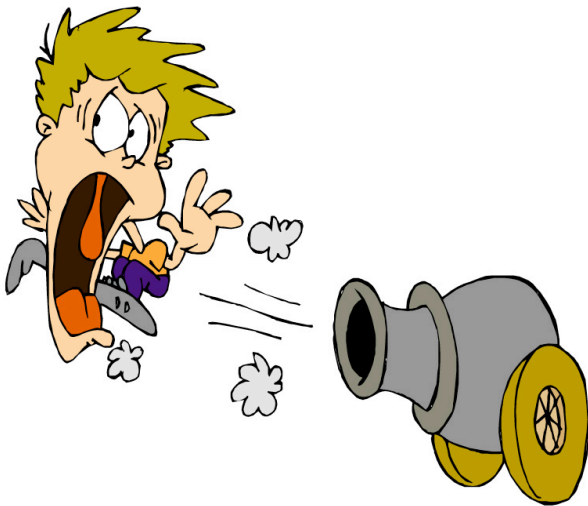


Science Companion[®]

Science Exploration Workshop Air Cannons: Proof that Air has Mass and Volume

Riddle: *Why is an empty box not really empty?*

Answer: *Because it is filled with air!*



When you look at an empty box or other container, it may be hard to realize that the air inside, which is a gas, has mass and volume.

But imagine turning an empty glass upside down in a sink of water: the water does not rush into the glass because air is already there taking up space. You can tell that air has mass when you stick your hand out of the window of a moving car. You can feel the air as you push it

out of the way.

The Air Cannon also demonstrates that air has mass and volume. When the cannon is squeezed, the air inside the cannon rushes out because there is no space for it inside anymore. The expelled air exerts a force, or push, on the paper streamers (or your sister's hair, or your parents' candles...).

mass: the amount of matter, or “stuff,” an object or substance contains
volume: the amount of space that matter, or “stuff,” takes up.

How else can you use your air cannon to show that air has mass and volume?

Make Your Own Air Cannon!

Materials: (all are suggested sizes and can be varied): dowel rod (7/8" x 1"), eye screw, sheet of plastic (20" x 20"; 4-6 mil thick, such as shower curtain or paint tarp), cardboard box (12" x 12" x 8"), scissors, 2 large rubber bands, 2 large paper clips, duct or packaging tape.

Construction:

Remove the flaps from the open end of the cardboard box. Securely tape the opposite end to keep it closed; cut a circular hole (5") in this end.

Use the tape to attach the sheet of loose plastic (should be about 8" wider than the box) across the open end of the box; lining up and overlapping approx. 2" of the plastic with the open edge of the box. The plastic should be loose enough to sink or "dish" inward into the box.

With the dowel rod on the outside of the box, and the eye screw on the inside, push the screw through the plastic and screw it into the dowel end.

Poke holes in the opposite side walls, 6" from the plastic covered end of the box.

Lace the rubber bands through the eye of the screw. Rubber bands should be taut enough to pull the plastic into box. Push a rubber band through each side, and hold in place on the outside with paper clips.

Operation: Aim the box, hole-side forward and pull the dowel away from the box, stretching the plastic taut, then let go. Blow down targets clear across the room!

Better still, a super duper Air Cannon: Use a plastic bucket (10 liter) from Home Depot and cut a 25cm hole in the bottom. Cover the top with rubber material such as auto tire inner tube. Tie or clamp the rubber on (with hose clamp stock). It should be tight as a drum. Hit it with a rubber mallet.

Have fun!

*(A Workshop from Science Companion and
the Center for Elementary Mathematics and Science Education at the University of Chicago.)*