



PROJECT N^o 5

Hovercraft



AUTHORIZED AMA
STE(A)M PROGRAM

AGE GROUP: 5-13 BEGINNER



PROJECT Nº 5

INFO FOR PARENTS:

Handling the cutting and gluing may require some adult help for younger students, particularly if you elect to use hot glue.

GOALS & OBJECTIVES

Fine motor skills: The building process involves manipulating materials and intricately connecting flexible and solid materials.

Problem solving: The presence of torque adds a complicating factor to what students might expect to see during testing and produces a critical thinking challenge.

Hypothesis: The open-ended nature of the problem to be solved means students can think creatively and asked to understand what they have learned from the outcome.

MATERIALS

- Foam board with template for body or pre-cut flightpack board
- Balloon
- Foam plate for ring
- quarter or washer
- Hot glue gun/glue or white glue
- Scissors
- Large, flexible straw
- Tape
- Pencil

BACKGROUND INFORMATION

It is an inarguable law of physics that objects at rest will stay at rest, and objects in motion will remain in motion, unless acted on by an outside force. One of the most common “outside forces” that can cause an object to stop moving is friction, or the force created when two surfaces rub against each other. There are many ways to lessen the effect of friction, but hovercraft are a type of vehicle that can glide over a surface—any surface—with hardly any friction at all!

Hovercraft travel over surfaces by generating a small amount of lift—not enough to become fully airborne, but enough to prevent too much friction from forming between the craft and the surface. Instead of using wings or rotors to create this lift, however, hovercraft simply create a cushion of high air pressure beneath themselves, on top of which they can glide around. It is similar to the way a puck glides over the surface of an air hockey table! Hovercraft are used for all kinds of tasks, including recreation, ferrying passengers and cargo, and military operations.

GO FURTHER

Although your hovercraft should perform reasonably well as it is, full-scale vehicles usually utilize an inflatable “skirt” around the edges of the hull to further cut down on friction. The skirts typically have very small openings at the bottom where they contact the surface so that the necessary air cushion can still form.

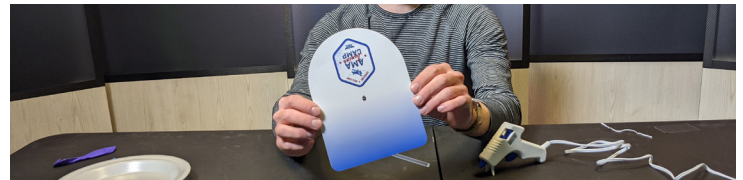
Think about how such a skirt could be attached to the hovercraft you have built. What materials could you use? How would it be attached and how would you operate it? What are the advantages and disadvantages to including one?

TIPS

A smooth, clean, solid surface is the best place for your first test runs, but the whole point of a hovercraft is that it can go almost anywhere! Try it out on other surfaces too—carpet, water, even ice if it is nearby. Where does it perform best? Why might this be?

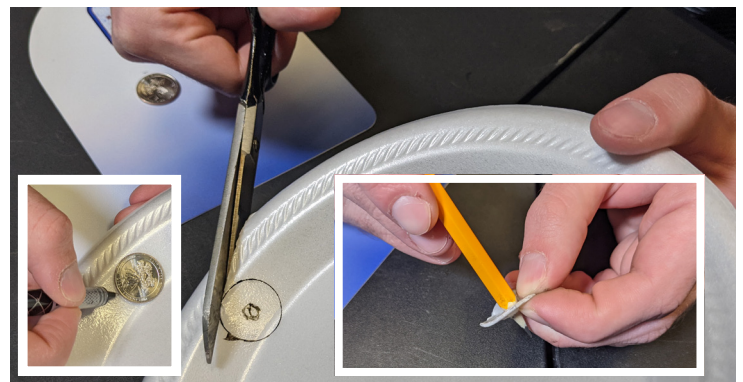
INSTRUCTIONS

1. Gather your supplies and organize your work area. If you have a flight pack, you have everything you need already and can skip to step 3!



2. Using scissors, cut out the shape of the hovercraft’s hull from the foam board. Take special care not to bend or crease the foam as you handle it.

3. Using a quarter or washer as your template, cut out a circle from a piece of foam plate; then pierce the center of this circle with a sharp pencil. Place this ring to the side.

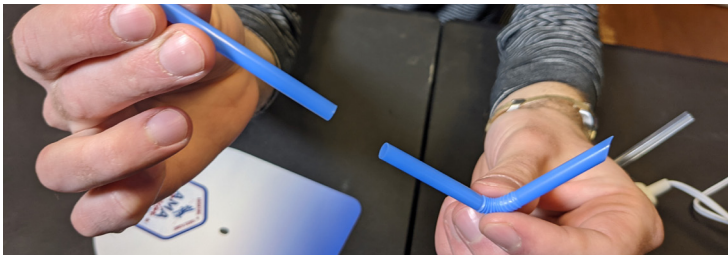


Hovercraft

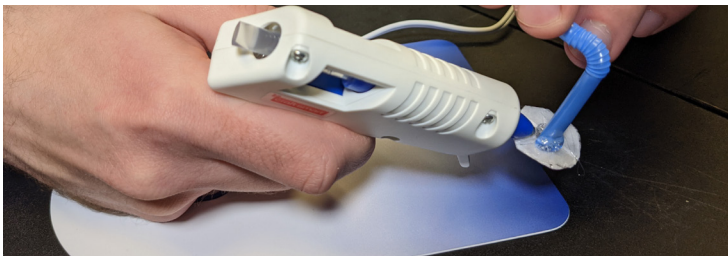
4. Cut the shorter end of the flexible straw so that it forms an angle as shown.



5. Cut the long end of the straw down so that it is roughly the same length as the short end as shown.



6. Bend the straw, press the flat end of the straw through the ring you made in step 3, and glue it to the flat end of the straw. Either hot glue or white glue can be used; hot glue dries much faster but white glue might prove to be stronger if you are willing to be patient. Be sure not to clog the straw's opening with glue.



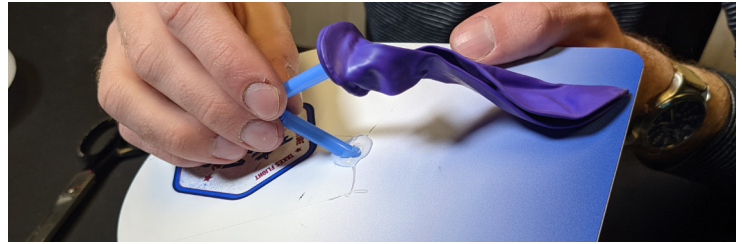
7. Place the balloon over the ring, ensuring that an airtight seal is made.



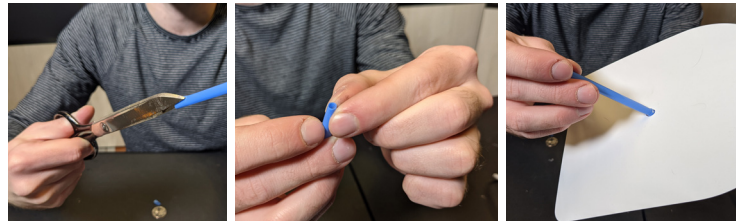
8. Using your scissors, gently scratch the surface of the hovercraft base around the center hole. This will give your glue enough surface area to hold securely.



9. Glue the angled end of the straw to the hole in the hovercraft hull's hole so that it forms a tight seal. You can try taping the straw in place temporarily as this is a bit tricky.



10. Take the length of the straw you cut off in step 2 and cut two slots on one end. Roll the end of the straw into a taper so that it can be inserted into the hull's hole from below. Use this to inflate the balloon.



11. Pinch the neck of the balloon tightly after it has been inflated. Set the hovercraft down on a clean, smooth surface and release!



Hovercraft Template

