

Remaining Neutral

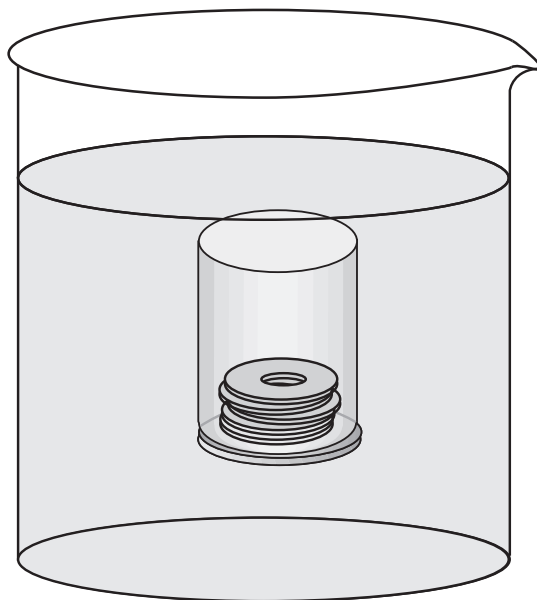
Objective: To load a plastic film canister with enough weight so that it will become neutrally buoyant.

Standards:

Science Content Standards
Structure and properties of matter
Abilities of technological design
Curriculum and Evaluation Standards for
School Mathematics
Geometry
Computation and Estimation
Universals of Technology
Physical Systems
Linkages

Materials (per group of students):

Plastic film canister
1000 ml beaker of water (large jar can be substituted)
Weights (washers, nuts, small nails, sand, etc.)



Background:

Before an astronaut gets to do a spacewalk, the astronaut receives extensive spacesuit training. One of the most important forms of training is to practice spacewalks under water. With the spacesuit properly weighted, the astronaut is immersed in an indoor swimming pool that holds nearly 25 million liters of water. The weights on the suit make the astronaut neutrally buoyant. That means when the astronaut is pulled under water by a couple of safety divers, the astronaut will be able to hover at any level in the pool without moving. This makes for a good simulation of a spacewalk. To make the simulation more effective, replicas of Space Station modules are present in the pool and the astronaut will practice making connections and turning bolts on the modules.

In this activity, students attempt to make a plastic film canister neutrally buoyant. They fill the canister with weights so that it can hover below the surface inside of a beaker.

Procedure:

1. Have students add weights to the film canister and then immerse it in water. If the canister floats at the surface, more weights must be added. If it sinks to the bottom, some weights have to be removed. The canister is weighted properly when the canister hovers in the middle of the beaker or jar.

Extensions:

- Increase the challenge to this activity by balancing an object of irregular shape and unevenly distributed mass for neutral buoyancy. One such object might be a small hammer. The hammer head will be much denser than the wooden handle. Weights will have to be added to the handle while small floats have to be added to the head to achieve neutral buoyancy. Styrofoam peanuts make good floats. Weights and floats are added to space-suited astronauts in underwater training facilities to achieve neutral buoyancy. Be sure to thoroughly dry the hammer after the activity.

