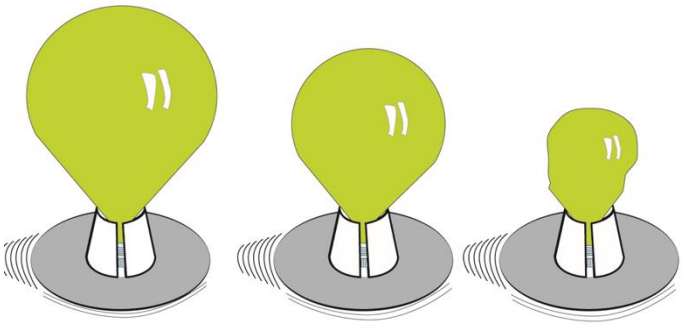
HOVERCRAFTS

Get a big lift from a little air pressure!



Curriculum topics

- Air Pressure
- Friction
- Motion
- Inertia
- Engineering/Design

Subjects

- Engineering
- Physical Science

Grade range: K – 8

Who we are: Resource Area for Teaching (RAFT) helps transform the learning experience by inspiring joy through hands-on learning.

Explore how a hovercraft can glide smoothly along by constructing this quick-to-assemble four-piece model. Once the hovercraft is built, test it on any smooth, flat surface!

Share Your feedback!
http://bit.ly/RAFTkitsurvey

Materials

Materials in the kit may vary but generally, this kit contains the following:

- CD with smooth side (1)
- Plastic sports bottle cap (push/pull top) (1)
- Balloon, 6”-12” (1)
- Foam cylinder, double-sided adhesive (1)
- Index card, 3” x 5” (1)

WARNING: Children under 8 years can choke or suffocate on uninflated or broken balloons. Adult supervision required. Balloons contain natural rubber latex which may cause allergic reactions.

To Do and Notice

1 Place the CD **smoother label side downward**. Remove the backing from one side of the foam cylinder, center it over the CD hole, adhesive side downward, and press down. See this RAFT video for assembly support (http://bit.ly/3czoNWe).

2 Remove the backing from the top of the adhesive foam. Center the cap over foam, bottom downward, and press down.

3 Make a collar by folding the 3” x 5” index card in thirds. A collar will prevent the balloon from tipping and dragging on the table.

4 Place the assembled hovercraft on a smooth and clean counter, desktop, or horizontal whiteboard. Make sure the push/pull part of the sports cap is in the “down” position (closed).

5 Inflate the balloon, twist the neck to seal in the air, and place the balloon’s neck over the sports cap. The neck of the balloon should seal tightly to cap.

6 Place the collar around the balloon as shown at right and untwist the balloon neck so that air flows through the cap.

7 Give the hovercraft a light push or spin, blow on the balloon, or fan the balloon to make the hovercraft move. The hovercraft should glide smoothly. If not, you can reposition the collar, poke more holes in the cap with a pushpin, and/or reclean the gliding surface to ensure a smooth “flight.”

8 **Share** student learning with RAFT! Submit photos/video via email at education@raft.net or on social media (Facebook, Twitter, Instagram).

Core Content Skills:

Science & Engineering (NGSS)

Developing and Using Models, Planning and Conducting Investigations, Properties and Structure of Matter, Forces and Motion, Definitions of Energy, Types of Interactions, Cause and Effect

Social Emotional Learning

- Self-awareness
- Self-management
- Responsible decision-making

The Content Behind the Activity

The air in the inflated balloon is compressed (pressurized) by the stretched surface of the balloon. When the compressed air escapes through the small holes in the top of the cap, it is pushed out of the hole in the center of the CD. Then the air pushes its way between the flat bottom of the CD and the smooth flat surface underneath. A thin cushion of moving air forms under the CD. When the force from the cushion of air is greater than the force of gravity pushing down on the hovercraft, the hovercraft will lift off the surface a tiny amount. The pressurized air continues to flow outwardly until it reaches the edge of the CD, where it goes back into the atmosphere. If it is replaced by new air coming from the balloon, the cushion of air is maintained. In commercial hovercrafts, a flexible curtain surrounds the edges of the vehicle to help trap the pressurized air so the hovercraft can rise higher and thus move over rougher terrain.

All moving objects rub against something else while moving along unless they are operating in a vacuum. The resistance to that movement (friction) is what keeps us from slipping as we walk. Friction also slows down a rolling ball. The thin cushion of air underneath the hovercraft reduces the friction between the flat surface below and the bottom of the CD. The friction is reduced so much that slowing down due to frictional energy losses is negligible, giving the illusion that the hovercraft could glide on forever. The CD weight and size help keep the CD parallel to the table so that the CD does not tilt and drag on the table. The CD also distributes the weight of the hovercraft over a wide area. The larger “footprint” means the hovercraft needs less upward force, per unit of area, to lift the CD up off the surface.

Reuse

This kit uses 100% reusable materials designed for other uses. To continue making a positive impact in reducing waste, reuse these materials in other projects. Additionally, any unused materials can be collected and delivered back to RAFT.

Feedback

Please comment on this kit by taking this short survey: http://bit.ly/RAFTkitsurvey. Let us know of any material concerns (missing, broken, or poorly fitting parts) as well as any suggestions for improvement.

Visit https://raft.net to view related activities!

Air – A Pressing Matter
Air Pressure – Feel It!
Balloon in a Bottle

Resources

- RAFT Hovercraft support video – http://bit.ly/3czoNWe
- Hovercraft history video - https://bit.ly/358Kk4R
- Images of different hovercrafts - https://bit.ly/3eVSoKM