

# Montshire at Home: Teacher Guide

**WEEKLY THEME: AIR PLAY** – Learn all about how different materials move through the air. Students will have a chance to use templates, open exploration, and design challenges to get them building, testing, and iterating at home.

**MONTSHIRE AT HOME** is a series of learning activities, resources and short videos, developed, hosted and curated by the Montshire's Education team. It's designed to support children, families, and teachers with easily accessible concepts, content, and materials while learning at home.

Teachers can use these materials to support remote science learning opportunities for their students at home. Below is a suggested learning progression using this week's theme, activities, and resources found on the Montshire's Online Resource web page.

## SUGGESTED LEARNING PROGRESSION

### Day 1: Paper Spinners at Home

#### EXPLORE

- ▶ Use a template to make a spinning paper helicopter, octopus, or fish.
- ▶ How does changing the shape of a piece of paper change how it moves through the air?
- ▶ Set up an experiment with multiple paper helicopters. Change one thing about each helicopter and compare the results to the original helicopter.

#### DISCOVER

- ▶ Surface area has a large effect on how objects fall.
- ▶ Changing only one thing at a time allows a single variable to be tested.

### Day 2: Make a Mini-Ball Floater

#### EXPLORE

- ▶ Use a hair dryer to float a lightweight ball in a stream of air.
- ▶ What different materials can you get to float with a hair dryer?
- ▶ Which materials do the most unexpected things in the airflow?
- ▶ Can you build something that stays up in the air longer?

#### DISCOVER

- ▶ Weight, shape, and surface area all affect how objects move in an airflow.
- ▶ A lightweight round object can spin and float at the top of an air stream because of the air pressure changing as air flows around the ball.

### Day 3: Paper Airplane Challenge

#### EXPLORE

- ▶ Build and test a variety of paper airplane patterns.
- ▶ Practice launching the plane multiple times. Is there a best way to throw it?
- ▶ How does the thickness of paper (where it's folded multiple times) affect how a plane moves?
- ▶ Experiment with the symmetry or balance of the plane. How do small changes affect the plane's flight?

#### DISCOVER

- ▶ Weight, balance point, wing shape, and wing surface area all are factors in a plane's flight.
- ▶ There are many different types of paper airplanes. Each shape meets different goals: speed, flight pattern, flight time, etc.

### Day 4: Make a Wind Exhibit at Home

#### EXPLORE

- ▶ Use a summer fan to create your own air exhibit at home.
- ▶ What different materials can you test from your home?
- ▶ How does changing the angle of the fan affect how objects float?
- ▶ What materials can you combine and build with to make a contraption for your air exhibit?
- ▶ Build a wind powered vehicle that can catch the air to move.

#### DISCOVER

- ▶ Fans create columns of moving air. Objects drop or stop moving as they move out of the air column.
- ▶ Friction, weight, and surface area are all factors in how objects move in an airflow.

### Day 5: Parachutes

#### EXPLORE

- ▶ Build a miniature parachute to safely float a toy to the ground.
- ▶ How does the starting height affect how your parachute works?
- ▶ How does changing the size of the parachute top affect its landing time?
- ▶ Is there a way to safely float a larger toy, like a stuffed animal?

#### DISCOVER

- ▶ There's a direct relationship between the surface area of the parachute and the weight it can support.

## EXTENSIONS

- ▶ Create controlled experiments for each activity, where only one variable is changed at a time and always compared to the original control object.
- ▶ Add math to the week by having students measure and record time and distance results of multiple trials.



## Activity: Spinning through the Air

Change a flat piece of paper into a spinning helicopter, fish, and octopus. Then experiment and try out different iterations to see how certain changes affect your creations.

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### Make a Paper Helicopter

- ▶ Cut on the three solid black lines, where the scissors image is shown.
- ▶ Fold on the dotted lines:
  - ▶ Fold lines 1 and 2 to make a long bottom
  - ▶ Fold up at line 3 to add a tail
  - ▶ Fold the top pieces in different directions at lines 4 and 5 to make wings
- ▶ Test it and make adjustments as needed.

Make a few more helicopters to experiment with. What is one thing you want to change about each helicopter? Its wings? Tail? Weight? Size? Change it and test it out.

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### Make a Spinning Paper Fish

- ▶ Cut on the two solid black lines, where the scissors image is shown.
- ▶ Curl the paper around and slide the two cuts together.
- ▶ Toss and spin!

Experiment with larger and smaller pieces of paper.

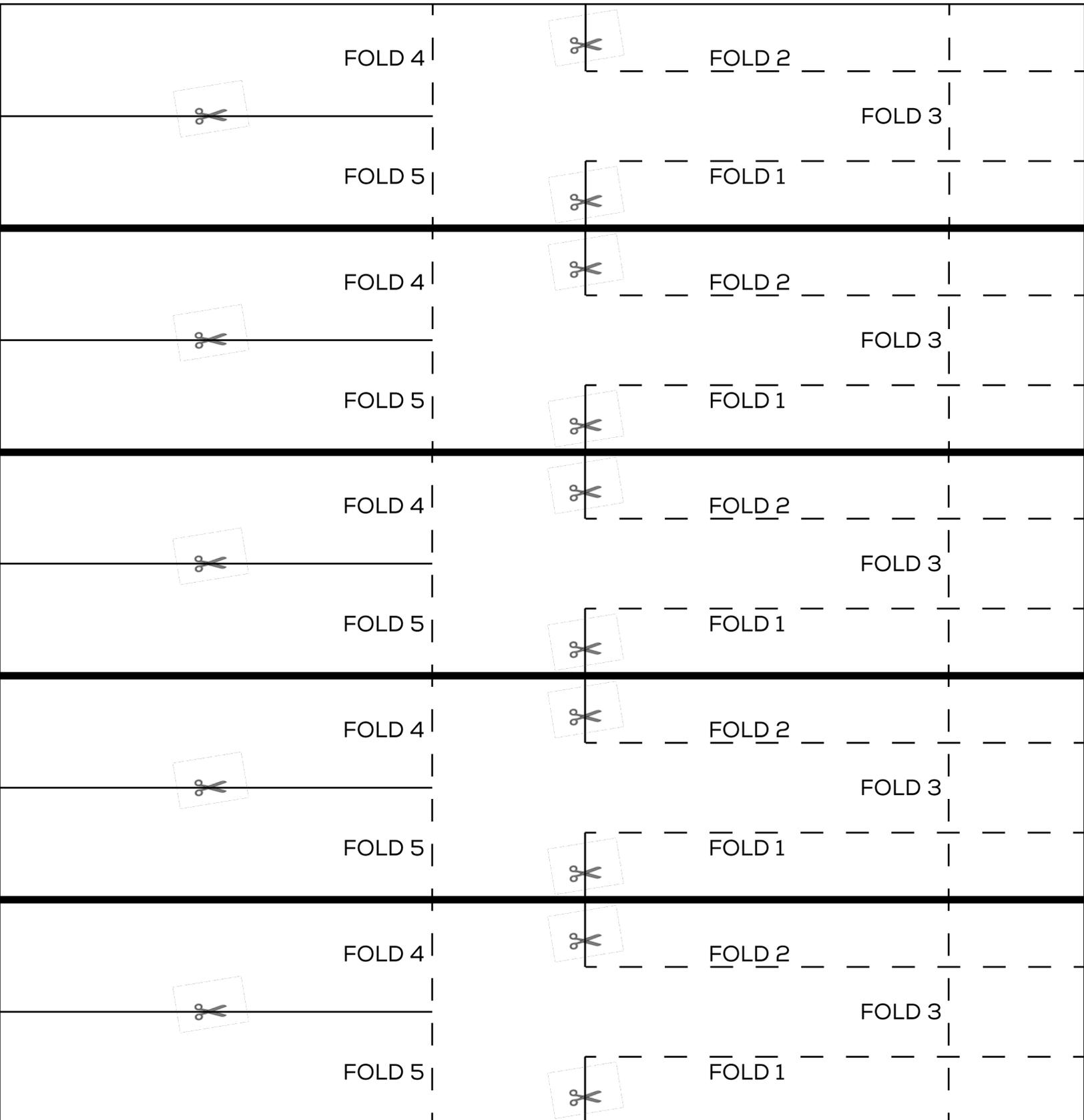
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### Make a Spinning Paper Octopus

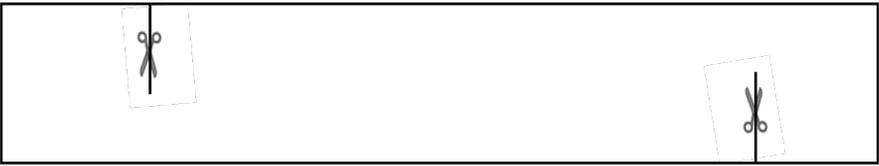
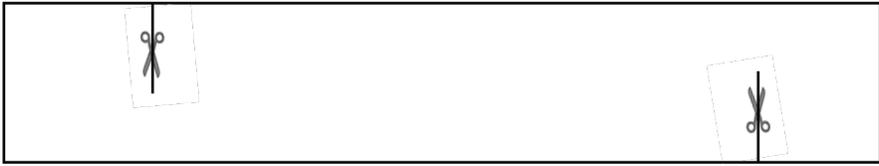
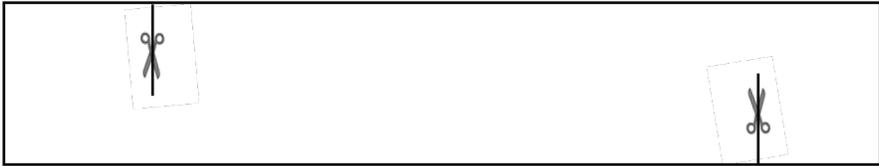
- ▶ Make a strong fold across the top dark line.
- ▶ Cut off the section that says "cut this part away."
- ▶ Cut each of the long lines until they end exactly at the fold you made.
- ▶ Run your finger along the fold to soften the paper and watch the legs pop out.
- ▶ Tape the two ends of the fold together to make a circle with legs. It's an octopus!
- ▶ Test your octopus by tossing or dropping it through the air. Which way does it spin the smoothest?

Experiment with your octopus. How does changing the length of the legs or adding weight change how your octopus moves in the air?

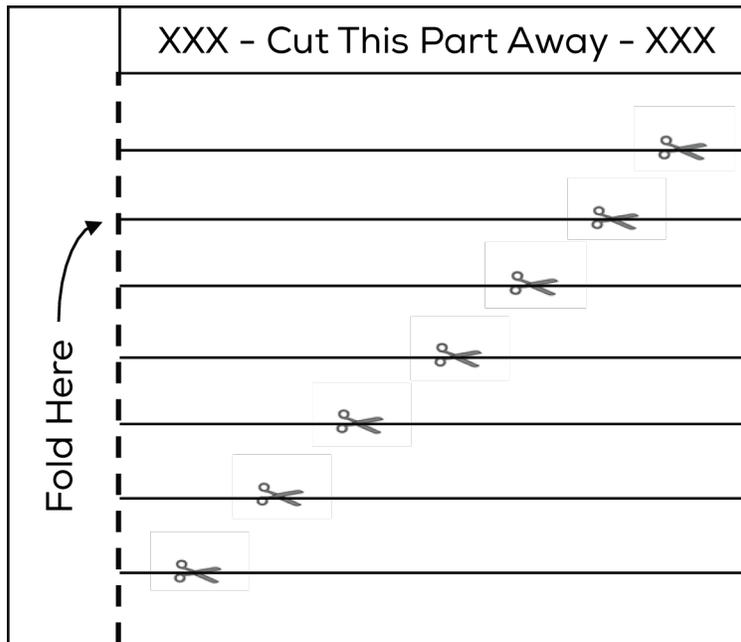
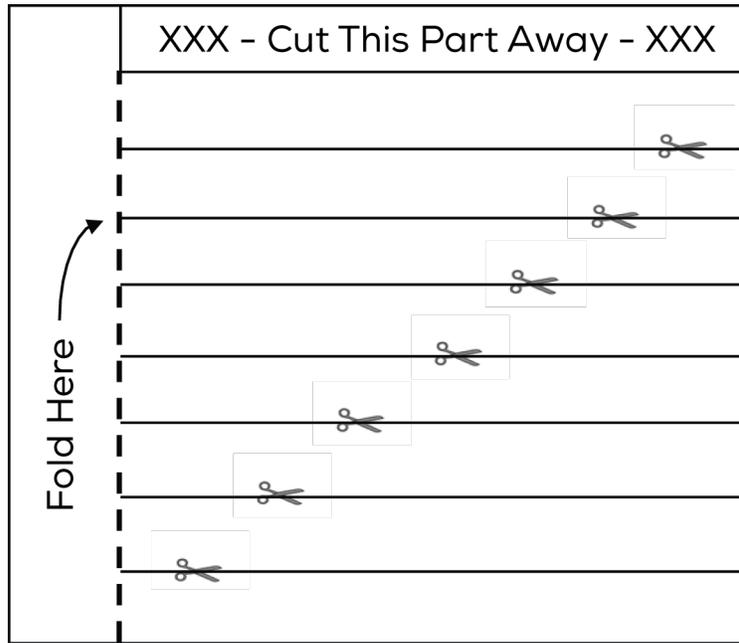
# Paper Helicopter Template



# Spinning Paper Fish Template



# Paper Octopus Template





## Activity: Make it Float Scavenger Hunt

Make your own at-home-air-exhibit using a hair dryer! (Set the hair dryer to COLD to prevent overheating. If needed, tape the button down.)

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**Go on a scavenger hunt in your home to find a variety of things to test:**

- |                |                |         |
|----------------|----------------|---------|
| ▶ Toilet Paper | ▶ Balloons     | ▶ _____ |
| ▶ Scarves      | ▶ Tissue Paper | ▶ _____ |
| ▶ Leaves       | ▶ String       | ▶ _____ |
- 

Which stayed up the longest? \_\_\_\_\_

Set a timer. How long were you able to keep it floating in the air? \_\_\_\_\_

Why do you think it was able to stay up so long? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What material was the funniest to try in your at-home-air-exhibit? \_\_\_\_\_

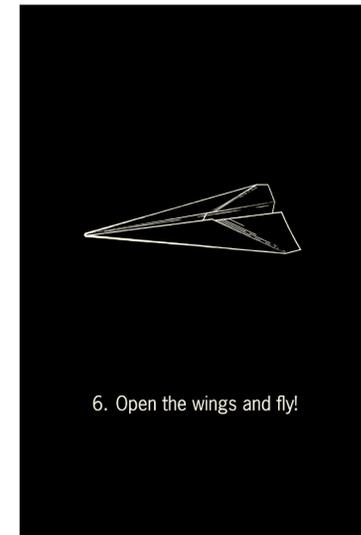
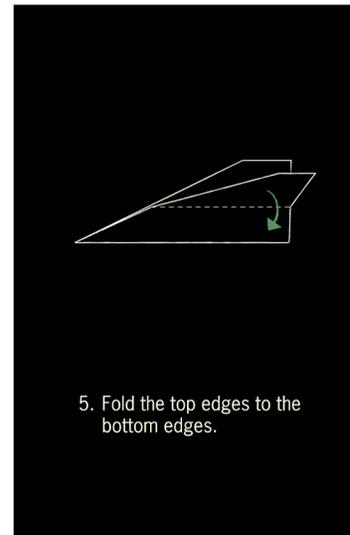
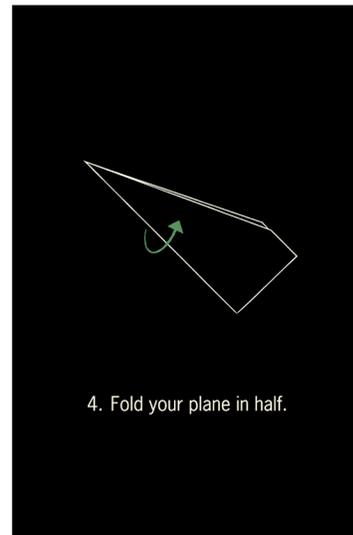
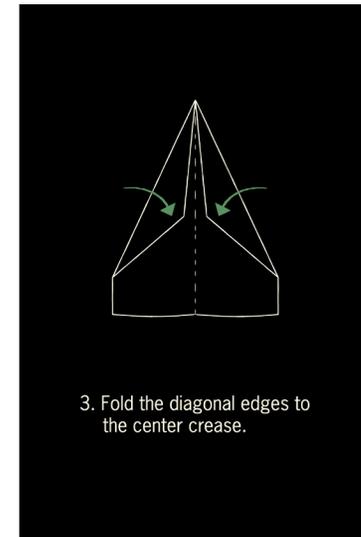
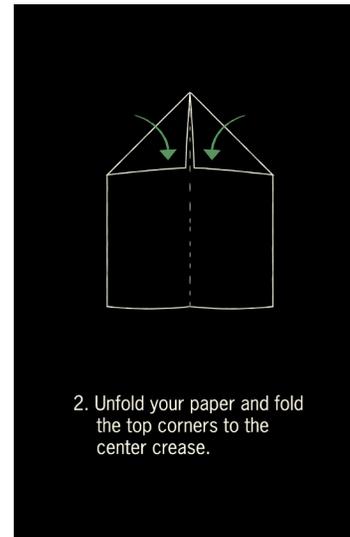
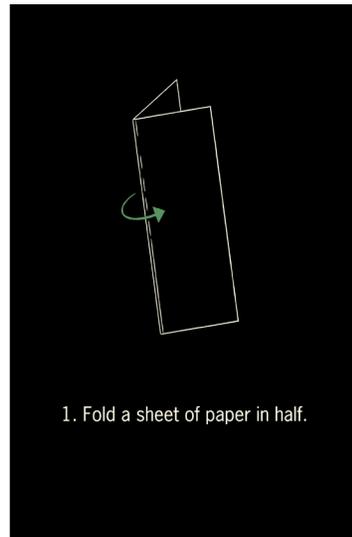
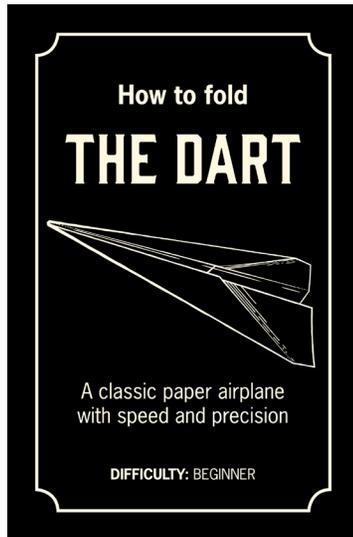
\_\_\_\_\_

\_\_\_\_\_

How many objects could you keep floating in the air at once? \_\_\_\_\_



## Activity: Fold a Paper Airplane



How to fold  
**THE GLIDER**

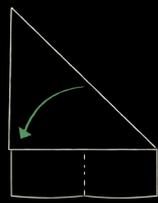


A paper airplane  
for long-distance flight

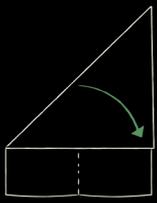
DIFFICULTY: INTERMEDIATE



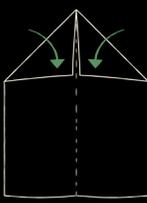
1. Fold a sheet of paper in half.



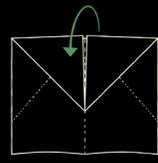
2. Unfold your paper and fold the top right edge to the left edge.



3. Unfold your paper and fold the top left edge to the right edge.



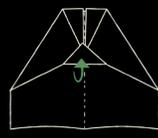
4. Unfold your paper and fold the top corners to the center crease.



5. Flip your paper over and fold the top triangle down.



6. Fold the top corners down to the center crease.



7. Fold the triangle between the flaps up.



8. Fold the sides to the center crease.



9. Flip it over, fold it in half.

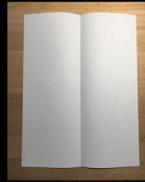


9. Open the wings and fly!

How to fold  
**THE  
EVEN KEEL**

A paper airplane  
with increased stability

DIFFICULTY: INTERMEDIATE



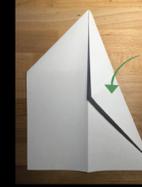
1. Fold a sheet of paper  
in half.



2. Unfold your paper and  
fold the top corners to  
the center crease.



3. Flip your paper over.



4. Fold the diagonal edge  
to the center crease.



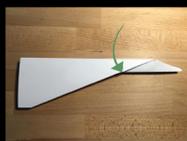
5. Fold the other  
diagonal edge to the  
center crease.



6. Fold the plane in half  
along the center crease.  
Notice the triangle at  
the front of the plane.



7. Fold the top point of  
the triangle to the  
bottom edge. Make  
your fold parallel to the  
bottom edge.



8. Flip your plane over.  
Repeat step 7 to match  
the other wing.



9. Open the wings and  
place the plane on  
its back.



10. Fold the outside edge of  
the wings to make fins.  
When you turn your  
plane upright, the fins  
point down.



11. Open the wings and fly!



## Activity: Building in the Wind – Design Guide

Catch the wind by designing and building your own wind powered vehicle. Use a summertime fan to launch it across the room.

### Possible Materials

- ▶ Cardboard
- ▶ Tape
- ▶ Toilet Paper
- ▶ Scarves
- ▶ Balloons
- ▶ Tissue Paper
- ▶ Bandana
- ▶ Straws
- ▶ Round Lids
- ▶ Pencils

### Plan It Out

- ▶ What type of vehicle do you want to build: a boat, car, sled, or plane? \_\_\_\_\_
- ▶ What will you use to catch the wind? \_\_\_\_\_
- ▶ What type of floor will you test it on (carpet, wood, tile)? \_\_\_\_\_

### Draw Your Plan Here

Label the special parts of your vehicle.

### Test It

How did your first test go? What worked well? What do you want to change for the second test?

## Measure It

VEHICLE'S NAME	FAN SPEED	DISTANCE TRAVELED	TIME TRAVELED	SPEED (DISTANCE/TIME)	NOTES



## Activity: Toy Parachutes

Build and test a miniature parachute to float a toy safely to the ground.

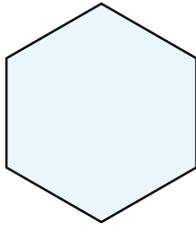
### Materials:

- ▶ Plastic grocery bag
- ▶ Scissors
- ▶ String
- ▶ Tape
- ▶ Small Toy

### Instructions:

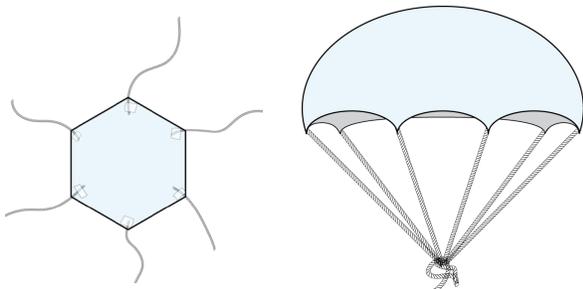
#### 1. Make your parachute top.

- ▶ Cut the sides off of a plastic grocery bag to create a sheet of plastic.
- ▶ Cut the plastic into a 6-sided hexagon.



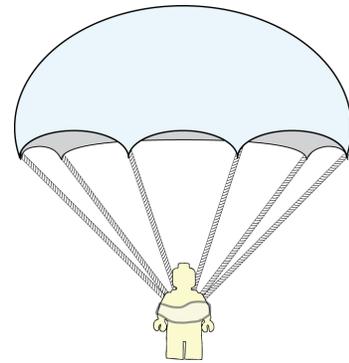
#### 2. Add strings.

- ▶ Cut six strings roughly one foot long.
- ▶ Tape a string to each point of the hexagon.
- ▶ Grab the center of your parachute and lift it up to gather all the strings together.
- ▶ Tie all six strings into one knot. They should all be the same length now.



#### 3. Add a toy.

- ▶ Add a toy to the bottom of your strings. Small toys like plastic figurines or lego people are good to start with.
- ▶ Use tape or string to attach your toy.



#### 4. Test it.

- ▶ Hold your parachute from its top. Stand on tip toes and let go!
- ▶ Check with your grownups to brainstorm taller things you could test it from: a chair, balcony, outside.

### Try These Experiments

- ▶ Does changing the number of sides your parachute top has affect how it moves through the air?
- ▶ Can you think of a different material to make the parachute top from?
- ▶ Does the size of the parachute top make a difference?
- ▶ Can you make a parachute that could safely land a stuffed animal?

## Record Your Results

TOY NAME	HEIGHT OF DROP	TIME TO DROP	NOTES AND IDEAS