

# SciGirls Activity 8

## Ridin' On Air!



### Icebreaker:

Create an uplifting experience with this Balloon Hovercraft!



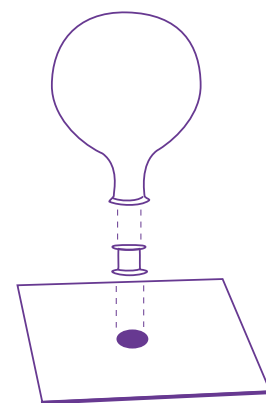
#### You'll need:

- an empty thread spool
- a 4 inch piece of cardboard
- white glue, or a hot glue gun
- a pencil
- a balloon

### SciGirls Skill: Engineering

#### Guide your girls as they:

- 1) Glue the empty spool to the piece of cardboard.
- 2) Punch a hole in the cardboard, so it lines up with the center of the spool.
- 3) Take a huge breath and blow up the balloon. Hold the bottom, but don't tie it.
- 4) Now stretch the bottom of the balloon to the top of the spool. And lift off!
- 5) Experiment with different sizes and shapes of cardboard to get the best hover out of your hovercraft! Give your hovercraft a shove along a smooth tabletop, and see how far it goes before coming to a stop.



**SciGirls Suggestion:** The materials required for this activity are simple enough that each girl should be able to build her own. Or for more collaborative fun, have the girls grab partners and work together. Two-girl teams are big enough.



Is this activity "raising" questions? Go to [pbskids.org/dragonflytv/superdoit/balloon\\_hovercraft.html](https://pbskids.org/dragonflytv/superdoit/balloon_hovercraft.html) for more information.

## Investigation:

### Homemade Hovercraft!

Engineering skills, from designing to building to modifying, star in this experiment.

We're Sara and Rachel, and we're so into engineering that we built our own hovercraft (really!). But it didn't work very well on grass. Our SciGirls question: **How can we improve our design to create the best air film that can work on a grassy surface?**



You'll need access to a wood shop, power tools, and:

- 3/4 inch plywood 1/2 sheet, cut into a 4 ft diameter circle
- plastic disc, approximately 6 inches diameter, like a coffee can lid, or cut from a plastic flying disk
- heavy plastic sheet, like a picnic table cloth, cut to a 6 ft diameter circle
- 1/2 inch wood screws, about 6 of them
- duct tape
- leaf blower, gasoline or battery powered
- tape measure
- electric drill and 1/4 inch drill bit
- staple gun
- saber saw

This is a rather involved project, but it has a great payoff.



For more information on this investigation, hover over to [pbskids.org/dragonflytv/show/hovercraft](http://pbskids.org/dragonflytv/show/hovercraft). Then surf to [pbskids.org/dragonflytv/contact/index.html](http://pbskids.org/dragonflytv/contact/index.html) to tell us about your investigation!



Check out this investigation on Tape 2, Segment 8.



## SciGirls Want to Know: How does the size of the hovercraft skirt affect how well the craft hovers?

Guide your girls through these steps:

- 1) If it isn't already cut to shape, use a saber saw to cut the plywood into a 4 ft diameter circle.
- 2) Measure the opening of the leaf blower, and draw a circle the same size on the plywood sheet, halfway between the edge of the plywood and its center. Draw the shape of the opening carefully to match the shape and size of the leaf blower nozzle. Carefully cut out this hole. (Fig 1)

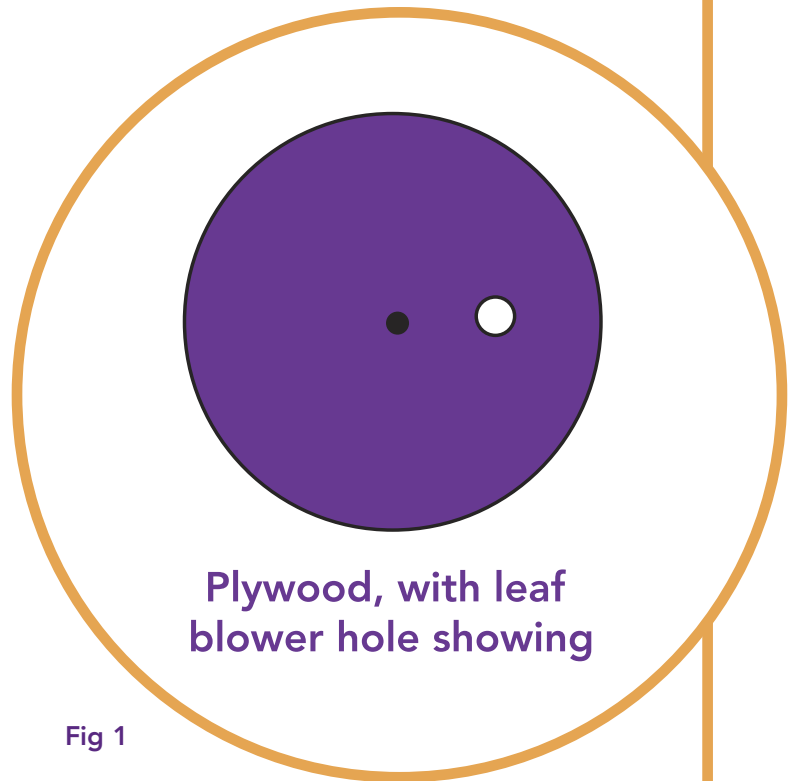
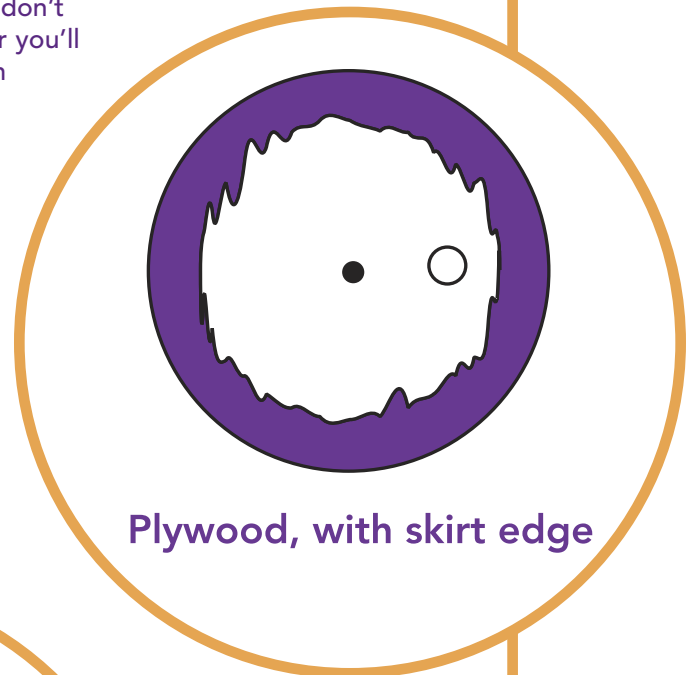


Fig 1

- 3) If you haven't done so already, cut the plastic sheet or table cloth to a 6 foot diameter circle. This is called the "skirt." You may want to experiment with different size skirts (5-1/2 feet, or 5 feet). Set the plywood circle over the skirt, then bring up the skirt edge and attach the skirt to the plywood. You can use a staple gun to hold it in place, then place duct tape all the way around to make a tight seal. (Fig 2)
- 4) Flip the plywood over, so the plastic skirt is now on top. Attach the plastic disk to the center of the plywood. You can do this using several wood screws around the edge of the plastic disk. Be sure to use wood screws that don't poke through to the other side or you'll have an unpleasant surprise when you sit on the hovercraft! (Fig 3)



Plywood, with skirt edge

Fig 2

Plastic disk mounted  
onto skirt-side of plywood

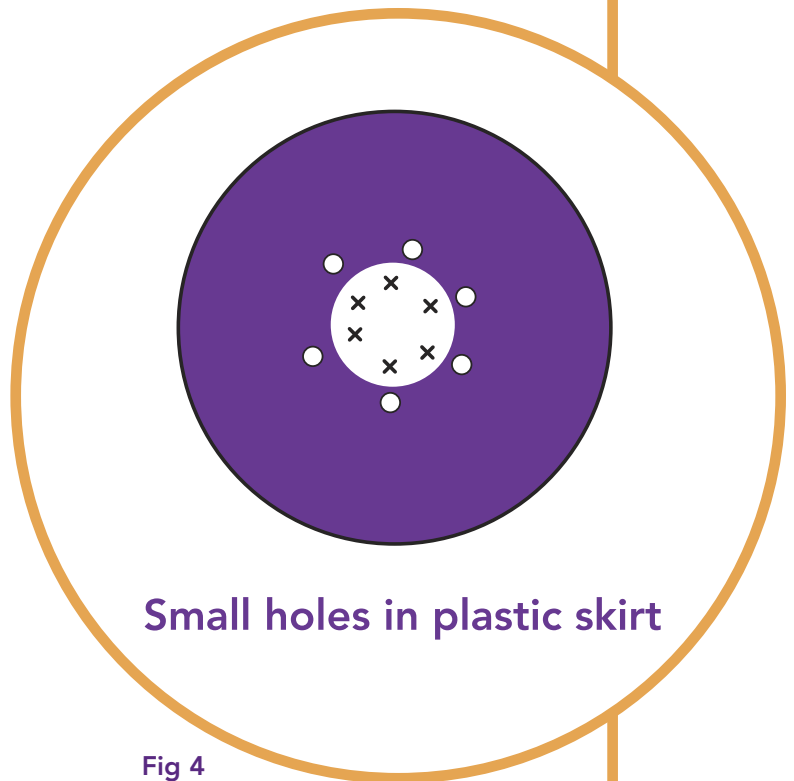
Fig 3

- 5) Carefully cut six small holes in the plastic sheet, to let air escape out of the skirt. The holes can be about 2 inches in diameter, and should be near the plastic disk. You can experiment with the size, number, and spacing of these holes. (Fig 4)
- 6) Flip the plywood back over, so it is skirt-side down. Insert the nozzle of the leaf blower into the hole you cut for it. Start the leaf blower and inflate the skirt. Check for air leaks around the edge of the skirt, where you taped it to the plywood, and around the hole where the leaf blower nozzle goes into the plywood. Your hovercraft is ready to ride!



## SciGirls Secret:

Some of your girls may be unfamiliar with power tools, so emphasize Rachel and Sara's ease and skill with this equipment. Seeing girls just like themselves succeed will encourage and empower your young scientists. Be safe and have FUN!



Small holes in plastic skirt

Fig 4

**Now test your hovercraft. Here are three suggestions:**

**Glitter test:** Set hovercraft on smooth flat level surface. Sprinkle glitter all around the perimeter of the hovercraft. Start the leaf blower, hold the hovercraft in place, and allow the air escaping from under the hovercraft to scatter the glitter. Turn off hovercraft blower. Measure the distance from the center of the hovercraft circle out to the edge of the scattered glitter, at four points around the circle. Calculate an average radius.

**Speed test:** Use a skateboard park ramp to “launch” hovercraft across a level surface. Record the time required to coast a set distance (15 meters, say). Perform at least three trials, and calculate an average time.

**Steering test:** Set up a course on a flat level paved surface, using cones to mark places where the hovercraft should make a turn. Use a steering device, such as a stream of water from a Supersoaker™ - like water sprayer. Give the hovercraft a push, then attempt to steer it through the course using the sprayer as a steering booster. Record remarks on effectiveness of steering the hovercraft.



## Keep Exploring!

- 1) Use an air hockey table for a science investigation. Find things around the house that might work as hovercrafts on an air hockey table. How does the amount of surface area relate to the amount of weight it can carry and still hover?
- 2) Make your own hot air balloon from a lightweight plastic bag, paper band, thread, cellophane tape, and paper clips. Inflate the bag with hot air from a hair dryer. When it's full, release it, and try to measure how high the balloon flies, and time how long it stays in the air before returning.
- 3) Get a helium-filled balloon and tie a small sand bag to the bottom. Adjust the amount of sand in the bag until the balloon floats just off the ground. How does the size of the balloon compare to the weight of sand in the sand bag?