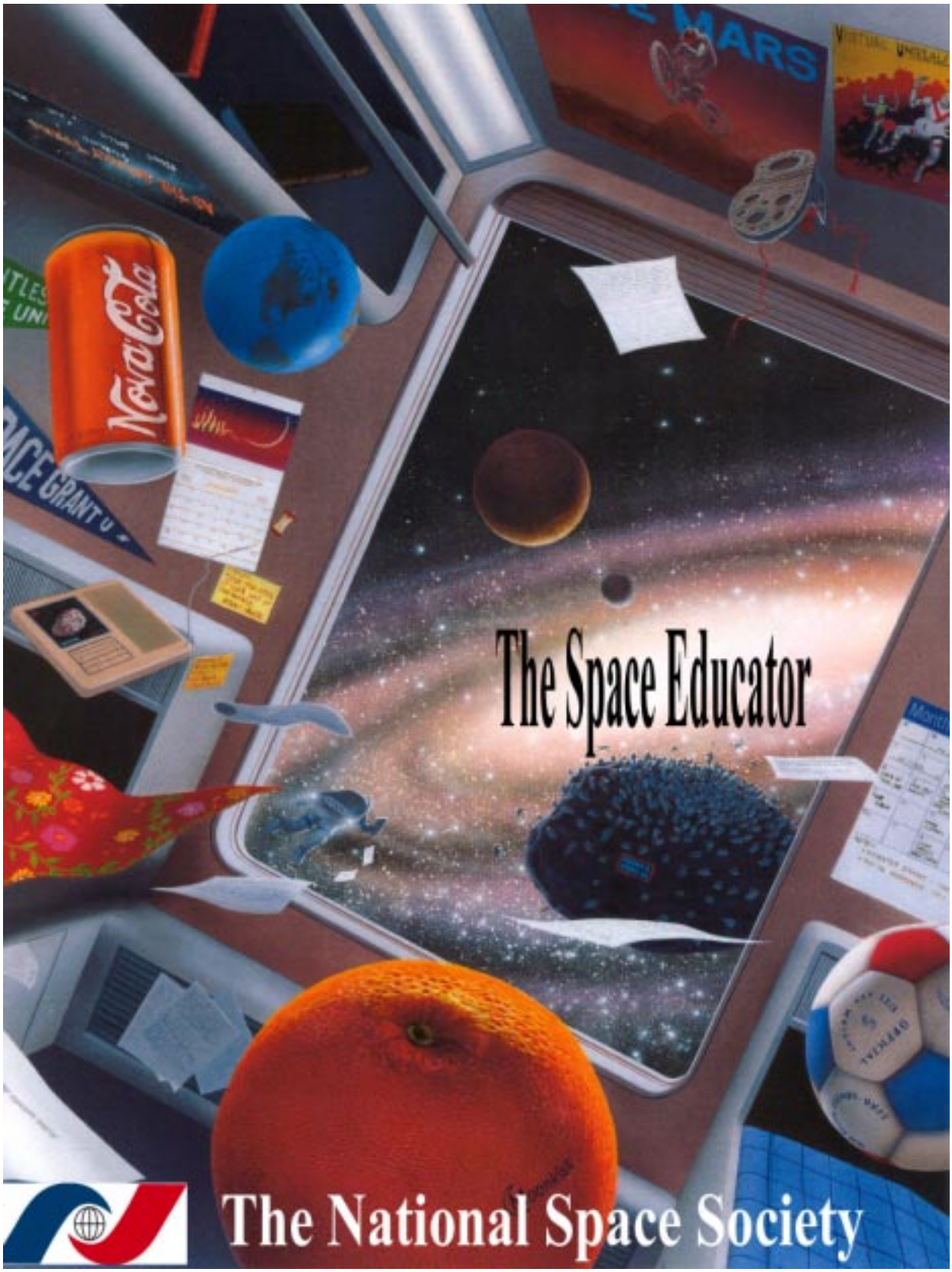

MARS
Coca-Cola
The Space Educator
The National Space Society

The Space Educator

Available in print and PDF downloadable format at http://www.nss.org

The Space Educator responds to the many requests for information the National Space Society receives from K-12 educators, university students, and the general public. Programs and web sites change frequently as space exploration goals are achieved, educational technology advances and budgets expand or contract. Therefore, recipients should be advised that if they discover a listing is no longer viable or a better one exists, they should contact NSS so that future updates can be maintained.

The organization of this publication is based on the educational framework developed at NASA Headquarters. Due to the large number of space education activities and products, we have not tried to evaluate or describe them individually. First the National Space Society is described and its role as a portal to space information. Next are the sources of curriculum support for space science, the human exploration of space, space transportation technology, and space policy. Following naturally from this is a list of web sites which link the user to federal resources, space businesses, and organizations which provide other types of media, data/project opportunities, contests, and scholarships. Museums and Visitor Centers where space is the primary focus of the exhibits and a general calendar of space-related events including annual conferences and tours are listed. Finally, as a quick reference guide, we have presented the most frequently asked questions which we receive by phone, email, and at personal appearances about astronauts, the space station, and Mars.

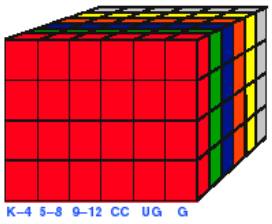
Content:

Space Science

Human Exploration & Development of Space

Space Transportation Technology

Space Policy



Implementation

Center for Lunar Research (Research & Development)

Impacts & Asteroids Slide Set (Curriculum Support)

NSS Web Site
Educational Technology

Conferences, Internships, Launch Tours (Knowledge Enhancement)

Customer: Formal/Informal Education Community
(Public, Media, Visitors Centers, Policy Makers)

Table of Contents

ABOUT THE NATIONAL SPACE SOCIETY

http://www.nss.org/

The National Space Society (NSS) is an independent international, educational, grassroots nonprofit 501(c)3 organization dedicated to the creation of a spacefaring civilization. The NSS has more than 20,000 members, and 80 chapters in the United States, Canada, Mexico, Australia, Ireland and the United Kingdom. The NSS, founded in 1974 by Wernher von Braun, celebrated 25 years of advocacy in 1999.

NSS STATEMENT OF VISION

People living and working in thriving communities beyond the Earth.

NSS MISSION

To promote change in social, technical, economic and political conditions to advance the day when people will live and work in space.

NSS GOALS

1. Increase public understanding of how space exploration and development result in scientific, technical and economic benefits that improve the quality of life on Earth
2. Encourage private sector investment in space and related activities
3. Support technical, economic and political activities that expand human presence in space beyond Earth orbit and establish communities throughout the solar system

Pursuit of these goals requires several actions: lowering the cost of access to space, learning how to work in space and use non-terrestrial resources, ensuring supportive government space policies and practices and fostering private space initiatives.

The National Space Society As A Portal To Programs And Products

The National Space Society supports educational activities through partnerships with both formal and informal science education organizations. Partners range from multi-organizational efforts like the *Mars Millenium Project* to efforts with individual organizations such as the International Astronautical Federation, International Academy of Astronautics, the International Institute of Space Law, the Planetary Society, the National Space Society of Australia, the Sociedad Espacial Mexicana, the American Institute of Aeronautics and Astronautics, and the U.S. Space Foundation. Ongoing projects with these organizations include model rocket launches, teacher training workshops, student seminars, simulated space missions, public technology demonstrations and scouting merit badge sponsorship.

Unlike organizations which have a specific disciplinary focus, NSS educational offerings support the interdisciplinary nature of space science. The NSS mission emphasizes public programs which stimulate interest in the creation of a space-faring civilization. In the past, these programs have appealed to a broad spectrum of ages and interests. Successful public education and outreach programs produce an informed public who appreciate space exploration; excited educators who use space to motivate our youth, and journalists, artists, politicians, and business leaders who recognize the value of space exploration and can articulate its merits.

Historically, NSS has provided various types of education programs through its Headquarters staff, International Space Development Conference organizers and Education chapter. Experiential opportunities which give members a way of engaging in the real thing are the most successful, said Carol Redfield, a faculty member at St. Mary s University. Model rocketry, tours and teacher workshops where participants can experiment are annual offerings. These activities rely on dedicated volunteers and experienced teachers to translate the information into classrooms.

In 1998, the society took a visionary step, establishing the NSS Center for Lunar Research which supports student and faculty projects, aiding our lunar resource utilization goals. To date two undergraduate students and one graduate student have been funded at the University of Wisconsin. A publication of their work will be available in late 2000. The Center has also sponsored its first lunar base conference. The Center is a response to:

- NSS decision to develop a large ambitious project;
- 25th Anniversary decision to proactively move from visionary dreams to reality;
- Reduced NASA emphasis on lunar exploration;
- Inadequate government funding of lunar data analysis;
- 1998 NSS Space Policy Survey which identified lunar applications and development as a priority.

The Internet is an enormous resource for the creation of interactive virtual environments, distribution of educational materials, and for course content that NSS will offer in the future. Members currently consult the NSS website for cybercasts of events, book reviews which can be ordered directly through our link to Amazon.com, and links to other space organizations.

Education usually refers to products or sustained services associated with formal classroom learning such as curriculum development, professional development of teachers, or support for systemic reform. Unfortunately this narrow definition does not take into account the millions of adults who pursue lifelong learning through seminars, workshops, and continuing education opportunities. These short-term efforts may require intense preparation and participant focus for a specified period of time and in the case of certification programs may require renewal every three to five years. In the new century many of our members will be able to participate in formalized certification programs that prepare them for colonization.

Public Outreach activities inform, excite, and arouse curiosity. Usually there is an element of entertainment such as a movie premiere attached to the activity and often the method of distribution allows many people to hear, see or surf. Products and services range from science articles in the media to Internet events. The NSS slide set, Impacts, Asteroids, and Comets supplemented the popular film, *Deep Impact*. While slides may be considered low tech , they are accessible to everyone and continue to be popular as NASA missions periodically bring asteroids or comets to the public s attention.

Sometimes the line between Education and Public Outreach is very gray: The Mars Millenium Project (http://www.mars2030.com) crosses that boundary. During 1999, NSS was asked to be one of more than 100 partners engaging the formal educational community in the ideas of colonization. Chapters participate by providing notification of events and supporting materials through local experts. Planetariums and observatories, museums and arts organizations are allowing access to their facilities with the intention of stimulating return visits. During 2000, NSS will release a special educational newspaper insert to assist in the promotion of the film, *Mission to Mars,* which is included in the Mars Section of this volume.

AD ASTRA (to the stars) magazine is the primary membership benefit and the official publication of the NSS. This non-technical, bimonthly magazine reports to members and the general public on a broad range of space-related topics, including domestic and international space policy and programs, transportation, commercialization, planetary science, extraterrestrial resources, colonization, education and space advocacy.

NSS CHAPTERS are sponsors of local and regional meetings and education symposia. These grassroots organizations are located in more than 80 cities in the United States and around the world. They serve as local organizers in space education and political activism, and provide speakers and demonstrations for schools, civic groups, the media and other forums on the merits of space exploration and development. Each year a local chapter serves as host to the International Space Development Conference (ISDC). The ISDC is the Society s annual meeting where activists convene to attend lectures, deliver papers and plan strategies for developing space.

$35 Individual ($20 Senior/Student) **MEMBERSHIP INCLUDES:**

- One Year Subscription to *Ad Astra* magazine
- Participate in the National Space Society s Shuttle Launch Tours
- Invitations to conferences, seminars, briefings and lectures around the country
- Access to the latest space information through the NSS website

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Country _____ Telephone _____
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Card# _____ Exp. Date _____
Signature _____

Your membership contribution, except for $10 which pays for a subscription to Ad Astra, is tax-deductible to the extent allowed by law. Enclose payment and return to:
National Space Society
600 Pennsylvania Avenue, SE, Suite 201
Washington, DC 20003

mailcode DTSE

Sources of Curriculum Support:

Space Science

An integral element of the OSS education and public outreach strategy is the establishment of an "Ecosystem" or network for space science to foster a wide variety of highly leveraged education and public outreach activities, which will be disseminated across the country. Key elements of the "Ecosystem" include: (1) a set of regional Broker/Facilitators whose role is to work with the space science community to identify high-leverage opportunities for education and public outreach and help arrange collaborations between scientists and educators; and (2) four major Education Forums that serve as major centers for space science education and public outreach in each of the four OSS Science Themes. Individuals wishing further information on space science related education and public outreach materials, activities, and opportunities to develop or participate in OSS sponsored education and public outreach activities should consult one of the OSS Brokers/Facilitators or Forums listed below.

FORUMS	BROKER/FACILITATORS
Astronomical Search for Origins and Planetary Systems Point of Contact: Carol Christian Phone Number: (410)338-4764 http://www.stsci.edu/ Email Address: carolc@stsci.edu	**South and Lower Midwest Region** Point of Contact: Pam Thompson Phone Number: (281)486-2175 **http://cass.jsc.nasa.gov/education/education.html** Email Address: thompson@lpi.jsc.nasa.gov
Structure and Evolution of the Universe Point of Contact: Roy Gould Phone Number: (617)496-7689 **http://cfa-www.harvard.edu/seuforum** Email Address: rgould@cfa.harvard.edu	**Southeast Region** Point of Contact: Cassandra Coombs Phone Number: (843)953-5437 **http://serch.cofc.edu/serch/** Email Address: coombsc@cofc.edu
Solar System Exploration Point of Contact: Stephen Saunders Phone Number: (818)354-2867 **http://www.jpl.nasa.gov/forum/index.html** Email Address: saunders@scn1.jpl.nasa.go	**Northeast Region** Point of Contact: Larry Cooper Phone Number: (513)245-9897 **http://www.oai.org/oss/** Email Address: OSSBroker@oai.org
Sun-Earth Connection (East Coast) Point of Contact: Richard Vondrak Phone Number: (301)286-8112 http://sec.gsfc.nasa.gov/ Email Address: vondrak@lepvax.gsfc.nasa.gov	**Upper Midwest Region** Point of Contact: Lynn Narasimhan Phone Number: (773)325-1854 **http://analyzer.depaul.edu/NASABroker** Email Address: cnarasim@condor.depaul.edu
Sun-Earth Connection (West Coast) Point of Contact: Isabel Hawkins Phone Number: (510)643-5662 http://cse.ssl.berkeley.edu/ Email Address: isabelh@ssl.berkeley.edu	**Northwest Region** Point of Contact: Cheri Morrow Phone Number: (303)492-7321 **http://www.spacescience.org/Products/Brokering/** Email Address: camorrow@colorado.edu

Other Space Science Resources of Interest to Educators:

The Space Scientists Online provides the educational community with new and exciting information from space sciences as well as collect relevant information from previous space science projects such as Online from Jupiter and Live from the Hubble Space Telescope. This project will feature material from previous projects presented in a new light and augmented

with new events, background information and online interactions from OSS. We will conduct chats and Learning Technology Channel events. Stay tuned to this page for more information as the project gets rolling. **http://quest.arc.nasa.gov/sso/index.html.**

The Space Scientists Online page includes:

- a welcome and some background for first-time visitors;
- the most recent updates.
- project segments to stimulate your students including live LTC events.
- learn about the men and women of the OSS to help students relate to the project at a human level. Biographies from previous projects will also be provided.
- entries from space science personnel from previous projects describe their day-to-day activities and their particular role in the project. These reports will help students understand the diversity of people and skills that are needed for success in a modern science project.
- talk to space science experts via the Web.
- view q&a from previous OSS projects and ask questions of Mars experts.
- learn about the Office of Space Science, NASA's space science mission as well as tidbits of information from previous and existing OSS projects.

The National Space Science Data Center (NSSDC) provides access to a wide variety of astrophysics, space physics, solar physics, lunar and planetary data from NASA space flight missions, in addition to selected data and some models and software. NSSDC provides access to online information bases about NASA and non-NASA data at the NSSDC and elsewhere as well as the spacecraft and experiments that have or will provide public access data. **http://www.nssdc.gsfc.nasa.gov/planets/mars.**

The Planetary Data System (PDS) archives and distributes digital data from past and present NASA planetary missions, astronomical observations, and laboratory measurements. The PDS is sponsored by NASA's Office of Space Science to ensure the long-term usability of data, to stimulate research, to facilitate data access, and to support correlative analysis. **http://pds.jpl.nasa.gov.**

Exploring Planets in the Classroom is a program of the Hawaii Spacegrant Consortium. **http://imina.soest.hawaii.edu/spacegrant/class_acts.**

Windows to the Universe. Sponsored by the University of Michigan Board of Regents. **http://www.windows.umich.edu.**

The Explorers Project. Sponsored by the Bishop Museum in Hawaii. **http://www.bishopmuseum.org/bishop/planet/ep.html.**

Earth in Space. This 16-page magazine stimulates educators and top science students by providing a window to current Earth and space science. Articles and news in *Earth in Space* are written by scientists and cover research and applications in geophysics and discuss the social context of science. Nine issues (Sept. - May) will be sent from the date the subscription is entered. Contents available at **http://www.agu.org/pubs/agu_joureis.html.**

MARS

Due to the public s interest in the Mars Missions of the last few years, this section is devoted to those resources which are focused on only this planet.

Destination Mars, produced by the Discovery Channel, explores the possibilities of such a mission with existing technologies and reveals ways we might sustain life on such an inhospitable planet. **http://school.discovery.com/lessonplans/programs/destinationmars.**

Exploring Mars - Activity Book for Middle School by Teacher Created Materials

Mars Madness, placed at the National Space Society web site, allows downloading of the *Mission to Mars* educational supplement, Mars party hints and links to other Mars sites**.** **http://www.nss.org/mars**. *Mission to Mars* is a Touchstone Pictures film which explores the theme of colonization. **http://www.missiontomars.movies.com**.

Mars Millenium Program - This umbrella effort of more than 100 cooperating organizations (all web sites are linked) is sponsored by the White House, NASA, US Dept. of Education, and National Endowment of the Arts to encourage students and their communities to apply lessons learned in Mars exploration programs to the process of colonization of Mars. **http://www.mars2030.com.**

Mars Navigator - interactive CD-ROM produced by Georgia Institute of Technology. **Http:/www.cad.gatech.edu/~space.**

Marsville and Mars City Alpha produced by the Challenger Center. **http://www.challenger.org**.

Red Rover and **Artist, Scientist, Engineers, Astronaut Entrance to the Mars Millennium Project** produced by the Planetary Society. **http://mmp.planetary.org/index.htm.**

The Mars Society - This is a membership organization whose goal is exploration and settlement of Mars. **http://www.marssociety.org.**

The Mars Scavenger Hunt sponsored by the Kennedy Space Center Visitors Center Complex.

The Whole Mars Catalog - http://www.spaceref.com/mars. Mars fact and fiction with daily news updates. Sponsored by Reston Communications.

Human Exploration of Space

Astronauts. For questions about educational requirements, astronaut training, living conditions in space, how various bodily functions are performed in space, and scheduling an appearance by a current astronaut contact:

Astronaut Office/CB
NASA Johnson Space Center
Houston, TX 77058
Fax: (281) 244-8863
http://www.nasajobs.nasa.gov/jobs/astronauts/jsc-aso.htm

Many retired astronauts are available for personal appearances. Several of them serve on the National Space Society Board and when the Society plays a supporting role in a function, we may ask them to appear. However, it should be noted that these people have returned to their private lives and maintain their own schedules. Due to the requirements of personal appearances, they may choose not to appear or require travel expenses and honoraria.

• Suited for Spacewalking, A Teacher s Guide with Activities for Technology Education, Mathematics, and Science. **http://spacelink.nasa.gov/products**.

Space Transportation Technology

- **International Space Station** will be a world class orbiting laboratory for long-term research, where the fundamental forces of nature-gravity-is a variable. In addition, worldwide research in biology, chemistry, physics, ecology, and medicine can be conducted using the most modern tools available. More than 1,000 hours of spacewalks will be conducted during the construction phase of the International Space Station from now through 2003. NASA Johnson Spaceflight Center and NASA Marshall Spaceflight Center have primary responsibility for the International Space Station. The Boeing Company is the prime contractor. Space Shuttle and International Space Station information can be viewed at **http://spaceflight.nasa.gov**. Space Shuttle Countdown: Landing to Launch - webcast with lesson plans broadcast monthly from Kennedy Space Center. **http://quest.arc.nasa.gov/space/events/ksc99.**

- **STELLAR** - Participants use Space Life Science and Shuttle mission data to create K-14 classroom activities that are distributed on the web, such as CDs, videos and printed products. **http://weboflife.arc.nasa.gov/stellar.**

- **The Shuttle Small Payloads Project - (**SSPP) designs, develops, tests, integrates and flies a group of small payload carrier systems for the Space Shuttle. The Hitchhiker, Getaway Specials (GAS), Space Experiment Module (SEM) -- support payloads supplied by NASA, other US government agencies, universities, high schools, domestic commercial customers, and foreign nationals and governments. These carriers can support payloads that range in size between 50 lbs (23 kg) and 4000 lbs (2270 kg). **http://www.wff.nasa.gov/~sspp/gas.**

Space Policy

American Bar Association. The largest organization devoted to the legal aspects of aeronautics in the United States and abroad. **http://www.abanet.org/forums/airspace.**

American Society of International Law. Provides an opportunity for interested ASIL members to keep abreast of developments, issues and policies in the field of international space law.
http://www.asil.org/interest.htm#space.
Chair: Stephen Gorove, University of Mississippi College of Law
PO Box 308, University, MS 38677
(601) 234-2391 FAX: (601) 234-2391

The Archimedes Institute directed by Larry Roberts (archimedes@permanent.com) conducts analysis of aerospace policy issues and implements related private policy initiatives.
http://www.permanent.com/archimedes.

National University School of Business and Technology
Thomas L. Matula, Ph.D., Lead Faculty in Space Commerce
11255 N. Torrey Pines Rd.
La Jolla, CA 92037-1011
(800) NAT-UNIV ext.8421
Introduction to Space Commerce, Markets, Financing Space Ventures, Regulation and Policy.
http://www.nu.edu.

Colorado State University. The objectives of the Space Policy Program are to research and analyze space policy issues and to develop space educational programs on:
http://www.engr.colostate.edu/~willy/policy/policy.html.

United Nations Office for Outer Space Affairs implements the decisions of the General Assembly. The office has the dual objective of supporting the intergovernmental discussions in the Committee and its Scientific and Technical Subcommittee and Legal Subcommittee, and of assisting developing countries in using space technology for development.
http://www.un.or.at/OOSA/oosa.html.

The George Washington University Space Policy Institute
2013 G St. NW Suite 201
Washington DC 20052
202-994-7292
Conducts research on space policy issues, organizes seminars, symposia, and conferences on various topics and offers courses on space policy. **http://www.gwu.edu/~spi**.

University of North Dakota, Department of Space Studies
P. O. Box 9008, Grand Forks, ND 58202-9008
Telephone: (701) 777-2480
The goal is to integrate, rather than separate, traditional disciplines related to space. While specialized technical training is an essential part of the space community, the all-encompassing

nature of space development also requires people who possess a broader background that links policy, business, law, science, and technology.
http://www.space.edu/info/program/description.html.

Learning Technology Resources and Web Sites

Eisenhower National Math Science Clearinghouse. **http://www.enc.org.**

Federal Aviation Administration Education Homepage. **http://www.faa.gov/search.htm.**

Federal Resources for Educational Excellence. **http://www.ed.gov/free.**

PubScience provides users the capability to search across a large compendium of peer reviewed journal literature with a focus on the physical sciences and other disciplines of concern to the Department of Energy (DOE).**http://pubsci.osti.gov.**

NASA

NASA Education Office. Links to all NASA education programs.
http://www.hq.nasa.gov/office/codef/education.

NASA Spacelink. Aerospace and space science information server with library, and schedules of education activities. **http://spacelink.nasa.gov/.index.html**.

Exploring Space. Interactive software (flash movies, CD-roms, and simulations) featuring NASA research programs at Ames, Lewis and Langley.
http://www.exploringspace.arc.nasa.gov.

NASA History Office. Indexes archival materials, websites, and images.
http://history.nasa.gov.

NASA Quest. Provides access to multimedia products, and real time science data projects including topical experts using broadcast and Internet technologies. **http://quest.arc.nasa.gov.**

NASA Space Grant Program. Funds research, education, and public service projects through a national network of 52 university-based Space Grant consortia.
http://calspace.ucsd.edu/spacegrant.

NASA Langley Learning Technologies Projects. **http://k12unix.larc.nasa.gov/projects.**

NASA Headquarters Library. This site answers many public reference questions.
http://www.hq.nasa.gov/office/hqlibrary.

NOVA. A national framework for enhancing science, mathematics and technology literacy for preservice teachers in the 21st century. **http://www.eng.ua.edu/~nova.**

NASA Student Involvement Program. SSIP competitions encourage students in grades 3-12 to incorporate science, math, technology and art into science exploration. **http://www.terc.edu**.

NASA Glenn Center Learning Technologies Projects.
http://www.lerc.nasa.gov/Other_Groups/K-12/K-12_homepage.html.

NASA Kids. Family space science activities. **http://kids.msfc.nasa.gov.**

NASA Ames Independent Verification and Validation Facility. Excellent source of imagery.
http://www.ivv.nasa.gov.

Chuck the NASA Test Pilot Bear. Preschool program of the NASA White Sands Test Facility.
http://www.wstf.nasa.gov/bear/default.htm.

NASA Observatorium. Public depository of space science data.
http://observe.ivv.nasa.gov/nasa/core.shtml.

The Cooperative Satellite Learning Project (CSLP). Students at the participating high schools learn about all aspects of how NASA satellite systems work.
http://joy.gsfc.nasa.gov/CSLP/home.html.

Military Links

Space Vehicles Directorate of the Air Force Research Laboratory
http://www.spacecom.af.mil/hqafspc.
"Defending America through the control and exploitation of space".

Space and Missiles System Center
http://www.laafb.af.mil.
"Forging the shape of space for tomorrow's conflicts".

45th Space Wing
http://www.pafb.af.mil/index.htm.
USAF spaceport near Kennedy Space Center; location for most military launches.

Space Businesses

Aerospace Industry Association represents the leading aerospace companies in the United States. **http://www.aia.org.**

Space Transportation Association represents the interests of organizations and people who are engaged in developing, building, operating, and using space transportation vehicles, systems, and services to provide reliable, economical, safe, and routine access to space for private users and government, civil, and military users. **http://www.spacetransportation.org.**

Aerospace.com provides online services for the aerospace industry.
http://www.aerospace.com.

Launchspace.com, the magazine of space industry, includes an extensive directory of aerospace companies. **http://www.Launchspace.com**.

Space News, Web version of the space industry weekly (requires membership).
http://www.spacenews.com. Also sponsors an education site, Outer Orbit at
http://www.outerorbit.com.

Space.com, Daily newslinks. **http://www.space.com**.

Space Online, News from Florida Today. **http://www.flatoday.com/space/today**.

SPACEHAB s Space Kids - The S*T*A*R*S program is a commercial education initiative that enables students to fly experiments on Space Shuttle missions.
http://www.spacehab.com/sk/index7.html.

Boeing Kids. The Boeing Company is a committed and long-standing supporter of education institutions and programs. **http://www.boeing.com/companyoffices/aboutus/kids.**

Digital Galaxy Project. A partnership of Silicon Graphics and the Hayden Planetarium.
http://www.sgi.com/features/2000/jan/haydn/.

Evolved Expendable Launch Vehicles.
http://www.laafb.af.mil/SMC/MV/eelvhome.htm. Partnership with industry (Lockheed and Boeing) to develop a national launch capability.

United Space Alliance - headquartered in Houston, USA is a Boeing/Lockheed Martin joint venture formed to manage the Space Flight Operations Contract for NASA. USA is the major corporate partner in NASA s space shuttle and international space station programs. Images are available at **http://www.unitedspacealliance.com/press**.

Other Links

Astronaut Memorial Foundation
The Center for Space Education
Mail Code AMF
Kennedy Space Center Florida 32899
321-452-2887
http://www.amfcse.org.
The Foundation honors all U.S. astronauts who have lost their lives while on missions or in training. The Institute offers training programs for educators and demonstration programs for the millions of annual Kennedy Space Center visitors.

American Astronomical Society
2000 Florida Ave, NW Suite 400
Washington, DC 20009-1231
202-328-2010
http://www.aas.org.
Provides support to members who are teachers; scholarships and fellowships.

American Institute of Aeronautics and Astronautics
1801 Alexander Bell Drive, Suite 500.
Reston VA 20191
703-264-7500
http://www.aiaa.org.
The primary purpose is to advance the arts, sciences, and technology of aeronautics and astronautics and to foster and promote the professionalism of those engaged in these pursuits.

Astronomical Society of the Pacific
390 Ashton Ave.
San Francisco, CA 94112
415-337-1100
http://www.aspsky.org.
The ASP has become the largest general astronomy society in the world.

Challenger Center for Space Science Education
1250 North Pitt St.
Alexandria, VA 22314
703-683-9740
http://www.challenger.org.
A network of 25 Centers across the country which sponsor Marsville, Cosmic EdVentures and other simulations.

International Space University
Strasbourg Central Campus
Parc d Innovation
Bld Gonthier d Andernach

67400 Illkirch-Graffenstaden
France
ISU supports a Masters program and other professional development opportunities which are interdisciplinary in nature. **http://www.isunet.edu**.

National Association of Rocketry
PO Box 177
Altoona Wisconsin 54720
http://www.nar.org.
The National Association of Rocketry is the oldest and largest sport rocketry organization in the world.

National Space Club
2000 L St. NW
Washington, DC 20036
202-973-8661
Sponsors the Robert Goddard Scholarship.

The Planetary Society
65 North Catalina Ave.
Pasadena, CA 91106-2301
http://www.planatary.org
The Planetary Society was founded in 1980 to encourage the exploration of our solar system and the search for extraterrestrial life. The Society produces the Planetary Report.

Space Day is dedicated to the extraordinary achievements, benefits and opportunities in the exploration and use of space. **http://www.spaceday.com.**

SPACE CAMP¤
One Tranquility Base
Huntsville, AL 35805
1-800-637-7223
http://www.spacecamp.com.
A five-day program jam-packed with astronaut training for young people. Activities include simulated Space Shuttle missions, IMAX¤ movies, training simulators (like the 1/6th Gravity Chair), rocket building and launches, scientific experiments, and lectures on the past, present, and future of space exploration. Alabama (Huntsville), California (Mountain View), and Florida (Titusville). Tuition, which ranges from $550 to $875.

Space Explorers
1825 Nimitz Dr.
De Pere, WI 54115

920-339-4600
http://www.space-explorers.com.
The promoter of Moonlink, education program of the Lunar Prospector Mission, and NEARlink education program of the NEAR mission.

Students for the Exploration and Development of Space (SEDS) consists of an international group of high school, undergraduate, and graduate students from a diverse range of educational backgrounds who are working to promote space as a whole. SEDS is a chapter based organization with a permanent National Headquarters for SEDS-USA at MIT. **http://www.seds.org/seds.**

SpaceWatch. An internet TV channel.
http://www.adlerplanetarium.org/99/ast_onl/in_star.htm.

US Space Foundation
2860 South Circle Drive, Suite 2301
Colorado Springs, CO 80906
719-576-8000
http://www.ussf.org
Founders of the National Space Symposium and the International Space Business Assembly.

Young Astronaut Club Students may become Young Astronauts through membership in school- or community-based Chapters, as individuals in the Young Astronaut Club, or as part of Space School, the Young Astronaut satellite television course for grades four to six.
http://www.yac.org/yac.

Publications

If you are updating your library, we recommend the following:

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Bromber, Joan Lisa. 1999. *NASA and the Space Industry*. Baltimore: Johns Hopkins University Press.

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Museums and Visitor Centers

NASA has many programs which are available nationally and each NASA Center has regional responsibility for educational resources. Educator Resource Centers service K-12 needs, including: **NEWEST** - NASA Educational Workshop for Elementary School Teachers; **NEWMAST** - NASA Educational Workshop for Mathematics, Science and Technology teachers; and The NASA Aerospace Education Services Program designed to increase awareness and understanding of scientific research and technological development and their place in the world in which we live. The lecture-demonstration program for schools, due to demand, may have a waiting list. University Affairs Officers handle the requests for co-op, summer experiences, and other college faculty needs.

NASA Audiovisual Materials are available from:

NASA CORE,
(Central Operation of Resources for Educators)
Lorain County Joint Vocational School
15181 Route 58 South
Oberlin, OH 44074
216-774-1051, Ext. 293 or 294

Media Resource Center
NASA LBJ Space Center
2101 NASA Rd 1
Building 423/AP32
Houston, TX 77058-3696
281-483-4231

National Air & Space Museum
Washington, DC
No Admission fee
202-357-1400
http://www.nasm.si.edu/
The Smithsonian Institution's National Air and Space Museum (NASM) maintains the largest collection of historic air and spacecraft in the world.

NASA Ames Research Center
Moffett Field, CA
No Admission fee
415-604-6274
http://www.arc.nasa.gov
Ames specializes in research geared toward creating new knowledge and new technologies that span the spectrum of NASA interests. Primary focus is on most information technologies and astrobiology.

The Air Force Space and Missile Museum
at Cape Canaveral Air Station
407- 853-3245
http://www.pafb.af.mil/museum.htm
Blockhouse and the control rooms for Complex 26 have been authentically restored with much of the original equipment.

NASA Dryden Flight Research Center
PO Box 273
Edwards, CA
805-258-3446
x3460http://trc.dfrc.nasa.gov
No Admission Fee
Provides a glimpse into the science of flight testing: detailed explanations and images of manuevers, flight test procedures, and how data is collected.

Kansas Cosmosphere and Space Center
Hutchinson, KS
316-662-2305 or 800-397-0330
http://www.cosmo.org
Admission Fees
A chronicle of the American space program with world's largest collection of space suits and Mercury, Gemini, and Apollo spacecraft, the museum has become one of the largest and comprehensive collections of space artifacts in the world.

NASA Glenn Research Center
Cleveland, OH 44135
216-433-4000
http://www.grc.nasa.gov
No Admission Fee
The work of the Center is directed the toward new propulsion, power, and communications technologies

Neil Armstrong Air & Space Museum
Wapakoneta, OH
419-738-8811
http://3d-interact.com/SpaceMuseum
Admission Fee
The museum is a receptacle of Ohio s aeronautical history and to Ohio s to the history of aviation and space.

NASA Goddard Space Flight Center
Greenbelt, MD
301-286-2000
http://www.gsfc.nasa.gov
No Admission Fee
Goddard's overall mission falls into three major areas of responsibility: space contribution science, technology, and earth science.

Kirkpatrick Science and Air Space
Museum at Omniplex
Oklahoma City, OK 73111
405-602-0664
http://www.omniplex.org
Various Fees
One of the nation s premier collections of aviation and space artifacts, aircraft memorabilia, the Air Space Museum through the history of aviation and space.

Jet Propulsion Laboratory
Pasadena, CA
818-354-3343
http://eis.jpl.nasa.gov/eao
No Admission Fee
The Jet Propulsion Laboratory is NASA's lead center for the robotic exploration solar system, and participates in takes visitors international space exploration, Earth observation missions, astrophysical research, and technology development.

Space Center Houston
Houston, TX
281-244-2100
http://www.spacecenter.org
Admission Fees
The Official Visitor center of NASA's Johnson Space Center.

NASA Johnson Space Center
Houston, TX
281-244-2100
http://www.jsc.nasa.gov
No Admission Fee
This Center is responsible for design, development, testing of spacecraft and associated systems for human flight; selection and training of astronauts; planning and conducting human space flight missions; and Engineering scientific experiments carried aboard space flights.

Virginia Air & Space Center
Hampton, VA
757-727-0900
http://www.vasc.org
Admission Fee

NASA Langley Research Center
Hampton, VA
804-864-1000
http://www.larc.nasa.gov
No Admission Fee

The Center is the official visitor center for NASA Langley Research Center.

U.S. Astronaut Hall of Fame
Titusville, FL
321- 269-6100
http://www.astronauts.org

Admission Fee
The only facility dedicated exclusively to telling the stories of America s astronauts.

U.S. Space & Rocket Center
Huntsville, AL
256-837-3400
http://www.ussrc.com.
This facility houses hundreds of artifacts
Apollo 16 command module,
rock and one of the shuttle s main
It is also the headquarters for
U.S. Space Camp.

The Center for aeronautics, earth science, space technology, and structures and materials research.

NASA Kennedy Space Center
Cape Canaveral, FL
407-867-7110
http://www.ksc.nasa.gov
http://www.kscvisitor.com
Admission Fees for some activities
The Visitor Center Complex is separately managed and has educational programs which differ from those offered by NASA focused on launch services and payload processing.

NASA Marshall Space Flight Center
Huntsville, AL
256-544-0000
http://www.msfc.nasa.gov.
Marshall is the world leader in space including the propulsion and transportation systems and a moon the lead Center for microgravity research. engines.

NASA Stennis Space Center
Luka, MS 38852-0508
601-688-3338
http://www.ssc.nasa.gov.
NASA Center of Excellence for rocket propulsion.

NASA Wallops Flight Facility
Wallops Island, VA
757-824-2298
http://www.wff.nasa.gov
National resource for providing low-cost integration, launch, and operation of suborbital and small orbital payloads.

NASA Ames Research Center Annual Space Settlement Contest

(http://www.nas.nasa.gov/Services/Education/SpaceSettlement/Contest)

This annual 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.

Contest prizes and certificates:

- All participants will receive a certificate.
- The best submission wins the grand prize. This space colony design will be placed on the NASA Ames World Wide Web site.
- The categories are individual 6-9 grade, small group 6-9 grade, large group 6-9 grade, individual 10-12 grade, small group 10-12 grade, and large group 10-12 grade. An additional category based on artistic merit is also included in the contest. NASA cannot supply travel funds, but many groups have had great success with community fund-raising. Tour participants from outside the U.S. may require special arrangements to enter Moffett Field.

Rules

- Submissions must relate to orbital colonies. Colonies may not be on a planet or moon. Colonies must be permanent, relatively self-sufficient homes, not temporary work camps.
- Submissions must be made in **hard copy**. No electronic submissions are accepted under any circumstances.
- An application with the appropriate information must be included with the submission. Fill out all fields unless you are not part of a school class. In this case, leave out the teacher and school information.
- Designs, essays, stories, models, artwork and any other orbital space settlement materials will be considered.
- Material copied from a source must be surrounded in double quotes (") and the source indicated. For example: "This is material copied from somewhere," *My Favorite Space Book*.

Tips

- Models are hard to handle and expensive to ship. Consider sending pictures of your model. If you must send the whole model, make it strong. Fragile models are frequently demolished during shipping or transport to the judging room. Submissions are not returned.
- Do your best to get the science right.
- Make your design as quantitative as possible.
- Include a bibliography. We want to know where you got your ideas and materials.
- Be creative. Surprise the judges. Put something of your own personality into your work.

- Consider designing a colony that you would really like to live in.
- Consider alternate possibilities and clearly describe why you made the choices you did.
- Present your material clearly and neatly.

Submission

Al Globus
MS T27A-1
NASA Ames Research Center
Moffett Field, CA 94035

Teachers using the contest in their class should submit all projects together. **Note: electronic submission is not allowed, only hard copy.**

Discussion

Space colonies are permanent communities in orbit, as opposed to living on the Moon or other planets. The work of Princeton physicist Dr. O'Neill and others have shown that such colonies are technically feasible, although expensive. Settlers of this high frontier are expected to live inside large air-tight rotating structures holding hundreds, thousands, or even millions of people along with the animals, plants, and single celled organisms vital to comfort and survival. There are many advantages to living in orbit: zero-g recreation, environmental independence, plentiful solar energy, and terrific views to name a few. There is plenty of room for everyone who wants to go; the materials from a single asteroid can build space colonies with living space equal to about 500 times the surface area of the Earth.

Why should colonies be in orbit? Mars and our Moon have a surface gravity far below Earth normal. Children raised in low-g will not develop bones and muscles strong enough to visit Earth comfortably. In contrast, orbital colonies can be rotated to provide Earth normal pseudo-gravity in the main living areas.

We hope teachers will make this contest part of their lesson plan. While designing a space colony, students will have a chance to study physics, mathematics, space science, environmental science, and many other disciplines. We would like students outside the science classes to participate as well. Thus, contest submissions may include designs, essays, stories, models, and artwork. Students can design entire colonies or focus on one aspect of orbital living. A class or school may submit a joint project where small teams tackle different areas in a coordinated fashion. For example, consider a cross curriculum project where science classes design the basic structure and support systems, art students create pictures of the interior and exterior, English students write related short stories, social studies students develop government and social systems, woodshop builds a scale model, and the football team proposes low-g sports. Schools and teachers may consider ongoing multi-year projects; each year's students add detail to a space colony design that becomes part of the school or class portfolio. In this case, teachers assign students to different parts of the design, gradually building a more and more complete and practical space colony concept. Each year the project can be submitted to the contest.

INTERNATIONAL HIGH SCHOOL SPACE SETTLEMENT DESIGN COMPETITION (http://space.bsdi.com/)

WELCOME to the Seventh Annual International Space Settlement Design Competition! This event is an industry simulation set in the future. Teams of High School students prepare designs for cities in space where over 10,000 people will live. The Competition is an exercise of creativity, technical competence, management skills, environmental knowledge, resources in space, teamwork, and presentation techniques. Each year the Competition organizers develop a new design challenge. Participating teams of students simulate the experience of working on an industry proposal team.

The 2000 Qualifying Competition teams will design the second Foundation Society settlement in Earth orbit, in the year 2020. The links below provide registration materials, background data for this scenario, tools to help students develop a design, and information about the Competition itself.

About the Competition

These materials (see the other pages, too!) will get you started in the Competition.

Phase 1: Qualifying Competition (at your high school). Your team represents a major aerospace company. Create and submit your design in the year 2020 for a space settlement in Earth orbit, in hopes that your company will be awarded the lucrative contract to construct it. When your team registers for the Competition, you will receive the Final RFP, which describes everything the customer wants in your design. **Submit your written (on paper!) design description** by April 12, 2000, to judges who will evaluate the proposals and select eight Finalist teams to attend the Finalist Design Competition at Kennedy Space Center in Florida, July 15-17, 2000. (Note: Final RFP packages will be sent after October 15.)

Phase 2: International Finalist Competition at Kennedy Space Center in Florida. The eight Finalist teams will be paired to form four competing companies. Your company will prepare a design at The Center for Space Education, July 15-16, for a settlement on the surface of Earth's moon in the year 2024. You will work in conditions that resemble those experienced by members of high- pressure proposal teams in industry, with assistance from real working engineers and managers. Designs will be presented July 17 to an audience that includes the judges and competing teams. Presenters will answer the judges' questions about their designs. Judges will select a winning design, and provide a debriefing describing merits and weak points of the proposals.

Competition Paradigm

This competition takes place in a simulated future: the year 2020. Technological advancements beyond the current state of the art have accrued. The contents of these links describe technologies the judges will accept in your design. Any other technologies assumed in your design must be fully justified (for example, if you plan to use 'warp drive', you must explain how it is constructed). The basic products, vehicles, and structures described for this competition are technically possible within the timeframes indicated. They do, however, represent ambitious technical, economic, and political commitments. Some will never happen, some will. Some are projects that Design Competition participants who become engineers will work on during their

careers. The company Northdonning Heedwell, including its product line and history, is based on a composite of real corporations, projected into the future. There is no such organization as the Foundation Society. The described efforts by the Foundation Society to foster commercial space infrastructure development could, however, be accomplished by other existing organizations. Your proposal will be judged by engineers with experience in the aerospace industry, so please base it on reasonable interpretations of the level of existing technology defined here, the laws of Physics, and common sense.

Details

Qualifying Competition teams may be of any size. The eight teams that qualify for the Finalist Competition will be limited to 12 members (who must be High School students during the 1999-2000 school year) each -- and two adult advisors. Select members with diverse experiences and/or interests; successful designs balance structural integrity, operating efficiency, use of computers and robotics, and pleasant living conditions. Prior competitions have shown that it will also be helpful to have at least one good artist and/or one good writer on your team. (International entrants: American High School students are typically between 14 and 18 years of age). The eight Finalist teams will be selected by May 15, and informed by U.S. Mail, or Global Priority Mail for International entrants. The Finalist teams are expected to arrange their own round trip transportation to Titusville, Florida, with arrival Friday evening, July14. Lodging and meals will be complimentary during the Finalist Competition for each team's twelve students and two advisors. Competition organizers and sponsoring organizations retain rights to publish or otherwise use any materials prepared in connection with this Competition. The Competition organizers occasionally develop new or revised background materials that might be helpful as your team works on its design. Check here periodically to access this information as it is added. A Change Log identifies additions and the dates when they were added.

Contact:

BSDI World Headquarters
Berkeley Software Design, Inc.
5575 Tech Center Drive, #110, Colorado Springs, CO 80918 USA
Toll Free Information: +1 800 800 4BSD. Toll Free Order Line: +1 800 776 BSDI
Phone: +1 719 593 9445 Fax: +1 719 598 4238 Email: bsdi-info@bsdi.com

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SPACESET

14th Annual
Space Settlement Design Competition
For High School Students

Spaceset is an annual event. To be placed on the mailing list for the Spaceset 2000 competition, to be held next April, please write us a letter containing your name and U.S. mail address, including ZIP code, and we will send you a mailing in February, 2000. Or you can simply return to this page next February when it will be updated with information on how to register for Spaceset 2000.

SPACESET
M/S 249-EXP
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109
Spaceset Information Line: 626.447.8694

Annual Space Calendar

February - NASA Budget is released
May - NSS International Space Development Conference
June - AIAA Annual Conference
July - AIA Annual Conference
October - Space Week
November - International Space Business Assembly

Launches of the Space Shuttle are scheduled almost monthly and may be viewed at the NASA Kennedy Spaceflight Center. Viewing areas include roadsides, tops of buildings, and through the NSS and KSC Visitors Center tour offices. Launch schedules are subject to change and for the most up to date information call 321-867-4636 or check **http://www~pao.ksc.nasa.gov/kscpao/schedule/schedule.htm**.