Engineering Inspired By Nature

AWIM®
ACTIVITY GUIDE
Dear Student Designers:

We need your help! The mission of EarthToy Designs, Inc., is to develop and promote toys that are fun and exciting. EarthToy Designs is introducing a line of toys inspired by nature. Our first toy will be based on seeds that fly in the wind and will come with a book about seeds. We want to develop a toy that will travel as far as possible on a windy day.

Our EarthToy engineers are seeking fresh ideas from young people like you. That’s why we need your help! We need you to investigate some seeds that move away from their parent plant (are dispersed) on the wind.

**We suggest that your teams take the following steps to help us:**

1. Closely examine some seeds and think about how they might fly.
2. Conduct experiments to figure out what keeps a seed in the air the longest.
3. Design a toy that will stay in the air a long time when dropped or thrown.

Good luck with your designs!

I. M. Green
President

EarthToy Designs, Inc.

I. M. Green
President
Build a Parachute

1. Gather the following materials: parachute canopy template, string, paper clips, scissors, a ruler, and some tape.

2. Cut the parachute canopy template along the solid lines.

3. Fold your parachute canopy template in half along the dotted lines and then in half again.

4. Cut four equal pieces of string. Each piece of string should be 30 cm long.

5. Use a small piece of tape to attach a string to each corner of the canopy. (see image to the right)

6. Wrap tape around the loose ends of all four strings to hold them together.

7. Attach a paper clip to the ends of the strings to add weight.

8. Your parachute should look like this. (see image to the right)

9. To launch, grasp the center of the canopy and release it. Make sure the weight (the paper clip) is not swinging around before you let the parachute go!
Parachute Template
The Effect of Weight on Parachute Flight

1. Find a testing area. A high but safe height is best (top of a staircase banister, top of a playground ladder, standing on a picnic table).

2. Attach 1 paper clip to your parachute.

3. As you release the parachute, start your timer. You can use a phone, watch, or clock. You can ask a friend or family member to help.

4. Stop the timer when your parachute lands on the ground.

5. Record your time in the data table.

6. Repeat steps 3-5 two more times. Each test will be a trial. Scientists perform multiple trials to make sure their results are correct.

7. Repeat steps 3-6 with two and three paper clips.

For Notes, you might include information about how the parachute flew (spun around, canopy didn’t open) or any other information you think is important.
Parachute weight vs. Flight time

<table>
<thead>
<tr>
<th>Weight (# of Paperclips)</th>
<th>Flight Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trial #1</td>
<td>Trial #2</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Which parachute stayed in the air the longest?

2. Which parachute fell to the ground the fastest (had the shortest flight time)?

3. If you wanted to build a parachute that stays in the air as long as possible, how much weight would you attach?
Build a Helicopter

1. Cut the helicopter template along the solid lines.
2. Fold flap A forward along the dotted line and flap B back.
3. Fold flaps C and D forward along the dotted lines.
4. Fold flap E upward.
5. Use one paper clip to hold flap E in place.
6. To launch, hold the helicopter by the wings and drop (with the paper clip at the bottom).
7. Repeat Steps 1-5 with the additional rotor length templates.
Different Rotor Length Template
The Effect of Rotor Length on Helicopter Flight

1. Find a testing area. A high but safe height is best (top of a staircase banister, top of a playground ladder, standing on a picnic table).

2. Get your short rotor length helicopter ready for launch.

3. As you release the helicopter, start your timer. You can use a phone, watch, or clock. You can ask a friend or family member to help.

4. Stop the timer when your helicopter lands on the ground.

5. Record your time in the data table.

6. Repeat steps 3-5 two more times. Each test will be a trial. Scientists perform multiple trials to make sure their results are correct.

7. Repeat steps 3-6 with medium and long rotors.

For Notes, you might include information about how the helicopter flew (didn’t spin around, spun around fast) or any other information you think is important.
## Rotor length vs. Flight time

<table>
<thead>
<tr>
<th>Rotor Length</th>
<th>Flight Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trial #1</td>
<td>Trial #2</td>
</tr>
<tr>
<td>Short</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Which helicopter stayed in the air the longest?

2. Which helicopter fell to the ground the fastest (had the shortest flight time)?

3. If you wanted to build a helicopter that stays in the air as long as possible, what size rotors would you use?
Make Your Own Flyer

1. Picture the kind of flying toy you want to make. Will your toy have wings or strings? Will it be light or heavy? Will it be shaped like a plane or a bird?

2. Look for materials and inspiration around the house or outside and start building!
   
   Material Ideas: Plastic bags, tissue paper, paper plates, aluminum foil, Styrofoam, feathers, sticks, leaves, and string

3. Test your toy in flight! Adjust size, shape, weight, and/or materials as needed.

Here is a picture of my flyer:

I designed my flyer this way because . . .