



Name: \_\_\_\_\_

## Build an Airboat at Home STEM Activity

Have you ever been on an airboat before? Have you ever wondered how scientists, researchers, and even students travel into the heart of the Everglades to study its plant and wildlife? The answer is airboats!

### Background Information:

An airboat is basically a boat propelled by a giant fan. Since the airboat's propellers are placed above the water, the base of an airboat can be made completely flat. This allows the airboat to travel over places where normal boats cannot go, such as shallow waters, swamps, and sawgrass like in the Everglades.

Airboats are a great way to experience natural ecosystems and the Everglades. Airboats are a popular form of transportation used by researchers and for recreation. Researchers in the Everglades use airboats to travel through rough terrain, and to sites that cannot be reached by other forms of transportation, including walking. Researchers monitor and assess water quality and ecological conditions by collecting data and samples at these sites. Scientists use this data to make management decisions to protect and restore the Everglades.

Learn more about how airboats work with this video: <https://youtu.be/afVulhauJTo>

**Directions:** In this lesson, students will learn how an airboat is made, and will learn how they can build one at home. Students will learn about the engineering process as a way to plan, design, and improve their airboat prototypes. Students will then watch a video of how to build an airboat at home using some recycled materials, and will observe how the engineering process was used to design and improve the airboat.

**Standards:** SC.3.N.1.6, SC.3.N.3.2, SC.4.P.10.2, SC.4.P.10.4, SC.4.P.12.1, SC.4.N.1.8, SC.5.P.13.4, SC.5.N.1.5

Newton's Laws of Motion help us to understand how airboats move. Newton's 1st Law says that an object at rest will remain at rest unless acted on by an unbalanced force. When dropped into the water, the airboat does not move on its own (unless it is windy). It needs the force of the propellers to move around. After the propellers have been turned on and the airboat has started moving, it will keep moving until it hits a wall, or something gets in its way (an unbalanced force).

In order to design and create your own airboat, it's important to follow the steps of the engineering process.



Name: \_\_\_\_\_

## The Engineering Process:

Engineers start by having a good idea about what they want to accomplish. They ask critical questions about what they want to create, whether it is a skyscraper, an amusement park ride, a bicycle, or a smartphone. They ask questions like: What is the problem to solve? What do we want to design? Who is it for? What do we want to accomplish? What are the project requirements? What are the limitations? What is our goal? Use the space provided below for your engineering process, or write it in your science journal.

**Step 1: Define the Need and Constraints:** Ask questions and research information about your airboat. What do you already know? What are the constraints? \_\_\_\_\_

\_\_\_\_\_

**Step 2: Research the Problem:** Brainstorm ideas and solutions. Choose the best idea to create a prototype. \_\_\_\_\_

\_\_\_\_\_

**Step 3: Plan a Possible Solution:** Gather all the materials you need to create your prototype. Plan each step you will take to create your prototype. You can make a list, or draw your design.

\_\_\_\_\_

\_\_\_\_\_

**Step 4: Create a Solution:** Follow your plan and create your prototype. \_\_\_\_\_

\_\_\_\_\_

**Step 5: Test your Prototype:** Test your prototype. Does it work? Are there any problems? \_\_\_\_\_

\_\_\_\_\_

**Step 6: Improve:** Think about changes you can make to improve your prototype. Re-test your prototype and record why it worked better. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

After using the engineering process to design/test an airboat, follow along with this video and student procedures of how you can build an airboat at home, and observe how the engineering process was used to test and improve the airboat.

Build an Airboat at Home STEM Activity: <https://youtu.be/ejxmJot7U44>

**Materials:**

- 9v battery holder
- 9v battery
- Connection wires
- Small motor
- Motor holder
- Large piece of cardboard
- Permanent marker
- Ruler
- Duct tape
- Electrical tape
- Hot glue gun
- Toilet paper roll

**Student Procedures:**

Use the video provided as a reference for each step when building your airboat.

1. Start by gathering your materials and drawing out the base of the airboat. On the large piece of cardboard, use a ruler to measure 20 cm wide and 30 cm long and use the permanent marker to draw the lines. Then measure 48 cm long from the middle of the base (10 cm) and draw along the lines. At the top of the 48 cm line, measure 8 cm in the center. From the top of each 30 cm line, measure 19 cm to the end of the 8 cm. This will be the base of your airboat.
2. On the same piece of cardboard, measure 16 cm across for the propeller. Use the permanent marker to draw the shape of the propeller with a narrow section in the middle, and a large fan on each side.
3. Carefully use scissors, or a box cutter, to cut out the shape of your airboat and the propeller.
4. With your 9v battery holder and the motor, you will need to create a closed circuit in order to turn the motor on. Make sure your battery is inside the motor, and make sure the switch is turned off. Create a small hole in the middle of your propeller, and push the propeller onto the motor. Connect the red wire from the motor to the red wire from the battery pack, and connect the black wire from the motor to the black wire from the battery pack. This will create a closed circuit and you will be able to turn on the motor. Test your fan to see which way the air is flowing. If it is not flowing outward, you may need to switch your wires and connect black to red, and red to black. Use electrical tape to secure the wires.
5. Since you will be testing the airboat in water, you will want to make sure that your boat is waterproof. Use duct tape to cover your cardboard base and cardboard propeller.

6. Next you will want to tilt up the narrow section of your airboat, this will help it to glide on the water.
7. Now it's time to place the motor onto the airboat. You will need to place the propeller high enough so that the blades will not hit the base of the airboat. You can use a toilet paper roll or something similar. Using spare pieces of cardboard, cut out squares to glue to the top and bottom of the toilet paper roll. Then with the hot glue gun, carefully glue the toilet paper holder onto the base of the airboat.
8. Next place the motor into the motor holder and glue the motor holder to the top of the toilet paper holder. Make sure that your propeller does not touch the airboat. Tape the wires to the toilet paper holder and tape the battery holder to the airboat.
9. Use extra cardboard to glue on seats, or decorate your airboat however you would like.

It's time to test your airboat! Before testing, write down some predictions in your science journal about what you think is going to happen. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

### Assessment Questions:

1. What worked? What didn't work? What can you do to make your airboat better?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. The video tested 2 different types of cardboard propellers. They both worked, but after getting wet they didn't work as well. What might be a solution to this problem?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Did your predictions come true about your airboat? Why or why not? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

4. After re-testing your airboat with your improvements, did it work better? If it did, what made it work better this time? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Take it a step further!

- Try adding different weights to your airboat.
- Test it against the wind to see if it still works.
- Try using your airboat in a shallow marshy area, like the Everglades.
- Waterproof your airboat so you can use it again and again.