventures of Sparrowboy*. For those illustrations, Brian Pinkney used a scratchboard technique. Scratchboard starts with white board covered with black paint. The white lines of his drawing appear when the paint is scratched away with a sharp tool. Colored paint can then be added to the white areas. Scratchboard is not a typical technique for comics. Often comics are drawn in pencil and finished in pen and ink. This technique will make it easy to photocopy your child's comic and share it with others!

ROUND-TRIP BOOMERANG



Simple boomerangs don't just fly, they turn around and come back to where they started!

WHAT YOU'LL NEED

- Manila file folder
- Pencil
- Scissors
- Printout of boomerang pattern in this PDF

WHAT TO DO

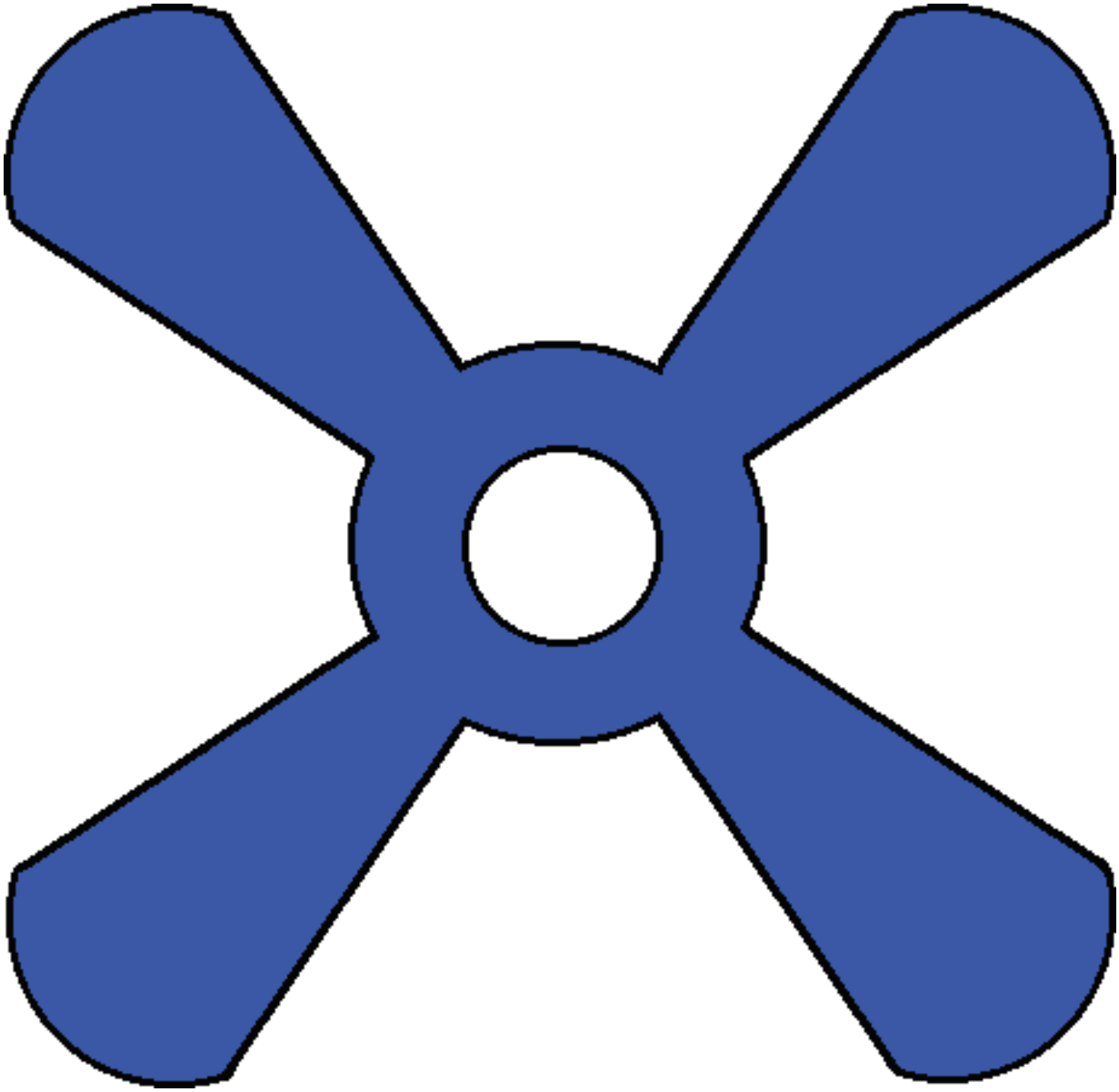
1. Print out this activity.

2. Cut out the four-wing boomerang pattern. Trace one boomerang onto each half of the file folder. (You can enlarge the pattern and use other materials too- cardboard, styrofoam trays, thin plywood. Be sure to fly wooden boomerangs outdoors.)

ACTIVITY CONTINUED ON NEXT PAGE

This activity was adapted from NASA's Four-Wing Paper Boomerang.

ROUND-TRIP BOOMERANG (ACTIVITY CONTINUED)



This activity was adapted from NASA's Four-Wing Paper Boomerang.

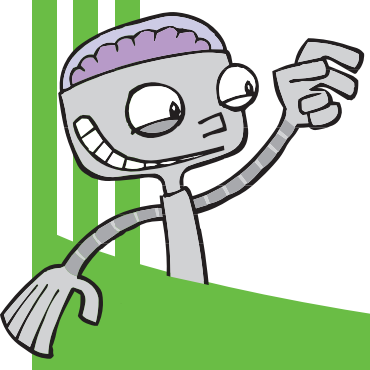
ROUND-TRIP BOOMERANG (ACTIVITY CONTINUED)

3 Cut out the boomerangs. (Decorate them if you like!)

Hold one wing of a boomerang between your thumb and index finger/ (Hold the boomerang horizontally, the same way you would hold a frisbee). Toss the boomerang away from you, flicking your wrist to give it spin. What happens? You may have to try a few times before it comes back towards you.

Now try holding a boomerang vertically to toss it. What happens?

You can catch a boomerang by clapping it between your hands, or pushing your finger through the center hole as the boomerang hovers for a moment in one place.



DID YOU KNOW?

- King Tutankhamen of Egypt collected boomerangs more than 2000 years ago!

- Today, boomerang competitors use computers to help design state-of-the-art boomerangs.

This activity was adapted from NASA's Four-Wing Paper Boomerang.