

Let Your Fingers Do the Walking

Objective: To develop strategies for moving about the International Space Station.

Standards:

- Science Content Standards
 - Motions and forces
 - Abilities of technological design
- Universals of Technology
 - Physical Systems
 - Linkages
 - Designing and Developing Technological Systems

Materials (for the entire class):

Swivel office chair with castors

Background:

When astronaut Edward White made the first American spacewalk, he discovered that moving in space was exhausting. His problem was finding hand holds.

Although an astronaut can exert a force on an object in space and propel it away, the astronaut will move away from the object in the opposite direction at the same time. This is explained by Isaac Newton's Third Law of Motion: For every action there is an opposite and equal reaction.

If a spacewalker is not touching any part of the spacecraft, it is impossible for the spacewalker to do anything but turn in circles. To get about, the spacewalker needs to be able to push or pull against an object or have some sort of rocket system for propulsion. Once moving, the spacewalker has to be able to exert another force to stop. This is explained by Newton's First Law of Motion: An object at rest will remain at rest and an object in motion will travel in a straight line unless acted upon by an unbalanced force.

Spacewalkers working on the International Space Station will wear a self-propelled rescue device called the Simplified Aid for Extravehicular activity Rescue (SAFER). SAFER is a clip-on unit that is worn around the backpack life support system. If a spacewalker should get loose from the Station, gas jets in the SAFER unit can propel the spacewalker back to the Station.

In this activity, a student will be placed on a swivel office chair. The student will attempt to move the chair without touching the floor. The chair becomes a simplified microgravity simulator that shows students the necessity of exerting a force in order to be able to change locations.

Procedure:

1. Place a student on a swivel office chair. Tell the student to move the chair without touching feet to the floor. The student will be able to get the chair to rock and spin but the motion will stop when the student stops moving. The student will not be able to get the chair to move off its spot on the floor.
2. Conduct a discussion with your students about ways to enable an astronaut to move about the International Space Station. Let students study the front side of this poster for ideas on how to get about.

Extensions:

- Present an emergency situation to your students and discuss possible answers. "You are spacewalking outside the International Space Station and become separated from it. How can you get back to the Station?" For additional information on transitional aids for spacewalking, refer to the background information section in the Suited For Spacewalking publication (see the panel on NASA resources on this side of the poster).

