



# SOLAR BAG

## SOLAR LESSON

JUSTIN TAYLOR

<b>Time Frame:</b>		<b>Standards:</b>	
45 – 60 minutes 4 <sup>th</sup> Grade		4.S.1.2.3 Make describe and/or use models 4.S.1.8.1 Analyze and follow multistep instructions.	
<b>Objectives:</b>			
SWBAT to work in groups and show how solar energy can change the air temperature.			
<b>Background Information:</b>			
<p>A Solar Bag is a long plastic bag made from a very thin plastic and colored black to absorb solar energy. The heated air inside the bag provides buoyancy and causes the bag to float. Over the years, it's become a very popular science demo for teachers to share with their students as they explore the properties of air.</p> <p>Although the Solar Bag looks similar to a regular, black trash bag, the key difference is the thickness of the plastic. But, a great science fair experiment might be testing bags of different thicknesses to see which one floats the highest!</p>			
<b>Materials:</b>			
<ul style="list-style-type: none"><li>• Solar Bag (If you do not have solar bags, black plastic bags will work.)</li><li>• String</li></ul>			
<b>Procedure:</b>			
<ol style="list-style-type: none"><li>1. Notice that the bag is made out of a light weight plastic material. Use caution when handling the bag since the plastic will tear easily.</li><li>2. Carefully remove the plastic bag from the packaging and locate one of the open ends of the bag. Tie a knot in this end of the bag.</li><li>3. The best time for a launch is in the morning when the temperature of the air outside is cool. We have not had much success with a launch attempt in the middle of a hot day.</li><li>4. Select an appropriate location for the launch. Find a park or an open field clear of any buildings, trees, and power lines to conduct the launch. Select a day to do the experiment when it's sunny and free of any wind.</li></ol>			

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5. Unroll the Solar Bag onto a soft surface like grass. Avoid pavement or gravel since the plastic material can easily tear. Have one person hold the bag open as you begin to run around and scoop up air. Believe it or not, you can inflate the bag in just a couple of minutes.
6. Fill the bag with air until approximately 2 feet of deflated plastic remains in your hand. Slide your hand along the plastic to make sure that the air in the inflated portion of the bag is stretching the plastic tight. Tie a knot in the end of the bag, and tether it to the ground with Solar Bag String.
7. Notice that the bag is made out of a light weight plastic material. Use caution when handling the bag since the plastic will tear easily.
8. Carefully remove the plastic bag from the packaging and locate one of the open ends of the bag. Tie a knot in this end of the bag.
9. The best time for a launch is in the morning when the temperature of the air outside is cool. We have not had much success with a launch attempt in the middle of a hot day.
10. Select an appropriate location for the launch. Find a park or an open field clear of any buildings, trees, and power lines to conduct the launch. Select a day to do the experiment when it's sunny and free of any wind.
11. Unroll the Solar Bag onto a soft surface like grass. Avoid pavement or gravel since the plastic material can easily tear. Have one person hold the bag open as you begin to run around and scoop up air. Believe it or not, you can inflate the bag in just a couple of minutes.
12. Fill the bag with air until approximately 2 feet of deflated plastic remains in your hand. Slide your hand along the plastic to make sure that the air in the inflated portion of the bag is stretching the plastic tight. Tie a knot in the end of the bag, and tether it to the ground with Solar Bag String.

### How does it work?

The remainder of the work is done by the sun. Gather around the giant bag but try not to touch it - sharp fingernails will easily puncture the very thin plastic. Be careful, the outside of the bag also gets very hot to the touch. What is happening to the gas molecules inside the bag? Of course, as the sun warms the air molecules in the bag, their movement begin to speed up. Since the heated air inside the bag is less dense than the cooler air on the outside of the bag, the Solar Bag will float. It's important to remember that it may take as long as ten minutes for the air inside to heat up enough to cause the bag to float.

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### Assessment:

Assessment would be an observation to see if the students are able to complete the task. Also to see if the student can verbally tell you how this is working.

### Additional Content:

#### Additional Info

#### Storage and Repair

We store the deflated bag in an old pillow case, which helps prevent accidental punctures or tears when it's not being used. If a small tear is spotted, clear packing tape can be used to repair the damage.



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### References:

Lesson used from steve spangler at  
<http://www.stevespanglerscience.com/content/experiment/solar-bag-experiment>

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