How Airplanes Stay Aloft

The Power of Pressure

Introduction

A wind bag is like a balloon without any elastic qualities. It's made out of material that is similar to a plastic grocery bag. It is eight feet long and ten inches in diameter. How many breaths would it take to blow up a bag of this size? 10 . . . 20 . . . 30 . . . more? With a little practice you will be able to blow up the bag in one breath. Try these two exciting activities with your wind bags.

Concepts

- Bernoulli's principle
- Air pressure

Materials

Wind bag

Safety Precautions

Although this activity is considered nonhazardous, please follow all normal laboratory guidelines.

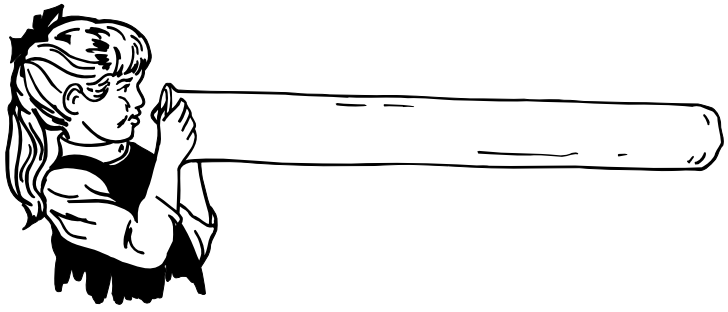
Procedure

1. Ask for a volunteer. Have the volunteer try to blow up the wind bag keeping track of the number of breaths it takes. In general, it takes anywhere from 10 to 40 breaths to fully inflate the bag.
2. Let all the air out of the bag. Explain to your students that you can blow up the bag using only one breath! Of course this challenge seems impossible.
3. Ask someone to assist you by holding onto the closed end of the bag. Hold the open end of the bag approximately 10 inches away from your mouth. Using only one breath, blow a sharp burst of air into the bag. Remember to stay about 10 inches away from the bag when you blow. Quickly seal the bag with your hand so that none of the air escapes. Twirl the bag to seal it. With a little practice, you will be able to inflate the entire wind bag using only one breath. How does it work?

Tip

- Place two books of the same thickness about 3″ apart on a desk top. Place a sheet of paper or a piece of card stock on the books. Challenge the students in your class to blow the sheet of paper off the books. The only condition that you set is that the students must blow their breath horizontally towards the edge of the paper. They are amazed that the paper not only does not blow off the books, but appears to become more firmly attracted to the books and to the desk top.

Discussion



The wind bag quickly fills with air because of a scientific law called Bernoulli's principle. As air is blown into the bag, the air pressure around the mouth of the bag drops. Bernoulli observed that whenever air moves, its pressure drops. The faster the air moves, the more the pressure drops. As a result, the air in the atmosphere (high pressure) fills the bag as long as the fast moving air (from your lungs) creates an area of low pressure around the mouth of the bag. In this example, high pressure air moves toward low pressure air and the bag fills. This is the same principle that explains why airplanes fly, why baseballs curve, and why a race car needs a spoiler.

Publication No. 91523
061616

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Systems, order, and organization
Evidence, models, and explanation
Content Standards: Grades 5–8
Content Standard A: Science as Inquiry
Content Standard B: Physical Science, understanding of motions and forces, transfer of energy
Content Standards: Grades 9–12
Content Standard A: Science as Inquiry
Content Standard B: Physical Science, motions and forces, conservation of energy and increase in disorder

Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *How Airplanes Stay Aloft* activity, presented by Irwin Talesnick, is available in *The Power of Pressure*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

Materials for *How Airplanes Stay Aloft* are available from Flinn Scientific, Inc.

Materials required to perform this activity are available in the *Wind Bag* product available from Flinn Scientific.

Catalog No.	Description
AP8767	Wind Bag

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.