



**OPTION AREA I  
EDUCATION & PUBLIC OUTREACH (EPO) ACTIVITY**

**GUIDELINES AND ACTIVITIES**

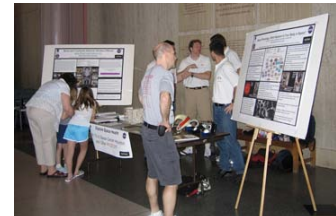
**FALL 2009**

**Option Area I - Education and Public Outreach**

Participation in Education and Public Outreach [EPO] Activities is encouraged among all NASA Centers and employees as a way to spread excitement about Science, Technology, Engineering and Math [STEM] to the community at large. Option Area I – offers each team the opportunity to get involved on their own and at the same time earn project funding. EPO activities can be conducted with K-12 classrooms, Girl/Boy Scouts, Rotary Club meetings, Museum Events or within the Campus Community.

**OPTION AREA I – OUTREACH - DESIGN TEAM RESPONSIBILITIES**

- Conduct any STEM-related EPO Activity with an audience. Document the activity in the format specified in "Putting an Outreach Activity Together" section below. Include photos of the team and the audience as documentation. Options include:
  - Present, demonstrate or display any STEM-related topic.
  - Test a "found" K-12 design activity; or use your own idea.
  - Adopt a classroom and visit during the semester.
  - Tutor any level of student.
  - Participate in an Engineering Fair or Earth Science Week.
  - Make a presentation to a non-academic civic group.
  - Conduct a public demonstration to a museum audience.
- Incorporate EPO anytime during the semester.
- Document EPO Activities in a submitted Report. Profile the outreach activity conducted and provide the following details:
  - Type and name of the outreach location.
  - Type and level of the audience.
  - Verification [photo documentation; note from sponsor].
  - Description, copy or sample of the activity.
  - Photos of the team conducting the activity.
  - Optional: Profile the EPO activity on a team website.
- For award consideration, all EPO Activities must be concluded and Reports received by the deadline specified.



**OPTION AREA I –DELIVERABLES**

- Option Area I – Education & Public Outreach Report
- EPO Report submitted upon completion AND included as Appendix to Final Report.

**FINAL DEADLINE: DEC 1<sup>ST</sup>**  
Award Consideration: by Nov 1<sup>st</sup> \*

**\$\$ AWARD \$125.00 \*\***

**NOTES AND RECOMMENDATIONS:**

- Option Areas may be undertaken anytime during the semester.
- Outreach Activities may focus on the team's design experience or any STEM-related area.
- Document EPO by submitting a report with photos upon completion. Include as an appendix to the team's final report so that all team activities can be archived.
- For award consideration, the EPO activity report must be received by the deadline specified.
- \* For consideration of an award aimed at team outreach – complete and submit by Nov 1<sup>st</sup>.
- \*\* Complete all three Option Areas and earn a total of \$400 PLUS a matching \$400 Scholarship.



**OPTION AREA I - OUTREACH**  
**GUIDELINES AND ACTIVITIES**  
**FALL 2009**

**WHAT CONSTITUTES AN OUTREACH ACTIVITY?**

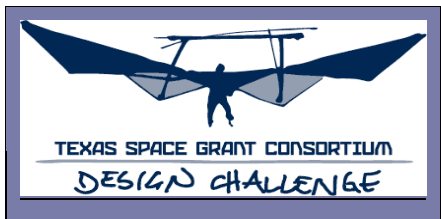
Outreach activities are the methods used to take learning beyond the university campus and into the community at large. NASA refers to this as EPO – Education and Public Outreach - and focuses primarily on STEM related outreach activities [Science, Technology, Engineering and Math]. Outreach occurs with groups who are not routinely exposed to STEM-related learning basis.

WHO?	WHAT?	WHERE?	HOW?
<b>K-12</b>  kindergarten through 12 <sup>th</sup> grade	<ul style="list-style-type: none"> <li>▪ age-appropriate</li> <li>▪ class presentation</li> <li>▪ lesson taught</li> <li>▪ hands-on activity</li> <li>▪ games or puzzles</li> <li>▪ reverse engineering</li> <li>▪ tutoring</li> </ul>	<ul style="list-style-type: none"> <li>▪ in the classroom</li> <li>▪ club or organization meeting spaces</li> <li>▪ after school care</li> </ul>	<ul style="list-style-type: none"> <li>▪ seek permission for your visit</li> <li>▪ give teacher or sponsor info on the activity you will present</li> </ul>
<b>Higher Ed</b>  college level students and faculty; incoming freshmen or student organizations	<ul style="list-style-type: none"> <li>▪ freshman welcome</li> <li>▪ parents' weekend</li> <li>▪ student org meeting</li> <li>▪ campus or dept display</li> <li>▪ campus fair or fest</li> <li>▪ physics / engineering circus</li> </ul>	<ul style="list-style-type: none"> <li>▪ classroom</li> <li>▪ meeting rooms</li> <li>▪ public area</li> <li>▪ library</li> <li>▪ dept lobby</li> <li>▪ green spaces</li> </ul>	<ul style="list-style-type: none"> <li>▪ seek out campus opportunities</li> <li>▪ get the necessary permissions</li> </ul>
<b>Off-Campus Orgs, Clubs, Civic Groups,</b>  Sun City, Rotary, Scouts, 4H	<ul style="list-style-type: none"> <li>▪ presentation</li> <li>▪ demonstration</li> <li>▪ badge activity</li> <li>▪ youth programs</li> <li>▪ interest groups</li> </ul>	<ul style="list-style-type: none"> <li>▪ community class</li> <li>▪ club house</li> <li>▪ meeting space</li> <li>▪ public area</li> <li>▪ citizen center</li> </ul>	<ul style="list-style-type: none"> <li>▪ contact groups to establish interest</li> <li>▪ talk to scout leaders, YMCA counselors or other youth activity directors</li> </ul>
<b>General Public</b>  Mall Science Day; Museum; Library, Science Center	<ul style="list-style-type: none"> <li>▪ presentation</li> <li>▪ demonstration</li> <li>▪ hands-on activity</li> <li>▪ display</li> </ul>	<ul style="list-style-type: none"> <li>▪ mall</li> <li>▪ museum</li> <li>▪ science center</li> <li>▪ library display area</li> </ul>	<ul style="list-style-type: none"> <li>▪ seek out opportunities in the community</li> <li>▪ look for theme-related events that seek involvement like Earth Week</li> </ul>



**BEST OUTREACH ACTIVITY SPRING 2006: RICE - High Performance Ninjas**

Several children's interactive activities were designed to teach kids about "Health in Space" at the McGovern Museum of Health and Medical Science.



# OPTION AREA I - OUTREACH GUIDELINES AND ACTIVITIES

## FALL 2009

Using displays, a tri-fold handout and activities, Rice-HPN taught visitors about Health in Space and invited all to compete for Space Center Houston tickets.

### What is an engineer?

- An engineer solves problems
- Engineering uses basic facts about math and science to improve things in our physical world.

Things that an engineer might do include:

- Building a bridge
- Designing a computer
- Making a new type of material
- Making human skin for burn patients
- Regenerating organs
- Making machines for doctors to use
- Figuring out a way to make water clean

### HEALTH IN SPACE!

Brought to you by:  
HPN, Rice University

hpn@rice.edu

### Your Body in Space

- Because there is no gravity in space, our bodies behave differently.
- By observing the health of astronauts, scientists have found many interesting facts about the body!

**Bones become weak** (up to 50% bone loss)

**Heart becomes weak** because there is less blood to pump.

**Muscles weaken** (up to 20% mass loss) (up to 20% mass loss)

**Less blood in space!**

Blood pressure becomes evenly distributed in the body in space, causing the brain to react and lower the amount of blood!

**More Space Facts...**

There is not enough sunlight in the spacecraft to provide astronauts with sufficient vitamin D, so these diets include fish oil and other supplements.

Renal stones are more likely to form in the kidneys.

In addition, astronauts lose weight in space because of nausea, difficulty in eating while floating, and the moisture diet.

**Muscles in Space**

- Muscles atrophy and grow due to physical stress (like exercise or daily movements).
- In space, there is no gravity to put stress on your muscles.
- Astronauts lose muscle size and strength.

**Bones in Space**

- Astronaut's bones become weaker in space because there is almost no gravity.
- Bones are specially designed to be lightweight but strong.
- The hard parts of bones are made of calcium minerals, but bones are not solid.
- The living cells in bones lay down and take away calcium.
- When we remove calcium from bone, it becomes flexible and cannot maintain its shape to provide support.

Exercise is important to maintain healthy muscles!

Download pre-tested outreach activities online or create your own. Be sure to test the activity first before taking it public!

LINKS TO OUTREACH RESOURCES		
HOST	DESCRIPTION	URL
<b>Texas Space Grant Consortium</b>	General Public and K-12 Public Games, activities & educational info.	<a href="http://www.tsgc.utexas.edu/fun/index.html">http://www.tsgc.utexas.edu/fun/index.html</a>
<b>NASA - Space Place</b>	Space-related things kids can make, do, get involved in or learn.	<a href="http://spaceplace.nasa.gov/">http://spaceplace.nasa.gov/</a>
<b>Space Telescope Science Institute</b>	K-12 astronomy and space science education support through services, products, activities and resources.	<a href="http://opposite.stsci.edu/pubinfo/education/educational-activities.html">http://opposite.stsci.edu/pubinfo/education/educational-activities.html</a>
<b>Federal Aviation Administration</b>	Coloring books, word puzzles and experiments organized by particular age groups.	<a href="http://www.faa.gov/education/kidcorner.cfm">http://www.faa.gov/education/kidcorner.cfm</a>
<b>Natl Oceanic &amp; Atmospheric Administration</b>	Classroom materials and weather questions in English & Spanish.	<a href="http://www.sec.noaa.gov/Education/">http://www.sec.noaa.gov/Education/</a>
<b>NASA Glenn Research Center</b>	Aerospace activities and lesson plans generated by teachers, engineers and scientists addressing fundamentals of flight, aeronautics, rockets and space.	<a href="http://www.grc.nasa.gov/WWW/K-12/aeroact.htm">http://www.grc.nasa.gov/WWW/K-12/aeroact.htm</a>
<b>Space Educator's Handbook</b>	Over 5,000 files covering topics like space calendar, astronomy, spinoffs, robotics and more.	<a href="http://vesuvius.jsc.nasa.gov/er/seh/">http://vesuvius.jsc.nasa.gov/er/seh/</a>



## PUTTING AN ACTIVITY TOGETHER

Addressing Option Area I is often the first time teams have interacted with students or the general public as the teacher - - so how would you go about putting something like that together?

The option offered is basic and open to afford each team a level of creativity.

- Visit any one of a number of groups to perform the STEM-related outreach activity of your choice with the age group of choice.

**Design** an activity that is age-appropriate for your audience. Activities could include puzzles, experiments, games, discovery, art, etc. These could be team-designed original activities; found activities with a team-twist; application of science in non-traditional areas like English [reading list, creative writing activity]; art [science fiction art, photography]; or music [space-related music mix]. It could project-related or general science.

**Create** an activity plan that offers step-by-step instructions, is easy to follow, duplicate and used by someone else [like a teacher]. Plan "Instructions for the Teacher" and "Instructions the Teacher Would Give to Students."

**Test Run** the activity among team members to make sure the activity works before taking it public. Check that the write-up, descriptions and instructions make sense and are easy to follow. Make sure the materials list is complete and age-appropriate [nothing too dangerous for little kids].

**Document** the activity by submitting a report that includes a description of the activity and photographs of the team conducting the activity. A letter of reference from the teacher or group may also be included.





**OPTION AREA I - OUTREACH  
GUIDELINES AND ACTIVITIES**

**FALL 2009**

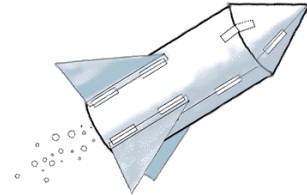
Sample Lesson Plan as submitted by TAMU Team Atlas:

<b>Title:</b>	<b>BUILD A BUBBLE POWERED ROCKET</b>
<b>Grades:</b>	<b>First and Second</b>
<b>Subjects:</b>	<b>Science</b>
<b>Brief Description:</b>	Through the construction of a small [launchable] rocket, the students learn about chemical reaction, the effects of pressure in a closed container and the basics behind rocket launching.
<b>Objectives:</b>	Students construct rockets and learn correlating scientific concepts.
<b>Vocabulary:</b>	<ul style="list-style-type: none"> <li>- pressure</li> <li>- reaction</li> </ul>
<b>Materials Needed:</b>	<ul style="list-style-type: none"> <li>- film canister</li> <li>- water</li> <li>- alka seltzer tablet</li> <li>- paper, scissors, tape</li> </ul>
<b>Background / Relevance:</b>	The Alka-Seltzer and water reaction illustrates a basic idea behind rocket launching.
<b>Lesson Plan:</b>	Students follow simple construction instructions and then are instructed in the launch techniques.
<b>Assessment:</b>	Teacher can observe the launch of the rockets and ask "understanding" questions to assess the success of the project.
<b>Source:</b>	The Space Place <a href="http://spaceplace.nasa.gov/en/kids/rocket.shtml">http://spaceplace.nasa.gov/en/kids/rocket.shtml</a>





## Build a Bubble Powered Rocket!



---

Build your own rocket using paper and fizzing tablets! Watch it lift off. How high does your rocket go? Print this page for the instructions.

**Warning:** This activity needs a grown-up to work with the rocket builders.

### Materials:

- Paper, regular 8-1/2- by 11-inch paper. Colored paper is best, but even notebook paper could be used.
- Plastic 35-mm film canister (see hints below)
- Cellophane tape
- Scissors
- Effervescent (fizzing) antacid tablet (like Alka-Seltzer - or any kind used to settle an upset stomach)
- Paper towels
- Water
- Eye protection (like eye glasses, sun glasses, or safety glasses)

### Hints:

The film canister **MUST** be one with a cap that fits **INSIDE** the rim instead of over the outside of the rim. Sometimes photography shops have extras of these and will be happy to donate some to you.

Keep in mind: Just like with real rockets, the less your rocket weighs and the less air resistance (drag) it has, the higher it will go.





## OPTION AREA I - OUTREACH GUIDELINES AND ACTIVITIES

FALL 2009

Here are the basic steps:

1. Cut out all the pieces for your rocket.
2. Wrap and tape a tube of paper around the film canister.

**Hint:** Tape the canister to the end of the paper before you start wrapping.

**Important!** Place the lid end of the canister **down**.

3. Tape fins to your rocket body, if you want.
4. Roll the circle (with a wedge cut out) into a cone and tape it to the rocket's top.



### Blasting Off

1. Go outside and put on your eye protection.
2. Turn the rocket upside down and remove the canister's lid.
3. Fill the canister one-third full of water.

Now work quickly on the next steps!

1. Drop one-half of an effervescent antacid tablet into the canister.
2. Snap the lid on tight.
3. Stand your rocket on a launch platform, such as your sidewalk or driveway.
4. Stand back and wait. Your rocket will blast off!



## So, what makes the pop-rocket work?

When the fizzy tablet is placed in water, hundreds of little bubbles of gas escape. The bubbles go up, instead of down, because they weigh less than water - so they rise toward the top. When the bubbles get to the surface of the water, they break open. All that gas that has escaped from the bubbles pushes on the sides of the canister.

Now when you blow up a balloon, the air makes the balloon stretch bigger and bigger. But the sides of the little film canister are too stiff to stretch, and all this gas has to go somewhere!

Eventually, something has to give! So the canister pops its top [which is really its bottom, since it's upside down]. All the water and gas rush down and out, pushing the canister up and up, along with the rocket attached to it. Real rockets work kind of the same way. But instead of using tablets that fizz in water, they use rocket fuel.

Scientists call this the **law of action and reaction**. The **action** is the gas rushing out of the rocket. The **reaction** is the rocket taking off in the other direction. In other words: *for every action there is an equal and opposite reaction*. The rocket goes in the opposite direction from the gas, and the faster the gas leaves the rocket, the faster the rocket gets pushed the other way.