M.A.R.S. Making Aerospace Real for Students

Mar. - Apr. 2004

News

AEROSPACE EDUCATION

Inspiring Students to Excel

IN THIS ISSUE

Topics of Interest

Aerospace Education News is the official bi-monthly publication of the Civil Air Patrol and is produced by the Leadership Development and Membership Services Directorate, CAP National Headquarters, Maxwell AFB, Alabama.

Jim Mallett.....Director
Judy Rice.....AE Deputy Director
Judy Stone.....Editor
Peggy Greenlee.....Layout/Graphics

Contributing Writers:
Kathy Baucum
Joan Emerson
Ben Millspaugh
Jeff Montgomery
Claudine Sayegh
Barry Spink
Beth White

AE Partners.....Technical Articles
Printing Service.....Terry Fontaine and the CAP Print Plant

If you have news, events, or ideas we might consider for the newsletter, please submit them electronically to jstone@cap.gov.

"WHATEVER YOU NEED, YOU WILL FIND IT AT NCASE!"

Tim Huddleston MCs the Hangar Talk with X-15 pilot Scott Crossfield; Erik Lindbergh, grandson of Charles Lindbergh; Gus McLeod, who flew to the North pole in an open cockpit airplane; and Astronaut Eric Boe.

2003 PARTICIPANT COMMENTS

About Exhibit Hall:

"Exhibitors were great ……."

"The exhibit hall's size is just right … I love the one-on-one attention I get with the exhibitors."

"Exhibitors are very professional and easy to talk to."

"Exhibits were great and they all had the kinds of information I was looking for as a teacher."

"I love the free stuff I get in the exhibit hall."

About Program and Seminars:

"I can't wait to get back to my classroom and share my experience with my students."

"I love these types of sessions!"

"Wow! I had no idea that Civil Air Patrol has so much to offer teachers!"

"All four members were very inspiring. They are a treasure of the aviation community….." (referring to Hangar Talk)

"This event was a great learning experience."

"Outstanding hands-on sessions. I learned so much I can use with my students and share with my teachers!"

"As a homeschooler, I am excited about how I can use aerospace to teach my children. Thanks!"

AEO IN THE SPOTLIGHT...Maj. John DiGiantomasso, CAP

John DiGiantomasso has Aerospace Education in his blood. A child of the 1960s "Space Race," John was always fascinated with the space program and rocketry. "The fact that my dad worked on the Mercury Redstone probably had something to do with it," he suggests; "...love of model building only fueled those interests. Although," he confesses, "I built an awful lot of ships and tanks, too - not just planes and rockets."

John became a Civil Air Patrol cadet at the ripe old age of seventeen. As a cadet, John specialized in Cadet Leadership as well as Aerospace Education training. "As captain of the Michigan Wing Champion Panel Quiz Team, " he recalls, "you had to know your AE stuff pretty well." In 1977, John met Audrey Brown, a cadet from a neighboring squadron. "It was pretty awkward - she was a cadet major, and I was a staff sergeant!" By the time they were married three years later, Audrey was a Cadet Lieutenant Colonel, and John had earned his Mitchell Award and turned senior member to work as the Group III Cadet Program Officer. John and Audrey moved to California in 1980, and drifted away from the Civil Air Patrol after relocating.

By 1998, Jayson and Andrea DiGiantomasso (John's children) represented the next generation of Civil Air Patrol cadets. When they wanted to join the program, John and Audrey returned "just to help out. "Along the way, John routinely began doing Aerospace Education events. "I saw cadets coming to meetings and spending two hours doing nothing but marching around the parking lot in a box," he lamented. "When they did get to do Aerospace Education, it was often in the form of 'story time' with some monotone senior member reading to them out of their textbook. I told myself, this has to stop." His premise was that an active Aerospace Education program would draw a lot more attention from the local youth and the local press.

As a result, John set about conducting Aerospace Education activities whenever and wherever he could, and to the most diverse audience possible. "I really fell in love with the Aerospace 2000 Program, now known as AEX. I just started picking activities out of the books and doing them. I found out that I was having a lot of fun at it!" When asked to assist with a Model Rocketry Bivouac at Travis Air Force Base in 1999, John leapt at the opportunity and served as Chief Instructor. "There's nothing like seeing 75 cadets all earn their Model Rocketry Badges at one time," John explains.

Knowing that John was 'into that aerospace stuff,' he was invited to speak on the topic at a Corporate Learning Course. The subject of the CLC AE segment was "How the Wing Supports the AE Mission." A few short weeks later, John was the new Director of Aerospace Education for California Wing.

John's first priority was to increase awareness about the Aerospace Education Mission. "Did you know that the Civil Air Patrol has THREE missions?" he asks with a sneaky grin. "It's true!" he goes on to explain. "While some senior members are not involved in the Cadet Program, and some cadets and seniors are not involved in the Emergency Services Mission, regulations require that EVERY Civil Air Patrol member participate in the AE mission!" These are trademark quotes from SLS and CLC sessions that John presents whenever he gets the chance, and he passes out copies of the regulations to prove that he is not making this stuff up.

"As near as I can figure it, I have directly assisted about 300 CAP cadets in earning their Model Rocketry Badges. On top of that, I have probably worked with about 500 more to help them build and launch model rockets at various CAP activities." That's a lot of rockets. Launchers, spare parts, and leftover kits for "next time" take up a significant amount of his garage - along with his own mid-power and high-power rockets. John is currently Level 1 certified with the Tripoli High Power Rocketry Association, and working on his Level 2 certification. "All that means, " he states, "is that if my neighborhood blows up, the FBI will knock on my door first." In addition to his Tripoli certification, John has also been recognized by the Civil Air Patrol and is a recipient of the

(Continued on bottom of next page.)

IN THE AEM SPOTLIGHT…Patricia "Paddy" Brown

Patricia "Paddy" Brown first became interested in teaching about flight sixteen years ago when a first grade teacher in her building asked if Ms. Brown's fifth graders would be interested in helping her first graders build a hot air balloon. Since Ms. Brown already had a personal interest in flight - her husband and father-in-law fly radio-controlled airplanes - this was another step to nurture her involvement in aviation. The balloon project piqued her desire to do more and the following year, she and her fifth grade teaching colleagues developed a Flight Unit that incorporated fiction and non-fiction reading with a study of the history of flight. They also included making rubber-band powered Delta Darts and flying them. This was the first unit of the school year and it truly captured the interest of every student. Beginning the year with the flight unit created a desire to learn more and became the springboard for the remainder of the year. When the boys found out that the girls were able to build better flying airplanes than they were, the boys became more interested in learning about the Famous Women in Aviation later in the year.

Ms. Brown's interest in flight continued to grow as she participated in Civil Air Patrol's Flight Symposiums at the Air Force Academy in Colorado Springs and her skill and expertise continued as she attended the associated aerospace classes offered through Adams State College. From participation in these valuable experiences, Ms. Brown garnered a variety of activities to choose from to teach about flight. In addition, she was able to relate flight to many subjects, such as the study of birds, just as Leornardo da Vinci did.

Ms. Brown has been teaching second grade at Summit Cove Elementary, Dillon, Colorado, for the past six years and has continued her aerospace lessons with her young students. She discovered that second graders' fine motor skills are not developed well enough to cut foam meat tray airplanes with exacto knives or to sand the wings symmetrically so the airplanes can fly. However, she tried rockets and found the second graders were wonderful rocket builders! Her classes build straw rockets, "junk" rockets from toliet paper tubes, and Alka-Seltzer™ powered rockets. When combined with Newton's Laws of Motion, you have a lesson that will be useful as these students continue to learn about flight in the following grade levels.

Ms. Brown's committment and enthusiasm for aerospace has caught the attention of her students and will make a lasting contribution to their education. She is truly an Aerospace Education Member to be honored.

AEO in the Spotlight continued...

Scott Crossfield Award, earned by obtaining his Master rating in the Aerospace Education specialty track.

Due in part to his efforts, as well as to the great support and enthusiasm for Aerospace Education shared by others in the wing, California Wing went from a non-existent program in 2000 to having the second best Aerospace Education program in the nation in 2002.

In late 2002, John was appointed Commander of California's South Coast Group 7. Even while serving as Group Commander, you could still find Major DiGiantomasso out on the rocketry range with cadets, or working at the California Wing Cadet Program Conference, or visiting a school or youth group.

In August 2003, Maj John DiGiantomasso relocated from sunny southern California to Anchorage, Alaska. "It was really hard to leave Southern California," he states. "I didn't have any family there, but my friends in the Civil Air Patrol had become my family. There is an amazing concentration of talent down there passionate about the Civil Air Patrol and making a difference in kids' lives, and I'm going to miss them all." On a bright note, however, Maj DiGiantomasso has assumed the role of Director of Cadet Programs for Alaska Wing. "And guess what?" he adds… "They want me to help out with Aerospace Education, too!" He is genuinely pleased with the opportunity to bring an excitement about Aerospace Education to a whole new wing.

"When I start out a class at SLS or CLC, I always say 'I am going to talk to you about becoming an Aerospace Education officer - the best job in all of the Civil Air Patrol.'" In the past, that comment was met with laughter - and sometimes still is today. But after an hour or two with Maj DiGiantomasso, most are convinced that it must be true. Aerospace Education has made this man genuinely happy to serve Civil Air Patrol.

FEATURED PARTNER - AC Supply

AC Supply has been a valuable resource for many teachers nationwide, supplying rocketry and aerospace projects and materials for more than 20 years. Their mission is to provide teachers and group leaders with consumable supplies at discounted prices in a timely manner!

Now CAP members have access to this outstanding resource for these same great products too.

One of AC Supply's major lines of products, Estes Rockets, is the mainstay of many teachers' curriculums across the country. AC Supply keeps a large inventory of all rockets, engines and accessories (including bulk packs) to fulfill any and all of your rocketry needs quickly and economically. What other teaching tool better keeps students interested in learning, and wanting to be in the classroom and out on the launch site?

Rockets aren't the only kits AC Supply carries though! Airplane kits, as well as raw materials, accessories and adhesives from various

manufacturers such as Midwest Products, Guillows, KNEX, Peck Polymers, are also stocked in their warehouse.

You may have seen AC Supply at one of the previous regional National Science Teachers Association (NSTA) shows, showing new products or speaking with teachers. One of their great assets is the ability to listen to a teacher's particular need, come up with a viable solution and put the product in the teacher's hands.

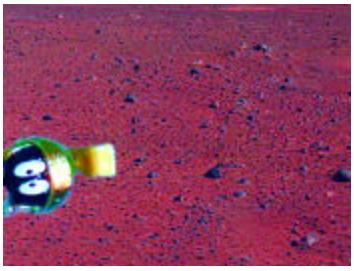
As a result of one these shows, AC Supply now has a new aerospace curriculum available called "Inventing Flight." It's an inquiry driven curriculum which has been correlated to meet current National and State Standards. One exciting feature about this curriculum is the low cost of the associated consumable planes, which are also available from AC Supply. This is just one example of how listening to the needs of a few teachers have come to benefit many!

With 90 years of combined experience, AC Supply's phone staff can answer most any question, come up with solutions to problems, and provide products so the children of our great country can have fun learning.

AC Supply can provide products to any destination in the United States in 3-5 days. This can happen due to their central location, large inventory and quick 24-hour turnaround.

For more information about AC Supply visit their website at ***www.acsupplyco.com*** or contact them at 1-800-536-0238. ■

BITS AND PIECES



Is There Life on Mars?

MARS and SPACE UPDATE

What a great *Opportunity* to get into the *Spirit* of the Space Program! How's that for a hint? The landing of the rovers *Spirit* and *Opportunity* on Mars in January has excited a whole new generation of space exploration enthusiasts. For future space initiatives, President Bush has given us a vision of returning to the moon and a manned mission to Mars.. To find out more about the current Mars mission, go to ***http://www.marsnews .com/*** and to find out about the NASA Mars Exploration Program go to ***http://marsprogram.jpl.nasa.gov/.*** There is also a website where you can try your hand at driving rovers the way NASA does. Go to ***http://www.marsquestonline.org/coolstuff/drivearover/index.html.***

INFORMATION and CONTESTS

NASA Ames Research Center's Annual Space Settlement Contest is for 6 -12th graders (11-18 years old) from anywhere in the world. Individuals, small teams of two to six, and large teams of seven or more (often whole classrooms with teacher leadership) may enter. Grades 6-9 and 10-12 are judged separately, except for the grand prize. Students develop space settlement designs and related materials. These are sent to NASA Ames for judgement. Submissions must be received by March 31, 2004. For more information, go to: ***http://lifesci3.arc.nasa.gov/SpaceSettlement/Contest/.***

REMEMBER!

SPACE DAY will be Thursday, May 6, 2004!!

www.spaceday.org/index.html

AEO NEWS AND VIEWS

Unit Grant Winners for Winter 2004!

CAP is very thankful for the continued support given by the Air Force Association and the Aerospace Education Foundation (AEF). Specifically, we are grateful for the AEF grants that are provided to CAP units and schools to enhance their aerospace missions. Since 1996, AEF has provided over $100,000 to CAP to help fund their aerospace programs.

According to the guidelines established by the AEF, the grant money cannot exceed $250 per request and will be used for aerospace-related items, activities, videotapes, aerospace-oriented field trips or aerospace education days. The grant cannot be used for flying, flying instruction, honor guard or color guard activities or to buy uniforms.

Grant recipients must send a follow-up report to HQ CAP/LMA stating how the grant contributed to their aerospace program. We will then send the report to AEF so they can see how their money was spent.

Here are the unit winners for Winter 2004:

- **130th Composite Sq, MN**
- **Alta Tulare Composite Sq, CA**
- **Cache Valley Composite Sq, UT**
- **Cadillac Highpoint Sq, MI**
- **Col. Francis S. Gabreski Sq, NY**
- **Concord Composite Sq, NH**
- **Golden Triangle Composite Sq, PA**
- **Granbury Composite Sq, TX**
- **Harrisburg International Composite Sq, PA**
- **Lewis Composite Sq, IL**
- **Machias Valley Composite Sq, ME**
- **Medina County Skyhawks, OH**
- **Michigan Wing - Rocketry Encampment**
- **Northside Christian School Cadet Sq, FL**
- **Reeves Field Skyhawks Composite, CA**
- **Sarasota-Bradenton Composite, FL**
- **Sequoia Porterville, CA**
- **St John the Evangelist Middle School Sq, TX**
- **Westchester Hudson Composite Sq, NY**
- **Winston-Salem Composite Sq, NC**

YEAGER TESTS AND SPECIALTY TRACK 215 TESTS

Good news, CAP Members! We are currently testing and preparing to place the Yeager tests and the Specialty Track 215 (Aerospace Education Officer) tests on-line for use by Senior Members and Cadets of Civil Air Patrol.

However, you should be aware of what will happen when a member passes their Yeager test and prints out a very simple looking "Certificate of Completion." The instructions on the web site, and on the actual certificate, will say to send a copy of the Certificate of Completion to your wing DAE or, if a Region staff member, to your DCS/AE. The DAEs and DCS/AEs should accept these Certificates of Completion in lieu of the CAPF 126 coming from a unit. Take the information from the Certificate of Completion, fill out a CAPC 20 (Yeager certificate) and send the CAPC 20 to the individual's unit commander (just as in the past). Then fill out a CAPF 127 and send it to Barry Spink and he will update the National Database and get the names in the CAP NEWS (just as in the past). Remember, these individual Certificates of Completion are for individuals who complete the Yeager on their own. They do not replace, but supplement the process you are used to with the CAPF 126. If a unit (say a squadron, for example) still does the test manually at their facility, then everything remains the same--they fill out a CAPF 126 and send it and the test answer sheets to you for verification. However, if an individual takes the Yeager on his or her own, then the computer generated Certificate of Completion takes the place of the CAPF 126 and the answer sheet. If you have any questions, please give Barry a call (334-953-5095) or e-mail him (bspink@cap.gov)!

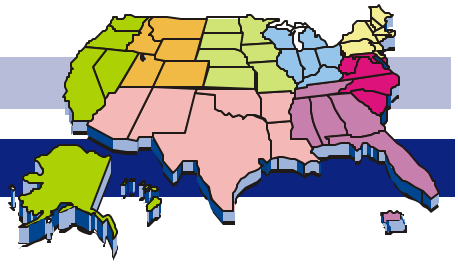
In the same manner, the Aerospace Education Officers Specialty Track tests for the Technician, Senior, and Master are being tested for on-line facilitation. However, since it takes more to obtain a specialty rating than just taking a test, the Certificate of Completion tells the test taker to present the certificate to his/her commander and to refer to CAPP 215, Attachment 1, for further requirements to upgrade to the next higher skill level. In accordance with CAPP 215, there is a four-month time period before trying to upgrade to the next higher level. The on-line testing program will not allow someone to take the next higher test until four months have passed since the last skill level test. Again, if you have any questions, please call or e-mail Barry!

Rocket Launches at Kennedy Space Center

March 8 - Delta 2
April 16 - Atlas
April 29 - Delta 2
May ll - Delta 2

For future launches and information about Kennedy activities, go to ***http://www.ksc.nasa.gov/***

REGION TO REGION



NORTHEAST REGION

March 13 - The Connecticut Science Teachers Association (CSTA) will hold its conference in New Britain, Connecticut. To find out more, go to ***http://www.ctscience.homestead.com/Newsletter.html.***

April 21 - 24 - The National Council of Teachers of Mathematics (NCTM) will hold its 82nd Annual Meeting in Philadelphia, Pennsylvania. Find out more at ***http://www.nctm.org/meetings/philadelphia/index.htm.***

MIDDLE EAST REGION

March 14 - Ken Hyde and Paul Glenshaw of the Wright Experience will discuss the process of building the accurate reproduction of the Wright B that sits in the College Park Aviation Museum's gallery and their recent experiences at Kitty Hawk at the College Park Aviation Museum in College Park, Maryland.

March 16 - Top leaders in science and education will take to the national stage for a day of dialogue about effective science education and the importance of K-12 science to the nation during the U. S. Department of Education's Summit on Science in Washington, D.C. The Science Summit, part of the Administration's nationwide Math and Science Initiative, will take place during the Excellence in Science, Technology, and Math Education (ESTME) week-long celebration of K-12 science and math education. For more information on the national Summit on Science, go to: ***http://science.nsta.org/nstaexpress/nstaexpress_2004_01_05_summit.htm.***

GREAT LAKES REGION

March 4 - 6 - The annual conference of the Michigan Science Teachers Association (MSTA) will be held in Lansing, Michigan. Contact information can be found at ***http://www.mstamich.org/index.php.***

March 11 - 13 - The Wisconsin Society of Science Teachers will have its annual conference at the Radisson Paper Valley Hotel in Appleton, Wisconsin. For further information, go to: ***http://www.wsst.org/convention/.***

SOUTHEAST REGION

March 24 - 27 - National Congress on Aviation and Space Education conference to be held at the Atlanta Marriott Marquis in Atlanta, Georgia. For more information, go to ***http://www.cap.gov/events/ncmain.html.***

April 2 - 3 -The 11th Annual Great Moonbuggy Race will be held in Huntsville, Alabama. Students are required to design a vehicle that addresses a series of engineering problems that are similar to problems faced by the original Moonbuggy team. ***http://moonbuggy.msfc.nasa.gov/ .***

April 13 -19 - *Sun 'n Fun* will be held in Lakeland, Florida. For more information, go to ***http://www.sun-n-fun.org/content/flyin/main.asp?section=flyin.***

April 23 - 25 - The Alabama Wing Conference will be held in Mobile, Alabama. For more information, contact Mel Keith at ***alwghq@juno.com.***

April 30 - May 2 - CAP Southeast Region Cadet Competition will be held at Tyndall AFB, Florida. Contact Lt Col Mark O'Brien at 678-655-5821 for further information.

NORTH CENTRAL REGION

March 26 - The North Dakota Science Teachers Association (NDSTA) will hold its conference in Grand Forks, North Dakota. Contact information found at ***http://www.ndsta.k12.nd.us/.***

April 23 - 25 - The Kansas Association of Teachers of Science (KATS) presents their annual conference in Junction City, Kansas. For additional information, go to ***http://kats.org/.***

SOUTHWEST REGION

March 14 - 19 - The 35th Lunar and Planetary Science Conference will be held at the South Shore Harbour Resort and Conference Center in League City, Texas. For more details (including a special education/public outreach workshop) go to ***http://www.lpi.usra.edu/meetings/lpsc2004/lpsc2004.2nd.html.***

March 18 - 20 - 66th Annual ITEA (International Technology Education Association) Conference will be held in Albuquerque, New Mexico. For more information, go to ***www.iteawww.org/D.html.***

ROCKY MOUNTAIN REGION

March 29 - April 1 - The Space Foundation's 20th National Space Symposium will be held at The Broadmoor in Colorado Springs, Colorado. For more information, go to **http://www.spacesymposium.org/national04/education/.**

PACIFIC REGION

April 1 - 4 - National Association of Elementary School Principals (NAESP) will hold its conference in San Francisco, California. For additional information go to ***http://www.naesp.org/ContentLoad.do?contentId=968.***

CURRICULUM CORNER

AN INTRODUCTION TO ROBOTICS

This activity was originally a NASA activity, but is included in the new AEX I Volume II (K-5).....In production.

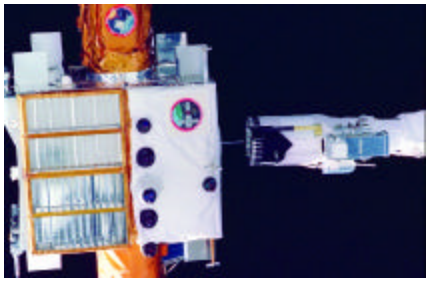
Objective: This activity will show students how a device, called the "Effector" can be used to pick up and move items much like the Space Shuttle's Robotic Arm.

Grade Level: 5-12

Background:

The goal of humans and robots working together has been demonstrated time and again with the Space Shuttle Remote Manipulator System (RMS) robot arm. The arm, also called Canadarm because it was designed and constructed by Canada, has been instrumental to the success of numerous space missions. The 15-meter-long arm is mounted near the forward end of the port side of the orbiter's payload bay. It has seven degrees of freedom (DOF). In robot terms, this means that the arm can bend and rotate in seven different directions to accomplish its tasks. There is a gripping device on the Canadarm called an end effector. It is located at the end of the arm and it has an effect (such as grasping) on objects within its reach. The RMS's end effector is a snare device that closes around special posts, called grapple fixtures.

The International Space Station's Mobile Servicing System (MSS), as seen below, works in much the same way.

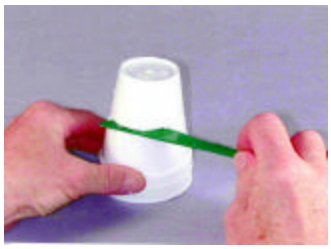


The International Space Station's Mobile Servicing System.

National Science Standards
Content Standard E: Science and Technology
- Abilities of technological design

Unifying Concepts and Processes
- Evidence, models, and explanation

Materials:
- Two Styrofoam® coffee cups
- Three pieces of string
- Scotch™ or similar household tape
- One serrated plastic picnic knife



Procedure:
1. Hold two coffee cups together and use a plastic knife to cut both as shown in the picture.
2. Cut three pieces of string to a length of 12 cm.
3. Tape the end of the first string to the inside of the inner coffee cup just below the cut edge.

Tape string loop from the outside cup to the inside cup.

Tape the other end of the string to the outside of the cup, but do not press this piece of tape tightly yet.

4. While holding the rim of the inner cup, rotate the outer cup until the three strings cross each other. The strings will have some slack. Pull the end of the strings on the outside until they are straight and intersect in the middle. Now press the tape on the outside to hold the strings.
5. You have now created an "Effector" and it will pick up a small object like a pencil. Have someone hold the pencil upright and open the end effector so that the strings are not crossing each other. Slip the end effector

over the pencil so that it extends down the center and not through any of the loops. Rotate the outer cup until the strings grasp the pencil. You should now be able to pick up the pencil.
6. You may find that the pencil is too slippery to be held securely. How might you modify the pencil so that it can be held? Design a standard grapple fixture that can be mounted to other objects so that they can be picked up.
7. Compare your grapple fixture to two other grapple fixtures designed by your classmates. Which one works the best? Why? Create a chart or a table that evaluates the strong and weak points of each grapple fixture you compared. How can you improve your design?

Assessment:
Review the tables or charts created by the students. Pay special attention to the ideas they have about improving their grapple fixtures.

Mars Pathfinder Egg Drop and Landing

This activity is from NASA JPL (Jet Propulsion Laboratory) website

Objective:
Students will design a "Pathfinder" model to cushion an egg and prevent the egg from breaking when dropped from a high place.

National Science Standards:
Standard A: Science as Inquiry
- Abilities necessary to do scientific inquiry

Standard E: Science and Technology
- Abilities of technological design

National Mathematics Standards:
3. Geometry Standard
- Use visualization, spatial reasoning, and geometric modeling to solve problems.

4. Measurement Standard
- Understand measurable attributes of objects and the units, systems, and processes of measurement.

Grade Level: 5-8

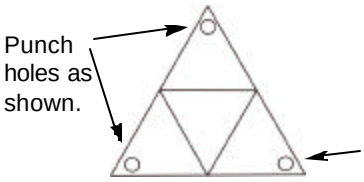
Background:

Mars Pathfinder was launched on December 4, 1996 and landed on the Martian surface on July 4, 1997. Mars Pathfinder was originally designed as a technology demonstration of a way to deliver an instrumented lander and a free-ranging robotic rover to the surface of the red planet. Pathfinder not only accomplished this goal but also returned an unprecedented amount of data and outlived its primary design life.

Today we have developed even more technology and data to send rovers *Spirit* and *Opportunity* to Mars to find out more about the red planet. And who knows where this information may lead us in the future of space exploration.

Materials:
1 cereal box, 4 balloons, 5 m of string, newspaper, 1 egg, tape, scissors, ruler, pencil, hole punch

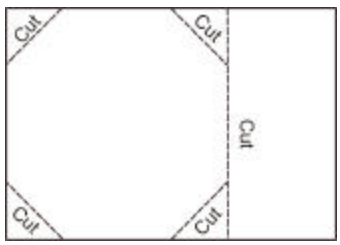
Procedure:
To make the Lander:
1. Starting with a cereal box, unfold the box.
2. On one side of the box, trace an equilateral triangle, 22 cm on a side.
3. Cut out the triangle and punch a single hole near each vertex.
4. Fold the triangle into a tetrahedron to form a "lander".



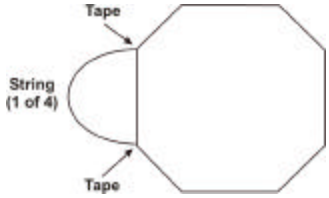
5. Place the egg inside the tetrahedron and tape closed along each seam.
6. Tie a 1 m piece of string through the holes at the vertices.

To make the Air Bags:
1. Inflate four 25 cm (10 in) balloons.
2. Using tape rolled back on itself, tape each balloon to each face of the lander.

To make the Parachute:
1. Unfold a large piece of newspaper.



2. Cut off the edge of the newspaper sheet to form a square.
3. Cut off each corner of the square to form an octagon.
4. Using four 1 m pieces of string, tape each end of each string to adjacent corners of the octagon parachute.



5. Gather the four strings on the parachute and tie them to the string on the lander.

Testing your "Lander":

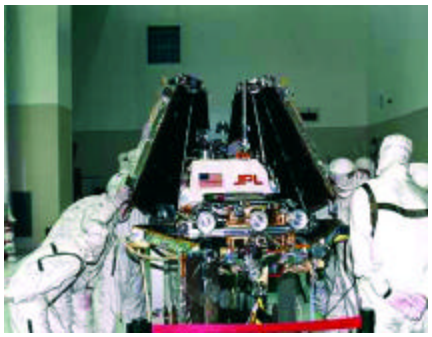
Drop your "Pathfinder" from a high place (about a six foot drop) and see if your payload (egg) survives!

Extension:

Have students work as Mars teams and create a better landing device. Have them draw their plan and discuss the pros and cons of their plan. They should implement their plan and evaluate the results.

Assessment:

Use a rubric to evaluate each students initial "Pathfinder" experiment (following directions) and also evaluate the results of the new "Pathfinder" device.



Packing up Pathfinder for the Trip to Mars