

# Air Engines

## Activity Objectives

- To observe how unequal pressure creates power
- To explain how air power can help airplanes fly
- To construct a working model of an air engine

## Materials

- ✓ Balloon
- ✓ Drinking straw
- ✓ Fishing line
- ✓ Tape

## Background

Aircraft powered by jet, piston, or rocket engines are capable of sustained flight. Remaining aloft longer means the aircraft offers greater utility and convenience to users. The aircraft engine provides a constant source of thrust to give the airplane forward movement.

This activity will allow students to build and demonstrate a source of thrust found in some research aircraft – the rocket engine. The straw represents the fuselage and the balloon represents the aircraft engine. Once the balloon is filled with air, there is a difference in air pressure between the outside and the inside of the balloon.

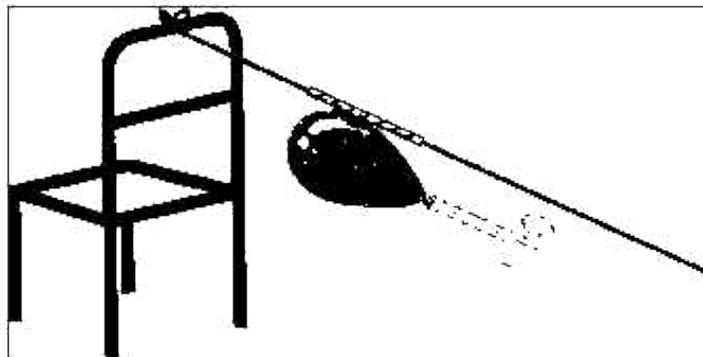
The inside of the balloon has higher pressure than the outside of the balloon. The air on the inside of the balloon equalizes with the air on the outside of the balloon when the balloon is released. Energy is generated as air equalizes from high-pressure areas to low-pressure areas.

Because every action has an opposite and equal reaction, the balloon moves in the opposite direction of the flow of the released air. Since the air is released from one small hole, the release of the air is focused in one direction. And because the air is focused in one direction, the balloon and straw are forced to move down the string in the opposite direction.

## Instructions

1. Place a drinking straw inside a mystery container. Play a game of 20 questions with the students to see if they can identify what is in the container.
2. Tell students that what is inside the container has something to do with learning about how airplanes fly.
3. After the students have asked all of the questions, show them the straw. Tell them they will be using the straw to build a model of an air engine.

4. Give the students a few minutes to investigate the straw. Give each student a straw and ask him or her to describe the straw and see if they can figure out a way to make the straw travel from one place to another (e.g., from the desk to the floor, or from one part of the room to another).
5. Tell the students they'll be learning another way to make the straw move by making an air engine.
6. Group students in teams of four and provide each team with a set of materials.
7. Have the students inflate a balloon and let it go. Ask the students to make observations about what happened to the balloons when they were released.
8. Explain to the students that the balloons move because the air pressure on the outside and the inside is different. Have the students observe how the balloons go off in all different directions.
9. The balloons will move. The energy inside the balloon propels it. Tell the students that the movement of the balloon can be directed toward one place.
10. Now have the students assemble their models.
11. Have the students place the fishing line through the straw. One student will hold one end of the fishing line, and the other end of the fishing line should be tied to the back of a chair. Then, have the students inflate a balloon with air and hold the end tight while another team member tapes the balloon to the straw. Once this is done, the students can release the balloon nozzle, and observe the balloon (air engine) as it moves across the fishing line.
12. Have each team tape their engine parts (straw, balloon, fishing line) to a piece of paper. Have the students explain how the activity worked.



### **Discussion**

Have the students identify the different parts of the air engine model: straw (fuselage), balloon (air engine), fishing line (track).

Ask the students to explain why the straw moved along the string. The balloon moves along the string when the air pressure inside the balloon escapes out of the nozzle. Since the balloon is taped to the straw, the straw moves with the balloon when the air is released. Help the students make the connections between this and airplanes moving through the air.

Ask the students to tell how moving the balloon along the string is different from how they tried moving the straw in the pre-activity. In the pre-activity, students did not use directed air pressure to move the straw. They moved the straw by throwing it or dropping it. In the air engine activity, the students move the straw when they focus the air power.

### **Assessment**

Have the students make a drawing of their air engines, and then write or tell about how the air engine worked.

Have the students write about how air power helps airplanes fly.

### **Extension**

Have the students construct another air engine model, but this time let them experiment with different balloon shapes and sizes.

Have the students make a longer track and record the distance the engine moves the straw along the track.

Have the students make a vertical track and observe how the air engine moves the straw from the floor to the ceiling.

Hold air engine contests to see which team can make the air engine straw go the farthest distance.