

Sky Floater Instructions



Here are some of the materials you can use

- binder clip (large)
- clear tape
- corrugated card board (8-in. [20 cm] square) (corrugated cardboard has grooves in the middle, like a cardboard shipping box)
- 1 Mylar balloon with a ribbon (helium-filled) (you can find these at party stores, florists, dollar stores, drug stores, or supermarkets)
- paper
- paper clips (various sizes)
- scissors



Prepare ahead of time

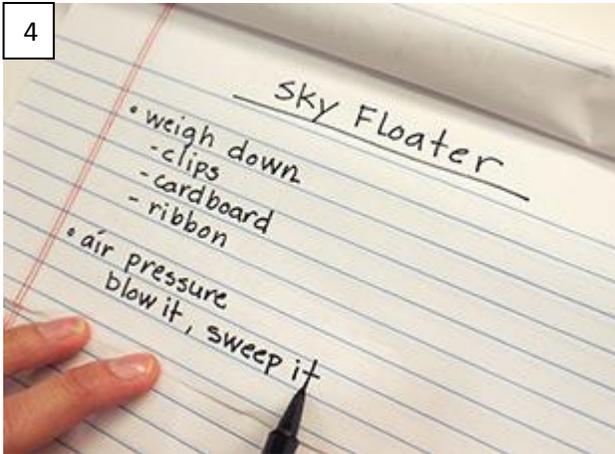
- Have paper and a pencil ready to write down ideas and sketches as you design.
- Work in an area away from windows or doors that might have drafts or breezes that could blow the balloon around.
- Think about balloons you have seen that seem to hover, or float, in one place. How do they do that?



Think about the challenge

- Why do balloons rise?
- How does a balloon stop rising?
- How can you keep your balloon from floating upward?
- TIP: Air is denser, or heavier, than helium. The air pushes the helium aside, and makes an upward force, or pressure, called a buoyant force. This pushes the balloon up.
- TIP: A balloon will stop rising when it reaches a point where the density of the air outside the balloon is equal to the density of the helium inside the balloon. When these two densities are equal, there is no longer a buoyant force.

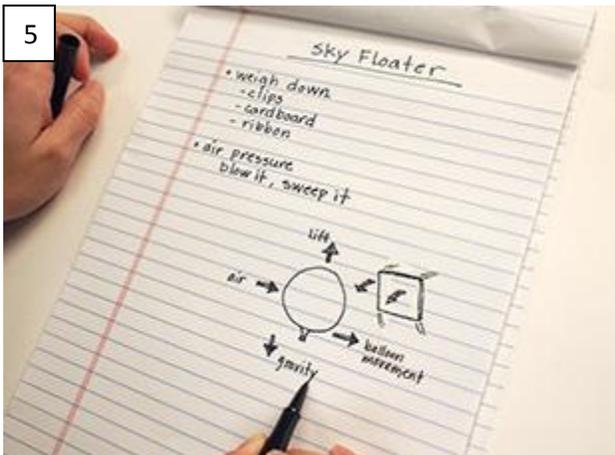
4



Think about and write down your ideas

- How will you make your balloon hover at one level?
- How can you make something move without touching it?
- How will you control the direction it moves in?
- TIP: *If you want your balloon to hover, it needs to have **neutral buoyancy**. This means the force pulling down (**gravity**) has to be equal to the force raising it up (**lift**).*
- TIP: *Inventors' and engineers' first ideas rarely solve a problem. They brainstorm ideas, try different ideas, learn from mistakes, and try again—this is part of the **design process**.*

5



Look at the materials

- What materials might pull down or lift up the balloon a lot? A little?
- How will you attach things to your balloon to keep it from rising?
- What materials do you have to make your balloon move fast or slow?

6



Choose weights to make your balloon hover

- Decide what materials can help your balloon hover in one place.
- Think about materials that will weigh down the balloon.
- Add or take away weight on your balloon a little at a time.
- TIP: *Add and subtract materials such as clips, ribbon, and tape to balance the weight of the balloon. Add or subtract one weight at a time to find the neutrally buoyant point when your balloon hovers in one place.*



Make the balloon hover

- Test your balloon.
- Make your balloon hover at eye level for at least 5 seconds.
- TIP: *Even a small paper clip or a piece of ribbon can make the balloon too heavy or too light to hover.*



Test drive your balloon

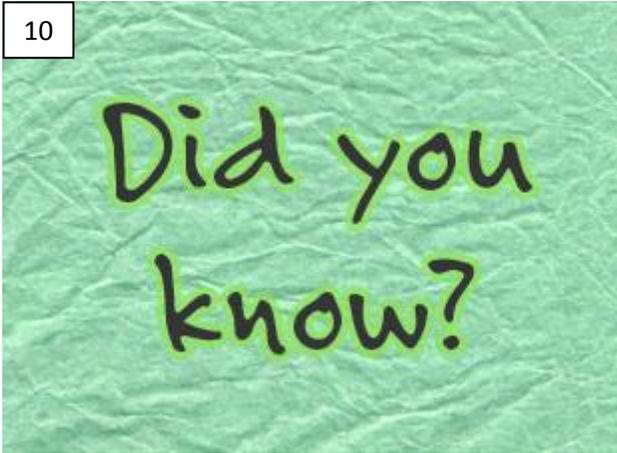
- Decide what material you will use to sweep the air so that it moves your balloon.
- Hold the sweeper next to your balloon and sweep it sharply alongside the balloon in one motion.
- Did the balloon move in the direction you thought it would?
- TIP: *Rapid fanning makes it hard to control the balloon's movement. Fanning motions make the balloon move in an unpredictable way.*



Drive in a circle

- Try different techniques for moving your balloon.
- Use big swoops, quick swipes, or a fanning motion.
- Try to move the balloon in a circle.
- TIP: *The balloon is surrounded by air. When you sweep the cardboard beside the balloon, you make **air pockets**, or temporarily remove some of the air. When you create a bunch of low-pressure air pockets, you will be able to move the balloon around the room a few inches at a time.*
- TIP: *Engineers always review and modify their ideas as they go along. It's part of the **design-build-test process**. Testing reveals information about a design and the materials an engineer can use to improve a design before going any further.*

10



Did you know?

- **Eye In the Sky**

The state of Ohio has a new way of keeping an eye on things. For a price tag of \$180,000, it has a new blimp in the sky! The blimp is an unmanned helium balloon that uses cameras to monitor things on the ground for as long as three days at a time. The balloon can fly as high as 480 feet (146 m) and the camera can see people as far as 3 miles (5 km) away. So, the next time you're in Ohio, look up and wave to the camera!

11



Try this next!

- **Drive through an obstacle course.** Drive your balloon through an obstacle course—up and over a pile of books, around a table, and into a chair.
- **Have a balloon race.** Time yourself (or race with a friend) as you steer your balloon over a desk and into the seat as fast as you can!