New Student Leadership Award

In celebration of NEED’s 25th Anniversary, and with the support of our Board of Directors, NEED has created the Youth Energy Leadership Award. The award will be given annually to a graduating high school senior or first year college student who has been active in NEED programs and is considering a career in energy and/or education. The $1,500 award may be used for tuition or other education expenses.

To kick off the award program, two NEED students will receive awards in June 2005, in conjunction with the Youth Awards Program for Energy Achievement in Washington, DC.

Applications can be obtained by calling NEED at 800-875-5029 or emailing mspruill@need.org. Completed applications are due by April 25, 2005.

The NEED Project extends continuing appreciation to our dedicated Board of Directors for recognizing and celebrating the leadership potential of NEED students:

Paula Barnett, BP
Paul Loeffelman, American Electric Power
Linda Silinsky, Schlumberger
Tom Fry, National Ocean Industries Association
Diane Lear, Hydro Research Foundation
Rick Zuercher, Dominion
Kevin Galligan, Cape Light Compact
Al Williams, Dril-Quip

Spotlight on Former NEED Students

Anu Pugalia first became involved with NEED in 1992 as a sophomore at Putnam City North High School in Oklahoma City. He was a delegate to NEED’s National Leadership Training Conference in Washington, DC in July 1992 and served on the National Youth Awards Staff in 1996, 1997, and 1998. Anu attended the University of Oklahoma (OU) from 1994-2000, where he earned Bachelor and Master of Science degrees in Electrical Engineering. While in college, Anu was an active participant in student government as well as the campus environmental organization. Throughout the years, Anu also assisted with NEED workshops and events in Oklahoma.

Upon graduation, Anu worked briefly for computer hard drive manufacturer Seagate Technology in Oklahoma City. Since July 2001, he has been employed by the U.S. Air Force as a Software Engineer at Tinker Air Force Base in Oklahoma. Anu is part of a team responsible for developing and maintaining diagnostic software for weapons systems and aircraft engine repair activities at the base. The jobs performed by Anu and his colleagues are a small but vital part of the overall mission to ensure readiness, safety and reliability of the USAF fleet.

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January 2005

6 Cape Light Compact NEED Workshop-Barnstable, MA  
11 Rhode Island Energy Workshop-Cranston, RI  
11 Kentucky NEED Workshop-Independence, KY  
12 Rhode Island Energy Workshop-Cranston, RI  
12 Cape Light Compact NEED Workshop-Barnstable, MA  
12 New York Energy Smart Students Workshop-Syracuse, NY  
17 New Jersey Energy Workshop in partnership with TransOptions-Cedar Knolls, NJ  
25 New York Energy Smart Students Workshop-Albany, NY  
30-2/2 NEED sessions at the National Biodiesel Board Annual Convention-Ft. Lauderdale, FL

February 2005

2 Illinois BioFuels Workshop-Carterville, IL  
3 Illinois BioFuels Workshop-Carol Stream, IL  
3 Cape and Self Reliance/Cape Light Compact KidWind Workshop-Falmouth, MA  
8 Illinois BioFuels Workshop-Palestine, IL  
10-11 Illinois Agriculture in the Classroom NEED Sessions-Bloomington, IL  
12 New York Energy Smart Students Workshop-Queens, NY  
15 Illinois BioFuels Workshop-Kankakee, IL  
16 New York Energy Smart Students High School Workshop-Buffalo, NY  
17 Illinois BioFuels Workshop-Champaign, IL  
17 New York Energy Smart Students Elementary Workshop-Buffalo, NY  
19 Louisiana Energy Workshop-New Orleans, LA  
26 New York Pre-Service Teacher Workshop-Oswego, NY

March 2005

14-18 NEED Week  
17 North Carolina Energy Workshop-Charlotte, NC  
18 NEED Day!  
18 Cape Light Compact NEED Workshop-Barnstable, MA  
20 NEED’s 25th Anniversary  
22 North Carolina Energy Conference-Raleigh, NC  
29-4/1 National Hydrogen Association’s National Hydrogen Conference-Washington, DC  
30-4/4 NEED workshops at the NSTA National Convention-Dallas, TX. NEED is hosting a reunion dinner for NEED teachers and partners who are attending. Please RSVP as soon as possible to mspruill@need.org.

April 2005

7-10 NEED Teacher Advisory Board Meeting-Chicago, IL  
12-14 North Carolina Energy Workshops—NEED and KidWind-Asheville and Wilmington, NC

May 2005

10-11 Kentucky High Performance Schools Workshop-Frankfort, KY  
18 Kentucky NEED Youth Awards Luncheon-Frankfort, KY  
19 Michigan NEED Workshop-Traverse City, MI

June 2005

13-17 Kentucky Traveling Energy Conference for Educators  
24-27 25th Annual NEED Youth Awards for Energy Achievement-Washington, DC

July 2005

9-13 NEED Energy Conference for Educators-Alexandria, VA  
16-20 NEED Energy Conference for Educators-New Orleans, LA  
16-20 A+ for Energy/California NEED Energy Conference for Educators-San Diego, CA  
23-27 A+ for Energy/California NEED Energy Conference for Educators-Palm Springs, CA  
24-28 NEED Energy Conference for Educators-Las Vegas, NV  
24-28 A+ for Energy/California NEED Energy Conference for Educators-Long Beach, CA  
30-8/3 A+ for Energy/California NEED Energy Conference for Educators-San Francisco, CA

August 2005

4-8 A+ for Energy/California NEED Energy Conference for Educators-San Francisco, CA

* For information about Ohio workshops, go to www.ohioenergy.org.  
** Go to www.need.org for up-dated information about NEED workshops and events.
California

Congratulations to the 2004 winners of BP’s A+ for Energy awards. Over 180 educators received grants for up to $10,000 to create or enhance classroom energy education programs. The 2005 A+ for Energy program kicks off in January 2005. Visit www.aplusforenergy.com for more information or to apply. In addition to the grant, each winning teacher receives sponsorship to attend a 2005 California NEED Energy Conference for Educators, a Science of Energy kit, and NEED classroom materials.

Norma Williamson (La Mirada High School) and NEED Teacher Advisory Board member Jim Wilkie (Hill Classical Middle School) did a great job facilitating a recent La Mirada NEED Workshop. Over 20 teachers participated in a day of hands-on energy education. More workshops are planned for later this spring.

Illinois

How much energy can you get from a field of soybeans or corn? The NEED Project, the Governors’ Ethanol Coalition, the National Biodiesel Board, and the Illinois Department of Commerce and Economic Opportunity are providing one-day energy workshops for Illinois teachers. A special focus on energy from agriculture brings new excitement to the program. Teachers learn about ethanol and biodiesel for school bus choices and personal vehicle use. Eight workshops will be held by June.

Iowa

Bill Wright and his students from Panorama Community School presented NEED materials to the Iowa School Boards Association. Students demonstrated the Science of Energy, NEED’s hands-on solar kits, and other activities. Panorama’s NEED program is growing, thanks to the support of the Iowa Energy Center.

Kentucky

Kentucky NEED conducted 14 teacher-student workshops across the state this fall with attendance at an all-time high. The workshops included activities that focus on energy efficiency and conservation.

The second year of the Energy Efficiency at Home project, sponsored by Union Heat, Light & Power/Cinergy, was a great success with over 500 student families in Northern Kentucky receiving energy efficiency measures for their homes. Teachers were provided ten-lesson units, with each student receiving a student workbook.

Kentucky’s EnergySmart Schools program is working with the Kentucky Department of Education on a 10-school pilot project targeting energy efficiency in schools. NEED materials and training are provided to each school in the pilot program. The third EnergySmart Schools Workshop will be held this spring. School administrators, architects and engineers will learn more about the benefits of high performance design and resources available through our Rebuild America partnership. For more information, contact Kentucky NEED at 859-578-0312 or kreagor@need.org.

Michigan

The NEED Project welcomes the Michigan Oil and Gas Association (MOGA) back as a sponsor of Michigan energy education workshops in 2005. MOGA, an organization of petroleum and natural gas explorers, producers and allied industries, represents nearly 1,000 members. “In the continued spirit of helping to give back to the areas in which we operate,” said Frank L. Mortl, president of MOGA, “we are proud to be a part of an education program that teaches young people and communities about the wise use of energy, the importance of home-shores petroleum supply and Michigan’s role as a substantial oil and gas producer, as well as a large energy consumer.” A teacher workshop will be held in Traverse City on May 19, 2005, in conjunction with MOGA’s annual membership meeting.

New York

Have you ever had a professional energy audit of your home? It’s a great way to find out how much energy you are using and determine cost-effective ways to conserve. NEED has partnered with Onondaga Cortland Madison (OCM) BOCES to give vocational students studying the building trades a taste of what it’s like to work as home performance professionals. These one-day workshops will give students an overview of this emerging career field and teach students the basics of heat transfer, insulation strategies, and diagnostic tools used to quantify heat loss. Five sites have been chosen for implementation this school year. Five more sites are planned for the 2005-2006 school year. If your program would like to be considered for this opportunity, please contact the NY Energy Smart Students office at 800-658-5753.

North Carolina

Congratulations to Amy Constant (NEED Lead Teacher and Teacher Advisory Board member) and Sue Hove (NEED Lead Teacher) at Fox Road Elementary in Raleigh, NC, for achieving National Board Certification!

NEED and Michael Arquin of KidWind will conduct one-day workshops combining NEED’s energy curriculum and the KidWind hands-on wind activities, with support from the North Carolina State Energy Office. Two workshops are scheduled for April. For more information, email mpsruill@need.org. Visit www.kidwind.org for information about the KidWind program.

North Carolina schools are going solar with the help of NEED and its partner Altair Energy. Five schools have been selected to receive solar installations, beginning in January. For information about the program, email info@need.org.

Ohio

During November 2004, the fourth grade students at Robinwood Lane Elementary School participated in the “Right Light for Bright Minds” essay contest sponsored by Reveal and GE. The contest involved writing a 200-250 word essay about inventing a new and unique light bulb. After weeks of waiting, two students received notification that they had won the contest. Madison Switzer won the fourth grade grand prize of $10,000 and a Scholastic Children’s Encyclopedia; Shannon Chaffee was the fourth grade runner-up, winning $2,500 and a Scholastic Children’s Encyclopedia. Madison’s essay was The Cooking Bulb and Shannon’s was The Amazing Glowing Tape. Both essays were written in conjunction with the fourth grade science club’s theme of Bridging the Future of Energy Conservation.
NEED NEWS

Virginia
Under the leadership of Energy Manager Gene Whitley, the Chesapeake City Public School District launched its Energy Education and Conservation Program with 17 schools participating. The elementary school student energy teams are performing energy audits of their schools and identifying “energy wasters.” The Chesapeake Center for Science and Technology energy team uses the annual energy program orientation information to audit their school, submits work requests to correct the “Energy Hogging” items, and produces a weekly “Energy Minute” on the school’s morning announcements session. This “Energy Minute” is filled with energy saving tips and statistics. They also recommended the “Energy Minute” to the school district radio station for broadcast. A special thanks to Mr. Thomas Spencer and the Chesapeake Center for Science and Technology energy team for exhibiting positive actions in energy conservation. Way to go Chesapeake!

Hydrogen Curriculum
With support from the U.S. Department of Energy, the NEED Hydrogen Education curriculum unit is nearing completion. Our Hydrogen Teacher Advisory Committee has worked (and played) a great deal over the last year putting together hands-on activities for middle school teachers interested in including hydrogen in their classroom curriculum. The materials are correlated to the National Science Education Content Standards and are currently in technical review with NEED partners, Sentech, the U.S. Fuel Cell Council, and the National Hydrogen Association. The materials, hands-on kits, and workshops will be available in February. The curriculum guides will be available at www.need.org. NEED thanks all members of the advisory team, including Robert Lazar (Cleveland Middle School, NM), Bob Thompson (Hadley Junior High, IL), Constance Beatty (Kennedy Middle School, IL), Shelly Baumann (North Rockford Middle School, MI), Barbara Lazar (Cleveland Middle School, NM), and Kim Jenkins (Harrison County Middle School, KY), for their dedication to this project!

Summer Conferences 2005
Registrations are now being accepted for the NEED Energy Conferences for Educators scheduled for July 2005 in Alexandria, VA (metropolitan Washington, DC), New Orleans, LA, and Las Vegas, NV. Registration fees are $800 and include lodging, meals, and local transportation. Travel to the conference is not included. Some sponsorships are available. To sponsor teachers to the conference, contact Mary Spruill at mspruill@need.org or 800-875-5029.

TEACHER RESOURCES

Transportation Links
Guide to purchasing energy smart vehicles
US Environmental Protection Agency
Guide to buying fuel efficient vehicles
Bureau of Transportation Statistics

Transportation Curriculum Resources
Environmental Protection Agency
Department of Transportation

Wind Activities
Districts across the nation are installing wind turbines to power schools with wind energy, generate revenue for districts, and provide educational opportunities for students. There are resources for teachers to incorporate wind energy into their classrooms. New standards-based curricula for all grade levels have been developed to get wind energy into science education. Go to www.kidwind.org to find out more about upcoming workshops on wind energy in the classroom.

Awards and Grants
BP Grants for California Teachers

Amgen Award for Science Teaching Excellence
This award recognizes extraordinary science teachers in kindergarten through grade twelve in communities where Amgen operates. This year, Amgen will honor a total of 19 teachers in California, Colorado, Kentucky, Massachusetts, Rhode Island, Washington, and Puerto Rico. Go to www.amgen.com/teacherawards for more information. Deadline: January 31, 2005.

ING Unsung Heroes Awards Program
The ING Unsung Heroes awards program is designed to recognize classroom heroes who “take teaching to new heights and make learning fun.” All K-12 education professionals are eligible to apply, with 100 finalists each receiving an award of $2,000. Of the finalists, three will be selected for additional financial awards: $25,000 (first place), $10,000 (second place), and $5,000 (third place). For more information, go to www.ing.com/unsungheroes. Deadline: April 30, 2005.
A Year in the Life of a NEED State—Tennessee

(Thanks to the hard work of Chyrall Dawson, Anne Allen, and Ramona Nelson)

January 2004
The current issue of Energy Angles and Bright Ideas for Teaching about Energy were made available on our website.

February 2004
Bookmark and Placemat Contest winners were announced with over 1,000 students statewide participating in the contests.

March 2004
The states of Tennessee and Mississippi submitted a competitive proposal to the U.S. Department of Energy to collaborate and support the enhanced development of the NEED program in both states. The proposal included provisions for four teachers from each state to attend a NEED Energy Conference for Educators and participate in an information exchange workshop in the fall. We were notified in April that we were awarded the grant. Our participating teachers were announced at our annual awards banquet in May.

April 2004
The Tennessee Energy Education Network provided $50.00 awards to students with outstanding energy-related projects in four regional science fairs.

May 2004
Over 150 students and teachers attended our annual Energy Education Awards Banquet at the Adventure Science Center in Nashville. A video of the luncheon can be viewed on our website at www.state.tn.us/ecd/energy_teen.htm.

June 2004
Three Tennessee schools received national recognition and two were finalists in the NEED Youth Awards for Energy Achievement. The Tennessee delegation of 70 students, teachers and parents representing our state winners attended NEED's National Recognition Ceremonies in Washington, DC.

Energy Smart Leader Teachers received second year orientation and stipends to assist them in recruiting new NEED schools, conducting NEED workshops for students and teachers, and conducting NEED programs in their schools.

July 2004
TEEN conducted a four-day Energy Bus Tour of energy-related sites for 20 teachers in Tennessee. Sites included a neighborhood which integrates energy-efficient, renewable power generation technologies and systems in several homes; the first dam built by TVA; the only commercial wind farm in the Southeast; a pumped storage facility, and the largest electric vehicle battery charging station in the U.S.

Tennessee and Mississippi teachers attended the NEED Energy Conference for Educators in Galveston, TX.

TEEN prepared a “How to Conduct a NEED Project” CD for distribution to teachers. The CD contains answers to many of the questions teachers have about how to get a program started, as well the judging criteria for the Youth Awards Program. The CD also gives examples of past projects to show the do's and don'ts of putting a project together.

August 2004
TEEN put together twelve Traveling Energy Trunks using NEED’s Energy Kits, along with the consumable materials needed to conduct the activities. The Traveling Trunks are available free on loan to Tennessee teachers.

We set a goal of 25 energy projects in 2005 to celebrate the 25th Anniversary of NEED.

200 Tennessee teachers have been registered to receive ACCENT, a monthly email publication that highlights an energy topic with activities and resources for teachers to use in their classrooms. Monthly issues have focused on coal, biomass, air quality, natural gas, and heat.

September 2004
TEEN distributed 5,000 contest announcements to schools about our annual Bookmark and Placemat Contest. The bookmark theme for grades 6-8 was Energy: Efficiency is the Key. Students in grades 3-5 creatively designed placemats using the theme Energy Superheroes: Busy Saving Energy for the Future.

October 2004
10,000 placemats from the three first-place winners in the 2003 contest were distributed in fourteen businesses in the communities of the winners.

Tennessee and Mississippi teachers attended a workshop in Olive Branch, Mississippi with Karen Reagor, NEED Training Director, facilitating the first day of the two-day workshop.

TEEN officially kicked off the new Three-Star Energy Education Program to encourage schools in the Three-Star communities to conduct energy education activities.

Grants of $500 are being provided to implement energy activities in schools. Points are awarded for each activity conducted. A total of ten points makes a school eligible for our Change Your Lights Program, which provides $1,500 grants to purchase and install energy efficient lighting in school buildings.

November 2004
TEEN conducted six pre-service workshops on college campuses for student teachers.

During the year a total of 17 workshops were conducted for 442 students attending the University of Tennessee Martin, University of Memphis, Middle Tennessee State University and Union University.

Other Activities
During 2004, TEEN conducted 142 classroom presentations for 5,216 students, distributed over 28,000 sets of materials for use in the classroom, conducted 13 teacher in-service training workshops for 166 classroom teachers, and given 27 special presentations to over 3,000 participants statewide.

During the spring of 2005, we will continue to network by participating in annual events sponsored by the Tennessee Science Teachers Association, Tennessee Environmental Education Association, Tennessee Aquatic and Marine Sciences, Adventure Science Center, Army Corps of Engineers, and Madison County Solid Waste Management.

Plans for 2005
Select new class of Energy Smart Leader Teachers for the fall of 2005, conduct new NEED workshop for teachers in the fall of 2005, promote new pre-school presentations to target audience, work with Three-Star communities on energy education activities, aggressively seek participation of 25 schools in NEED Youth Awards Program, and prepare a brochure entitled, “Your Guide to a Successful NEED Project” to accompany our CD.
**Primary Activity: Transportation**

**Goals:**
- To introduce students to the ways people and goods are moved from place to place, and the energy that is used in transportation.
- To introduce students to the ways transportation has changed over the years.

**Concepts:**
- Transportation is moving people and goods from one place to another.
- There are many different ways to move people and goods.
- It requires energy to move people and goods.
- Transportation has changed as the United States has developed.

**Materials:**
Pictures on reverse page.

**Preparation:**
- Make three copies of the reverse page and cut out the pictures. One set is for the students and two sets are for the bulletin board.
- Prepare a bulletin board with two sections, titled Settlers and Today. Under each of the sections, make two sub-sections titled People and Goods.

**Procedure:**
1. Introduce the activity by asking the students: What is transportation?
2. Give each student a picture and explain the energy symbols. (The Primary Energy Chants on pages 15-18 of the Games and Icebreakers booklet is a great activity to introduce energy sources to primary students. The plug indicates electricity, which is a secondary source of energy that is produced from many primary energy sources.)
3. Have the students sit in a circle. As you ask the following questions, ask the children who think they have pictures that answer the questions to stand. Have them explain one at a time why they think their pictures answer the questions. Many students’ pictures will answer several questions. If there is a dispute, discuss until there is a consensus. As the questions are answered, put copies of the pictures on the bulletin board.
   - How did early settlers move from place to place?
   - How did early settlers move goods from place to place?
   - How do people move from place to place today?
   - How do people move goods from place to place today?
4. After the bulletin board is finished, discuss the differences between the transportation of early settlers and transportation today.
5. Make four bar graphs showing the energy sources used in the four subsections. Discuss the energy sources that are used in transportation and how energy use has changed.

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**Transportation**

**Early Settlers**
- People
- Goods

**Today**
- People
- Goods
<table>
<thead>
<tr>
<th>Subway</th>
<th>Monorail</th>
<th>Cruise ship</th>
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<tbody>
<tr>
<td>Gondola</td>
<td>Tram</td>
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<td>City Bus</td>
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<td>Taxi</td>
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<td>Freighters</td>
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<td>Balloon</td>
<td>LPG Tank</td>
<td>U235</td>
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<td>Train</td>
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<td>Submarine</td>
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<td>Sleds</td>
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</table>
ELEMENTARY ARTICLE: Energy Efficient Human Transporters

Three years ago, the Segway® Human Transporter (HT) hit the streets as the first electric, self-balancing, personal transportation device. Powered by batteries, the Segway produces no air pollution and can easily be recharged at any standard outlet. The Segway is designed to be an alternative to short car trips. It can reduce the amount of energy consumed and improve the air quality in urban areas.

This new machine has no accelerator or brake. To move forward or backward, the rider just leans forward or back. To stop, the rider stands straight. To turn, the rider moves the handlebars, or steering grip, to the left or right. The Segway has only two wheels—but it doesn’t require you to balance like a bicycle does!

So why doesn’t it fall over? The Segway is designed a lot like the human body. If you lean forward, you change your center of balance. You probably don’t fall, though, because the fluid in your inner ear senses your movement and communicates it to your brain. Your brain tells your muscles to move your leg forward and stop your fall.

The Segway reacts in much the same way, but it has wheels instead of legs, a motor instead of muscles, a computer instead of a brain, and sensors instead of an inner ear. Like your inner ear, the Segway sensors tell its computer when you lean forward. It tells the wheels to turn so the machine moves at just the right speed to stay balanced. The computer makes adjustments one hundred times a second to keep itself balanced. Segway® calls this dynamic stabilization and has patented the process that allows the Segway to balance on two wheels.

The Segway can travel all sorts of places. It can move over sidewalks, up hills, through grass and dirt. It is small and safe enough to ride on walking and bike paths, and you can park it almost anywhere! It can be used in any weather, even rain and snow. It can get people where they need to go up to three times faster than walking. These advantages make it the perfect vehicle for many colleges, businesses and government agencies.

Colleges have started using Segways in many ways. Patrol officers at Duke University use them to quickly move around the 16 square miles of the campus. Colleges also use them for making deliveries and giving guided tours. They find the Segways cut down on traffic and parking problems.

The City of Seattle, Washington, bought ten to replace vehicles in jobs like reading water meters. The city is saving about $8,000 a year with the new machines. The Chicago Police Department uses Segways to patrol the huge terminals of O’Hare International Airport. They find they can respond quickly and safely to security alerts.

The newest invention from Segway® is a four-wheel all terrain vehicle (ATV). It can move and balance on all four wheels or on just two wheels (wheelie style). It can go twice as fast as the two-wheel Segway, and is just as clean and quiet. It can travel 10-15 miles on one charge at a top speed of about 20 miles per hour. It goes by the code name “Concept Centaur”, but it isn’t on the market yet. The Concept Centaur is designed to be a fun, exciting, recreational vehicle for the future.

SPACE FLIGHT FOR YOU AND ME  Have you ever dreamed about being an astronaut and traveling into space? You may not have to become an astronaut to do it. It’s possible that one day these cutting edge forms of transportation could take you into space, or at least make you feel like you are there.

In November 2004, NASA made history with the flight of its unmanned Scramjet X-43A, which demonstrated that an air-breathing engine could fly at almost ten times the speed of sound (Mach 9.6). Its name stands for supersonic-combustion ramjet or **scramjet**. Its engine has no moving parts; it compresses oxygen from the air and mixes it with hydrogen fuel rather than carrying liquid oxygen in tanks like an ordinary rocket.

The 12 foot long Scramjet X-43A broke the world record for speed, flying almost 7,000 miles per hour during its historic 20-second flight. A modified B-52 airplane carried the scramjet into restricted airspace over the Pacific Ocean northwest of Los Angeles, California. At 40,000 feet, the B-52 released the scramjet and its booster rocket. The booster rocket powered the scramjet up through the atmosphere for 90 seconds. At 110,000 feet, the booster rocket broke off, and the scramjet flew for 20 seconds using its own engine, before it began to glide, losing speed until it crash-landed into the ocean. The flight covered 800 miles, and the scramjet encountered temperatures up to 3,000 degrees Fahrenheit.

This was the most successful test in NASA’s eight year, $230 million Hyper-X Program. The program’s purpose was to explore alternatives to rocket power for travel into space. NASA believes scramjet technology could be the answer to ultra high-speed flights within the atmosphere and into the first stage of Earth’s orbit. The scramjet’s main advantage is that once it is accelerated to approximately Mach 4 (four times the speed of sound) using a conventional jet engine or booster rocket, it can fly at the same supersonic speed as a rocket without carrying heavy oxygen tanks, leaving room to carry cargo or passengers. Maybe you will be one of those passengers in the future and be able to experience the thrill of space travel without having to become an astronaut!

ZERO GRAVITY FLIGHTS  It’s possible for you to experience the weightlessness of outer space riding on an airplane. Zero Gravity Corporation (ZERO-G®) is the first FAA-approved company to offer a zero gravity experience to the public. The weightless experience is created in **G-FORCE ONE™**, a specially modified Boeing 727 that performs parabolic flight patterns. The plane’s angle of ascent or descent temporarily counteracts the force of Earth’s gravity to create different gravity conditions. During the flight, passengers experience how strong the force of gravity feels on Mars, the moon and in zero gravity space.

Now anyone can experience weightlessness first-hand, a privilege once enjoyed only by training astronauts and select researchers. Zero Gravity Corporation also works with the entertainment industry. This is how Tom Hanks floated during the filming of Apollo 13! Weightlessness is achieved by specially trained pilots who fly the parabolic maneuvers at altitudes of 24,000 to 34,000 feet. Each parabola (extreme up-and-down swoop) takes about ten miles of airspace and lasts about one minute from start to finish.

The maneuver is somewhat like a roller coaster in that the plane is initially pulled up to approximately 45 degrees nose high. Next the plane is pushed over the top to reach the zero gravity segment; for 25–30 seconds, everything in the plane is weightless. At approximately 30 degrees nose low, a gentle pull-out is started, which allows flyers to stabilize themselves on the aircraft floor. Finally, the gravitational, or g-force, is smoothly increased to about 1.8 until the aircraft reaches a flight altitude of 24,000 feet. The maneuver is then repeated.

During the flight, flyers experience three different gravity conditions: Martian (1/3 Earth’s gravity), Lunar (1/6 Earth’s gravity) and Zero Gravity. The weightlessness experienced inside the airplane feels like a sky diving free fall. Up to 27 flyers can ride in the fully padded cargo plane, which also has a seating area for take-off and landing. Onboard instructors help flyers perform acrobatic rolls and spins. The flight lasts for two hours and costs $2,950 per person.

For more information, go to [www.nogravity.com](http://www.nogravity.com).

For more information about the Hyper-X program and the flights of the X-43A, go to [www.nasa.gov/missions/research/x43main.html](http://www.nasa.gov/missions/research/x43main.html).
The Next 20 Years in Energy
The U.S. Department of Energy’s Energy Information Administration recently released its Annual Energy Outlook 2005. According to the report, U.S. energy needs will increase an average of 1.4 percent each year for the next 20 years. Coal will continue to be the main energy source for electricity generation for the nation. Petroleum imports will increase, with up to 68 percent of U.S. petroleum needs met by imports. In addition, U.S. imports of natural gas will increase from 0.4 trillion cubic feet to 6.4 trillion cubic feet. Renewable electricity generation is projected to increase slowly over the next 20 years as fossil fuel generation continues to remain relatively low in cost. For more information, go to www.eia.doe.gov/oiaf/aeo/index.html.

Hybrids, Hybrids Everywhere
The success of Toyota and Honda hybrid electric vehicles has spurred automobile makers into action. (There is a six to 12 month wait to buy a Toyota Prius.) The Accord Hybrid is available this year, upping the hybrid count to three models available through Honda, including the Civic and Insight. The Ford Escape Hybrid, the first commercial SUV hybrid, is also on the market nationwide. The Toyota Highlander Hybrid SUV is scheduled to be released in early spring 2005. General Motors and DaimlerChrysler have announced that they will be working together to develop a new propulsion system for their vehicles. Vehicles with this new system will be available to the general public in the fall of 2007.