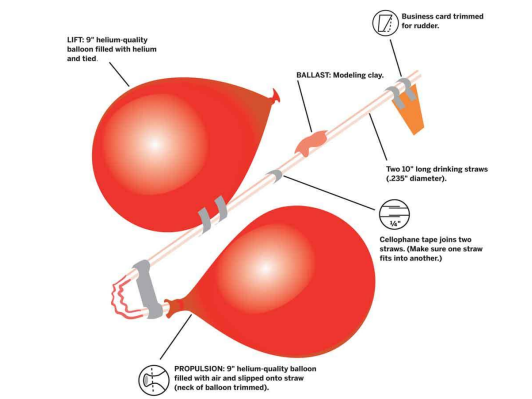


Engineering Challenge: Building Blimps

Propel buoyant floaties across the sky



Summary

This is an Engineering Challenge that takes place in the air. Using helium and regular air alike, blimps not only have lift, but propulsion, too. Students try to make a blimp that has a predictable trajectory as it goes bopping around the room.

Objectives

- Youth will learn fundamental terms of aero-engineering
- Youth will learn to prototype, and go through the iteration cycle.
- Youth will work in groups and present their work in front of an audience.

Preparation

- ☐ Arrange Materials.
- ☐ Prepare "Aero Engineering" slides
- ☐ Pre-inflate three balloons with your breath.
- ☐ Pre-inflate helium balloons, tie on strings.
- ☐ Optional: make sample.

Materials Needed

See the Materials Generator on the sheet "[Material Info Sheet](#)" to see the materials needed for this lesson. Scroll right to find the column for this project.

Helpful Links

- ❖ [Make Magazine Blimps](#)
- ❖ [Blimp Jets](#)
- ❖ "Aero Engineering" cards

Project Outline

- Warm Up (10 min)
- Aero-Engineering Gallery (15 min)
- Blimp Building (20-50 min)
- Blimp Share Out (10 min)

Activity One: Warm-Up (10 min)

1. (10 min) **The Air Up There** -- This quick warm-up game is to see which group can keep a balloon in the air the longest. Break groups into 6-10 and give a pre-inflated balloon. The goal of the game is to keep their balloon in the air the longest without touching it. Use a timer, say go, and see who can keep it up with breath the longest.

Add-Ons:

- You can have students sheets of paper for a different type of round
- You can try to have teams get a balloon from one place to another.

Activity Two: Aero-Engineering Gallery (15 min)

1. (2 min) **Introduce** -- Explain that today we're going to be engineering in the air. Aerospace engineering is crucial and amazing branch of engineering to keep us safe in amazing transport. We will be looking at some photos to see what we can discover. Instruct youth to bring pens with them for marking.
2. (10 min) **Aero-Engineering Gallery** -- Distribute images around room holding on to term sheet.

Using questions, have students find:

- A type of transport they've been in.
- A type of transport they'd like to go in.
- Something that lifts off by floating.
- Something that lifts off by engines.
- Something that lifts off some other way.

Using the word cards, find examples of:

- *Thrust* -- something that pushes an object forward through the air. Draw arrow with label showing which direction something is pushing an object in the picture.

- *Drag* -- the force and direction that slows something down (air resistance). Draw arrow showing direction.
 - *Lift* -- force propelling an object upwards. Draw arrow labelling and showing direction.
3. (3 min) **Discussion** -- Use the example of a single person pretending to be flying through the air like a bird. Which way would the thrust, drag, lift, and weight forces be pushing on them?

Activity Three: Building Blimps (40-90 min)

1. (2 min) **Introduce** -- The challenge is to make a blimp that can propel itself through the air in a predictable direction. You and a partner will be working together using a helium balloon for lift, and a regular air balloon to propel it forward.

Students will have access to bendy straws, clay, balloons and notecard to see what they can create.

2. (5 min) **Design + Plan** -- Diagram out a potential blimp design with your teammate. How will you attach your balloons together. Which way will the contraption move? How could you change that?
3. (30-70 min) **Create, Prototype, Improve** -- While working on your blimps, keep them tethered to a chair or the table to prevent balloons from escaping. What do you have to do to make them hover? How could you lose weight or add weight? How can you control the direction?

Hints for Building:

- Tape your balloons to straws. This is an easier way to keep them together.
 - Tape your propulsion balloon around a straw. You can control flow by changing the angle of a bendy straw at the back, or by stuffing it with a tiny amount of clay, and pricking a hole.
 - [This image](#) is a good model to begin with.
 - A small notecard rudder can help keep your path straight.
 - Encourage youth to draw their designs, and add some personality to their design.
4. (10 minute) **Blimp Share Out** -- Have youth draw their blimp designs, labelling different parts. Have blimps zoom across the room, and look at and have youth comment on trajectory. What might they change if they had more time? What had they changed?

Bonus: If you want, you can set up a specific target for the blimps to hit or pass through. It can be anything from a suspended hula hoop to a poster on a wall.