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Decline

futuristic simulation game where high school students team with NASA mentors to design a Mars base proposal.

JSC also has expanded the successful KC-135 Student Flight Opportunities program to community college students in an effort to raise the visibility of engineering careers. There's also the Science Advisor Program (SciAd), Distance Learning... the list goes on and on.

Through these programs, JSC has established its commitment to sharing the excitement of space science with the engineers of the future. Now, it is up to individual engineers to ensure a positive legacy is left.

To be placed on the distribution list for outreach and volunteer opportunities, please call or e-mail Debbie Herrin at x38694. ■

GET INVOLVED!

Have you promoted engineering lately?

It's up to all of us to share our unique experience in the space program with students as they begin to mold their education and make career choices. Here are just some of the programs at JSC where you can help our youth discover engineering.

TEXAS AEROSPACE SCHOLARS PROGRAM (TASP)
This is a yearlong, interactive, online learning process highlighted by a weeklong internship at JSC. Selected students are encouraged to study math, science, engineering and computer science by interacting with JSC engineers.

Contact: Mike Kincaid
281.483.4112

SUMMER HIGH SCHOOL APPRENTICE RESEARCH PROGRAM (SHARP)
In this program, students work at JSC for eight weeks during the summer with a NASA mentor in a lab or office environment.

Contact: Nancy Garrick
281.483.3076

MARS SETTLEMENT DESIGN COMPETITION
This is an exciting industry simulation game for high school students, set in the middle of the 21st century. A weekend overnight residence program at JSC emulates the experience of working as a member of an aerospace company team developing a design and operating proposal for a new Mars base. This year's competition is scheduled for February 2-4 and 16-18 at WSTF.

Contact: Norm Chaffee
281.483.3777

NEED MORE INFORMATION?

Explore these Web sites for more information and creative ideas!

Engineers Week
For information on JSC's E-Week celebration, visit http://www4.jsc.nasa.gov/scripts/eweek/index.cfm.

For information on National Engineers Week, engineering statistics and creative ways you can participate in E-Week on your own, visit http:www.eweek.org or http:www.discoverengineering.org/eweek

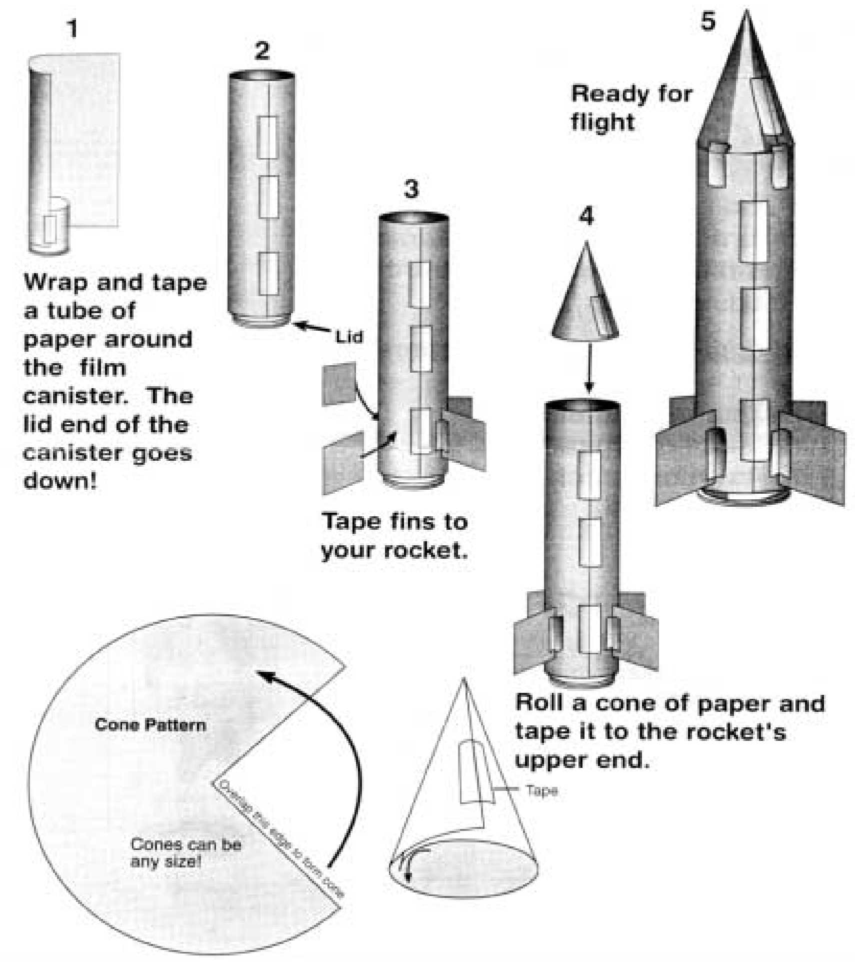
Women in Engineering
For special information on engineering opportunities for women visit http://www.nae.edu/cwe

Here are simple but exciting demonstrations you can use for Engineers Week or other outreach project!

3-2-1 POP!

This activity demonstrates Newton's Laws of Motion. The rocket lifts off because it is acted on by an unbalanced force (First Law). This is the force produced when the lid blows off by the gas formed in the canister. The rocket travels upward with a force that is equal and opposite to the downward force propelling the water, gas and liquid (Third Law). The amount of force is directly proportional to the mass of water and gas expelled from the canister and how fast it accelerates (Second Law).

Materials and Tools
Heavy Paper (i.e. construction paper or stock paper)
Plastic 35 mm. Film canister* (with internal sealing lid)
Cellophane tape
Scissors
Effervescing antacid tablet
Paper towels
Water



COUNTDOWN:

1. Put on your eye protection.
2. Turn the rocket upside-down and fill the canister 1/3 full of water.

Work quickly on the next steps!

3. Drop in 1/2 tablet.
4. Snap lid on tight.
5. Stand rocket on launch platform.
6. Stand back.

LIFTOFF!

Discussion
How does the amount of water placed in the cylinder affect how high the rocket will fly?
How does the temperature of the water affect how high the rocket will fly?
How does the amount of the tablet used affect how high the rocket will fly?
How does the length of empty weight of the rocket effect how high the rocket will fly?
How would it be possible to create a two-stage rocket?

Extensions
Hold an altitude contest to see which rockets fly the highest. Launch the rockets near a wall in a room with a high ceiling. Tape a tape measure to the wall. Stand back and observe how high the rockets travel upward along the wall. Let all students take turns measuring rocket altitudes.
What geometric shapes are present in a rocket?
Use the discussion questions to design experiments with the rockets.

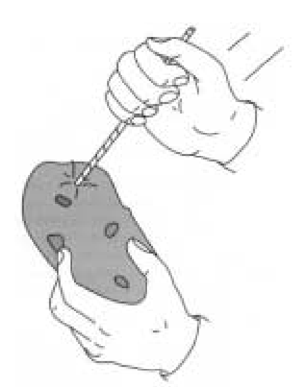
Potato Astronaut

The effects of high-speed micrometeoroid impacts are simulated with a potato and a straw. Students hold the potato in one hand and stab it with the other using a plastic milkshake straw. The penetration depth into the potato relates to the speed of the stabbing action. A straw slowly pushed into the potato collapses. The plastic isn't strong enough to support the force exerted at the opposite ends of the straw. However, when the straw is thrust rapidly into the potato, the straw easily penetrates and passes through. The straw enters the potato before it has a chance to collapse. As it enters, the surrounding potato helps support the straw by shoring up its sides.

Materials and Tools Checklist
Potato
Plastic (milkshake-size) straw

Objective
To investigate the relationship between velocity and penetration depth when a potato is struck with a plastic straw.

Procedure
Step 1. Hold a raw potato in one band. (See illustration.) While grasping the straw with the other hand, stab the potato with a slow motion. Observe how deeply the straw penetrates the potato.
Step 2. Repeat the experiment but this time stab the potato with a fast motion. Observe how deeply the straw penetrates the potato. Compare your observations with the results of step 1.



The kinetic energy output of an impact, given in joules, is calculated with the following equation:

KE = 1/2mv2

m = mass of impacting object
v = velocity of impacting object

Note: The mass in this activity is actually the combined mass of the straw and the hand and forearm driving it.

Safety Precautions
Be careful to hold the potato as illustrated so that the straw does not hit your hand. Work gloves will provide additional protection.

Challenge
Students design a way to protect the potato from damage caused by impacts using flexible and light weight materials .

Materials and Tools Checklist
Plastic (milkshake-size) straw
Potato
Tissue paper, notebook paper, handkerchiefs, rubber bands napkins, aluminum foil, wax paper, plastic wrap, etc.

Procedure
Step 1. Students design a method for protecting potato astronauts from damage caused by the plastic straw when the straw is quickly stabbed into the potato.
Step 2. After students have tested a method for protecting a potato, conduct a discussion to evaluate technologies developed. Refine the constraints for a protection system (e.g., the materials used must together be no thicker than - mm).
Step 3. Have students redesign their system based on the refined constraints. Conduct additional impact tests with the straw.
Step 4. Test protection systems. Evaluate the effectiveness of the protection systems developed.

Extensions
Compare technologies for protecting astronauts from micrometeoroid and space debris impacts to other protective technologies such as bullet-proof vests, suits of armor, shields on power tools, and windshields on vehicles. How does the function determine the form? Experiment with different fabrics and fabric combinations for protective garments.