



Balloon Spacesuits

Background

The spacesuit is carefully constructed to ensure an astronaut's survival. Researchers in the space program were challenged to find a way to maintain proper pressure in a suit. If there were no pressure, the air in our lungs would rush out. The gases in our body fluids would expand and boil off. That would be the end of us!

One of the challenges of working in a pressurized suit is the ability to bend. Bending can slightly increase the pressure within the suit. To circumvent this problem, researchers have included breaking points outside of the pressure bladder (a balloon-like layer in the spacesuit used to help maintain pressure and to create an impermeable barrier between the pressure of pure oxygen inside the spacesuit and the vacuum of space outside of the suit). These breaking points help to form joints. Other solutions include sewing folds into the restraining layer of the suit that expand and contract like the ribs on a vacuum cleaner hose.

The Activity and Objective

A balloon can be used to simulate the arm of a pressurized suit. Students observe how adding joints to something that is pressurized increases flexibility or bending ability.

Materials

- Two long balloons for each student
- Three heavy-duty rubber bands for each student

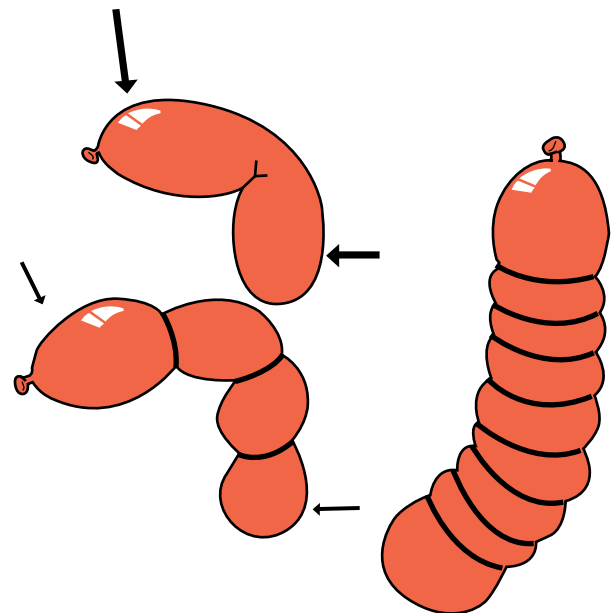
Method

1. Ask the students to blow up and tie off a long balloon. Tell them that this represents the pressure bladder of a spacesuit arm.
2. Ask them to start blowing up the second balloon, but as they do it, they should slip the rubber bands around the balloons at intervals so that the balloon gets pinched by the rubber bands in two different places.

3. Ask the students to try to bend the balloon without the rubber bands and then try to bend the balloon with the rubber bands. Ask them to compare the force that's required to bend these two balloons. What differences do they observe?

More Activities to Stimulate Interest and Learning

- Astronauts also experience the challenge of increased pressure in their gloves when trying to hold or manipulate tools. What can be done to help alleviate the pressure in the gloves? (e.g. make the tools larger to reduce the force required to hold the tools.)
- Researchers are looking for ways to increase the pressure in the suit in order to reduce pre-breathing time for astronauts. What do they need to take into consideration when it comes to mobility? (e.g. materials, joints for bending, etc.)



For answers to these questions or for more information about spacesuits in general, please visit the KidStation for Cosmofans at <http://www.space.gc.ca/ks-cosmofans>.