

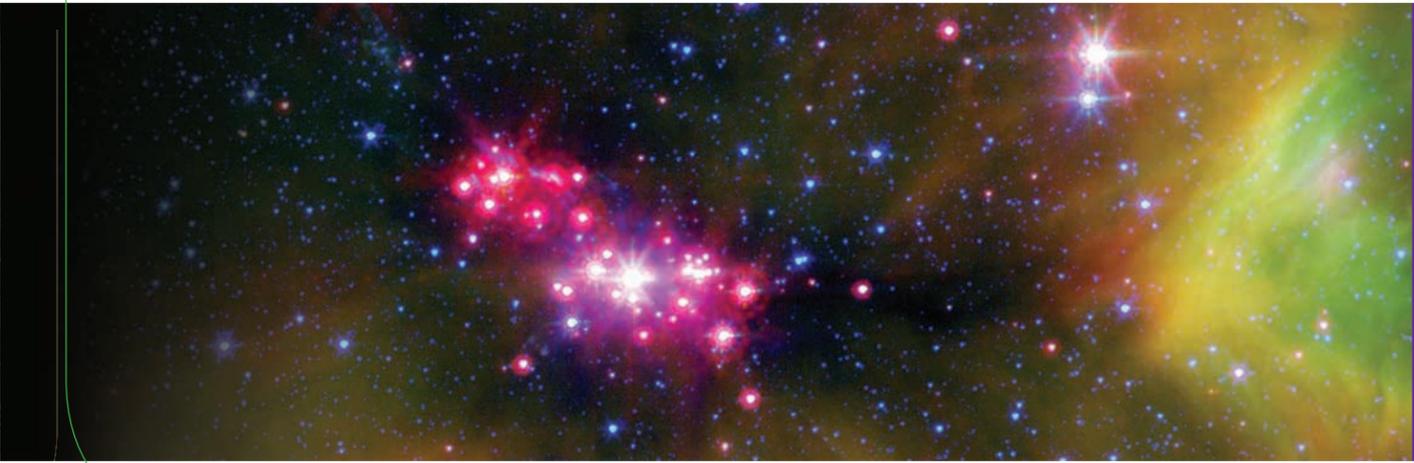
# New Steps for Education



inspire engage educate employ...  
the next generation  
of explorers and innovators.



2009 NASA Education Highlights



## New Steps for Education

“I submit that one of the most important roles of government is to motivate its citizens, and particularly its young citizens, to love to learn, and to strive to participate in—and contribute to—societal progress.”

—Neil Armstrong, NASA Astronaut

Read about the innovative ways NASA is creating new activities that spark the interest and imagination of people from all segments of society.

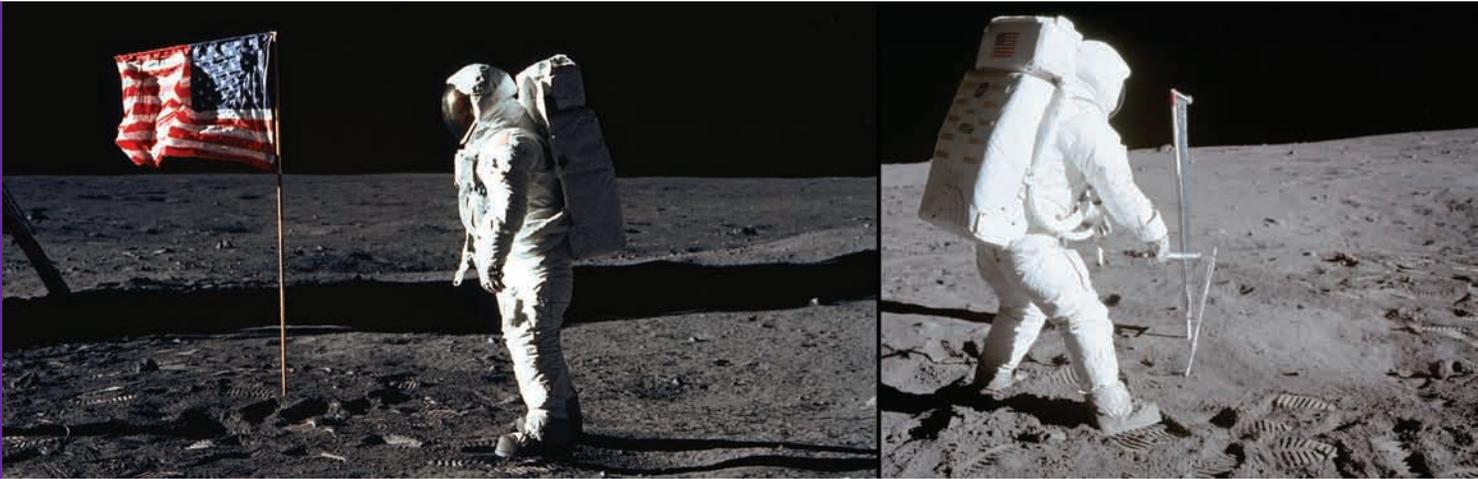
Our future exploration journey will be shaped across many years and many missions. . . . Through these missions, we will strengthen our Nation's technological leadership and build strong international coalitions. The reasons for these new exploration missions are as old as the idea of America itself: discovery, science, innovation. These new voyages will inspire the next generation of young Americans just as [the Mercury, Gemini, and Apollo] missions inspired many of my astronaut classmates to pursue careers in aviation, the military, and eventually at NASA.

—NASA Administrator, Charles F. Bolden

<http://www.nasa.gov/education>

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As NASA celebrates the achievements and innovations of the Apollo program, the Agency continues its commitment to support today's education community and provide compelling STEM experiences that inspire tomorrow's explorers.



June 2010

## A Message from the Associate Administrator for Education



In 2009 NASA celebrated the 40th anniversary of one of the greatest achievements in its history, the first footstep made by a human on the lunar surface. The Agency used this defining moment to renew public imagination and fuel the Nation's ongoing mission of exploration and discovery. NASA Education was also revitalized in its commitment to inspiring, engaging, educating, and employing the next generation of explorers, leaders, and innovators.

In February, astronauts Ricky Arnold and Joe Acaba ventured into space on mission STS-119. Mission specialists selected through the Educator Astronaut Program, they conducted spacewalking operations that were critical to the building of the International Space Station. I marvel at the fact that the third educator and astronaut from the Educator Astronaut Program, Dottie Metcalf-Lindenberger, will orbit Earth as part of the STS-131 mission in 2010. The Agency has conducted truly engaging education programming around these flights. Special activities and events involved thousands of students and educators with activities based on spacesuits, robotics, and engineering.

Missions with educators aboard provide unique teaching opportunities that would be impossible without the commendable efforts of our staff here on the ground. This year, our education experts engaged nearly 1.5 million elementary and secondary students in our programs. Of the students graduating from our higher education programs, a significant 44 percent of them were inspired to pursue advanced degrees. When our students graduate and enter the workforce, over half find employment with NASA, our aerospace contractors, and education institutions, with another 27 percent working in science, technology, engineering, and mathematics industries that strengthen the Nation.

In order to effectively support NASA education's national reach to students, we have relied on partnership and collaborative efforts. We have actively engaged more of our community and industry partners, educators, students, and leaders in workshops and forums. We developed enhancements to improve the quality and return on investment of our projects. We implemented new competitive awards that foster innovative approaches to improving teaching and learning, and seek to adopt

education approaches that are grounded in evidence-based research. We are working more closely with other Federal agencies, including the National Science Foundation, the Department of Energy, and the Department of Education. The Office of Education is also working more closely than ever with our colleagues in the Mission Directorates and at the Centers. In addition to incorporating education into NASA's missions Agency-wide, during the past year we took the opportunity to build infrastructure and implement strategies that will ensure future success for our programs and our participants.

In celebrating Apollo, we honor past discoveries and motivate ourselves for challenges ahead. NASA Administrator Charles F. Bolden recently noted, "I believe, in fact, that the future of exploration is bright, and that great journeys are still to come." As acting Associate Administrator for Education, I also look forward to continued greatness from NASA, with discoveries not yet imagined. NASA education supports this philosophy as we build the future workforce that will usher in the next era of understanding our world and exploring the universe.

I am proud of our many education accomplishments showcased in this document, and I am pleased to present the 2009 NASA Education Highlights.

James Stofan  
NASA Associate Administrator for Education (Acting)

# NASA Education Overview

NASA is taking a leading role in the effort to inspire interest in science, technology, engineering, and mathematics (STEM)—as few other organizations can—through its unique mission, workforce, facilities, research, and innovations. NASA is continuing to pursue three major education goals: strengthening NASA’s and the Nation’s future workforce, attracting and retaining students in STEM disciplines, and engaging Americans in NASA’s mission.

## NASA Education Programs

**Higher Education** focuses on strengthening the research capabilities of the Nation’s colleges and universities as well as providing opportunities that attract and prepare increasing numbers of students for NASA-related careers. The research conducted by these institutions contributes to the research needs of NASA’s Mission Directorates. The student projects serve as a major link in the pipeline for addressing NASA’s Human Capital Strategies and the President’s Management Agenda. The projects help to “build, sustain, and effectively deploy the skilled, knowledgeable, diverse, and high-performing workforce needed to meet the current and emerging needs of government and its citizens.”



**Minority University Research and Education** engages underrepresented populations through a wide variety of initiatives. Multiyear grants are awarded to assist minority institutions, faculty, and students in research pertinent to NASA missions. The program focuses on recruiting and retaining underrepresented and underserved students in STEM disciplines through completion of undergraduate or graduate degrees in support of their entry into the scientific and technical workforce.



**Elementary and Secondary Education** projects provide K–12 educators with tools, experiences, and opportunities to further their education. Students participate in unique NASA learning experiences that enhance their knowledge of STEM and inspire the pursuit of STEM careers. The program supports the role of educational institutions, providing the framework to bring together students, families, and educators for educational improvement.



**Informal Education** inspires learning by educating students, educators, and the general public on specific STEM content areas, resulting in the expansion of the Nation’s future STEM workforce. Projects within the program produce supplemental education materials that are standards-based and support life-long learning in the STEM fields. Self-directed learners and education professionals are engaged through NASA-themed, hands-on activities.





**The National Aeronautics and Space Administration (NASA) Office of Education** administers national education efforts that draw on content from across the Agency. The Office of Education is responsible for ensuring compliance with external requirements and laws and NASA-wide processes, procedures, standards, audits, and accounting related to education. It also provides the leadership for coordinating and integrating NASA's Strategic Education Framework, implementation approach, and policies.

**NASA Centers** are responsible for institutional assets and the execution of components of the Agency's numerous and varied research and development programs across the Nation. Center Education Offices implement NASA education projects and activities for the Mission Directorates and the Office of Education, as well as planning and implementing education programs that are unique to, and funded by, their Centers.

**Ames Research Center (ARC)** specializes in research geared towards creating new knowledge and new technologies that span the spectrum of NASA interests.

**Dryden Flight Research Center (DFRC)** is the lead for flight research, and continues to innovate in aeronautics and space technology. The newest, fastest, the highest—all have made their debut in the vast, clear desert skies.

**Glenn Research Center (GRC)** develops and transfers critical technologies that address national priorities through research, technology development, and systems development for safe and reliable aeronautics, aerospace, and space applications.

**Goddard Space Flight Center (GSFC)** has a mission to expand knowledge of Earth and its environment, the solar system, and the universe through observations from space.

**Jet Propulsion Laboratory (JPL)**, managed by the California Institute of Technology (Caltech), is NASA's lead Center for robotic exploration of the solar system.

**Johnson Space Center (JSC)** continues to lead NASA's effort in Human Space Exploration, from the early Gemini, Apollo, and Sky Lab projects to today's Space Shuttle and International Space Station programs.

**Kennedy Space Center (KSC)** is America's gateway to the universe—leading the world in preparing and launching missions around Earth and beyond.

**Langley Research Center (LaRC)** continues to forge new frontiers in aviation and space research for aerospace, atmospheric sciences, and technology commercialization to improve the way the citizens of the world live.

**Marshall Space Flight Center (MSFC)** is bringing people to space and bringing space to people. MSFC is the world leader in the access to space and use of space for research and development to benefit humanity.

**Stennis Space Center (SSC)** is responsible for NASA's rocket propulsion testing and for partnering with industry to develop and implement remote sensing technology.

**NASA Mission Directorates** each cover a major area of the Agency's research and development efforts. The Mission Directorates and other NASA Headquarters organizations that fund education efforts are responsible for embedding education components into their research and development programs and flight missions, administering the discipline-/content-specific activities for which they provide funding and resources, and ensuring meaningful collaboration between the NASA science/engineering community and the education community.

Aeronautics Research Mission Directorate (ARMD) conducts long-term, cutting-edge research in the core aeronautics disciplines across all flight regimes (subsonic, supersonic, and hypersonic) that will lead to the development of revolutionary ideas, concepts, approaches, technologies, and capabilities that have broad applicability to the aeronautics community.

Exploration Systems Mission Directorate (ESMD) is developing the next generation of spacecraft, including capabilities and technologies that enable sustained and affordable human and robotic exploration in support of the U.S. Space Exploration policy.

Science Mission Directorate (SMD) invests in the continued development of a workforce able to pursue Earth and space science research from space, partners with institutions and professional societies in increasing public understanding of science and technology, and informs the teaching and learning of STEM subjects in the classroom.

Space Operations Mission Directorate (SOMD) provides the Agency with leadership and management of NASA space operations related to human exploration in and beyond low-Earth orbit and seeks to provide educational projects, products, and activities to inspire the next generation of explorers to take the next steps in the U.S. Space Exploration Policy.

*Please see Appendices for more information about NASA Education.*



## ‘Lunacy’ Prevails in Moon-inspired Robotics Competition

On July 20, 1969, human history was changed forever as Apollo 11 commander Neil Armstrong stepped out of the lunar module and took “one small step” in the Sea of Tranquility. In 2009, NASA celebrated the 40th anniversary of that iconic moment, the program that launched this ongoing exploration journey, and the Agency’s plans for future leaps beyond Earth’s orbit. The 2009 “For Inspiration and Recognition of Science and Technology,” or FIRST competition, of which NASA is the largest sponsor, used the anniversary of the first Moon landing to create interest in science and mathematics among today’s high school students. The competition is a unique varsity sport of the mind designed to help students discover the interesting and rewarding careers of engineers and researchers. NASA’s support for FIRST includes sponsorship of 5 regional competition events and more than 280 teams.

The 2009 competition was called “Lunacy,” in recognition of NASA’s yearlong focus on the achievements of the Apollo program. Student teams with identical kits of parts worked with teachers and mentors for six weeks to design, build, program, and test robots to meet the season’s engineering challenge. The Lunacy playing field contained a special low-friction floor, which gave the teams a challenge dealing with the laws of physics. During each match, robots picked up 9-inch game balls, called “moon rocks,” to shoot them into the opponents’ trailer for points.

NASA, in cooperation with local technology firms, sponsored the first-ever District of Columbia regional FIRST robotics competition in February 2009 at the DC Convention Center in Washington.

The FIRST DC regional included more than 60 high school teams from Virginia, Maryland, Washington, and several other states. In Cleveland, OH, 59 teams faced off for the FIRST Buckeye Regional that was sponsored in part by NASA Glenn Research Center. In 2007, NASA Stennis Space Center sponsored the new FIRST Bayou Regional as it debuted in New Orleans. This year, 31 high schools in 9 states competed in an event that was attended by Supriya Jindal, wife of Louisiana Governor Bobby Jindal. These were among 40 regional competitions across the United States, Canada, and Israel that led up to the April 2009 FIRST Championship at the Georgia Dome in Atlanta.

FIRST was founded in 1989 by accomplished inventor Dean Kamen to inspire an appreciation of science and technology in young people, their schools, and their communities. Based in Manchester, NH, FIRST is a non-profit organization that designs accessible, innovative programs to build self-confidence, knowledge, and life skills while motivating young people to pursue academic opportunities.

## Drawing Inspiration from Spacewalking Educators and Hubble Images

True to the spirit of its founding legislation, NASA has actively endeavored to engage the public through its compelling scientific and exploration missions. One such mission, Space Shuttle Discovery’s STS-119 flight to the International Space Station (ISS) in March 2009, delivered the fourth and final set of solar array wings, completing the station’s truss, or backbone. The Agency’s Office of Education focused on highlighting this important mission and its crew that included two NASA astronauts who are also educators.



Mission Specialists Joe Acaba and Richard Arnold are science teachers who are now fully trained NASA astronauts, and made their first journey into orbit on STS-119. During the mission, Acaba and Arnold stepped outside the station to conduct critical spacewalking tasks. NASA Education planned a variety of activities that leveraged the excitement of the flight, showcased the Agency's education resources, and provided direct opportunities to get involved with the STS-119 mission.

On Wednesday, March 11, NASA held a forum at Kennedy Space Center entitled, "New Opportunities for NASA and STEM Education," that included 40 higher education and K-12 education leaders, experts, educators, and students. Forum participants discussed current and future science, technology, engineering, and mathematics (STEM) initiatives, relevant student and educator experiences, leveraging NASA content for education, and partnerships between organizations serving diverse audiences and grade levels. Many of the forum participants witnessed the dazzling evening lift-off of Discovery on March 15.

To complement the spacewalks scheduled for Acaba and Arnold, NASA unveiled a new "spacesuits and spacewalks" Web site for educators. NASA's Digital Learning Network produced a live webcast of the STS-119 launch, with student questions that were submitted electronically and answered on the air. Channel One News invited over six million middle and high school students to its Web site to submit text and video questions for the STS-119 crew. After the crew arrived aboard Discovery at ISS for the 13-day mission, they answered selected questions during three educational downlinks including one from the White House which featured questions from President Barack Obama, members of Congress, and students.

Another truly historic NASA mission was targeted for May 2009: the final Hubble Space Telescope servicing flight. The STS-125 Space Shuttle Atlantis mission aimed to push the boundaries of how deep in space and far back in time we can see. The crew of seven astronauts was slated to upgrade what already may be the most significant satellite ever launched, and NASA engaged students, educators, and the informal education community with the mission's key breakthroughs and the awe-inspiring Hubble images currently available.

Through a prelaunch education forum entitled "Using the Power of Hubble to Inspire the Next Generation of Explorers," NASA engaged informal education leaders in discussing collaboration between the Agency and the informal education community, strategies to improve STEM awareness, and best practices for engaging audiences with Hubble imagery. Participants were also invited to tour KSC and view the launch of STS-125. The Office of Education showcased the increased capability of the tremendous telescope that will result in untold new knowledge and opportunities to inspire future explorers

Additional missions included the summer STS-127 launch where NASA celebrated young professionals and sought input from them that will help the Agency attract, engage, educate, and employ the dynamic next generation. The forum, entitled "Strengthening the STEM Workforce: Strategies for Engaging Generation Y" included discussion on the state of the Generation Y workforce with interns, fellows, and early career professionals across NASA, industry, and academia. The Office of Education leveraged the STS-128 mission in August 2009 to engage higher education leaders and innovators in the prelaunch education forum, "Building Bridges among Higher Education Institutions and NASA." Faculty from colleges of science, engineering, and education nationwide gathered in Florida to discuss strategies to increase collaborations among organizations regarding STEM topics.

These engaging activities for students, teachers, and leaders before, during, and after compelling missions support NASA's ongoing efforts to deliver content and experiences that involve Americans in the Agency's mission and strengthen the Nation's education programs.



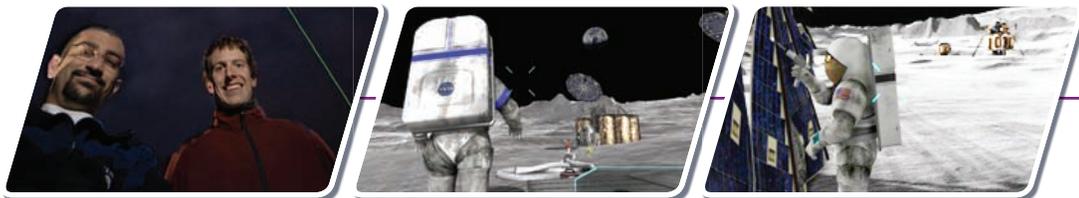
## Exploration for All

The STS-125 mission to service the Hubble Space Telescope enhanced the Agency's ability to immerse the public in the excitement of space science. NASA aims to engage every American in its mission and open the minds of the entire next generation to the limitless possibilities of education and exploration. Toward that end, NASA is using its longstanding relationship with the National Federation of the Blind (NFB) to make the stunning images received from its space telescopes available to students of all sight abilities. In 2008, the Agency released a NASA-sponsored book, "Touch the Invisible Sky" which uses Braille, large type, and tactile diagrams of celestial images observed by space telescopes Hubble, Chandra, and Spitzer. "Touch the Invisible Sky" is among several outstanding products and activities that engage the blind and seeing-impaired with NASA STEM.

On March 25, 2009, the NFB and the U.S. Mint presented the new 2009 Louis Braille Bicentennial Silver Dollar, and NASA Assistant Administrator for Education Dr. Joyce Winterton participated in the ceremony. Dr. Winterton informed the audience of NASA's plans to carry the Braille coins to space on the STS-125 mission to Hubble. Winterton said: "NASA believes strongly in the importance of educational opportunities for everyone, and that is why we have partnered with the National Federation of the Blind to help create programs that enhance scientific study for blind youth. Launching the first coin ever to contain tactile, readable Braille into space symbolizes NASA's commitment to the spread of knowledge by every means and to every individual."

NFB leaders were invited to participate in the NASA STS-125 prelaunch education forum, which was planned to culminate with viewing the Braille coin's liftoff aboard Space Shuttle Atlantis. The coin honors the life and work of the man who invented the Braille method of reading and writing that has enabled the literacy of millions of blind citizens. A portion of the proceeds from its sales will further NFB programs to promote Braille literacy.

Similarly, NASA's goals in STEM education include dissemination of knowledge, resources to help all students realize their potential, and valuable learning experiences for diverse audiences. Since 2004, NFB and NASA have collaborated to produce many products and activities, including the "Rocket On" science camps for blind high school students. The camps challenge students from across the country to develop, build and launch a 12-foot rocket from NASA's Wallops Flight Facility on Virginia's Eastern Shore. During the summer of 2009, the Agency again worked with the NFB on its second Youth Slam, a five-day experiential academy focusing on STEM subjects and careers. The partnership between NASA and the National Federation of the Blind will continue to pioneer new frontiers of accessible science that make exploration possible for all.



## GSRP Paves Way for International Recognition

Through opportunities to directly support NASA missions and research, the Office of Education is increasing the number of highly trained scientists and engineers in aerospace-related disciplines, and broadening the base of students pursuing advanced degrees in science, mathematics, and engineering.

First year graduate student Amin Nehrir is involved in one such NASA opportunity, the Graduate Student Researchers Project (GSRP) at NASA Langley Research Center. GSRP builds research ties to the academic community to help meet the continuing needs of the Nation's aeronautics and space effort. Fellowships are awarded for graduate study leading to master's or doctoral degrees in fields related to NASA research and development. Nehrir, who studies Electrical and Computer Engineering at Montana State University, recently won the best poster award at the 24th International Laser Radar Conference (ILRC). The 2008 ILRC was held during July in Boulder, CO, as a part of the International Coordination Group on Laser Atmospheric Studies (ICLAS).

The biennial conference brings together an interdisciplinary group of scientists working in the field of laser remote sensing as applied to the atmosphere, Earth, and oceans. Nehrir was selected from approximately 290 posters and also received a monetary prize. The best poster award was based on his outstanding paper entitled: "Water Vapor Profiling using a Compact Widely Tunable Diode Laser Differential Absorption Lidar."

In early 2009, Nehrir was also nominated by GSRP to become part of the new NASA Student Ambassadors Virtual Community. "There are many new and exciting technologies being developed in the field of Applied Electrical and Computer Engineering. The Graduate Student Researchers Program has allowed me to extend my knowledge of Electrical Engineering into the field of atmospheric optical remote sensing," Nehrir said. "It has given me the opportunity and freedom to conduct and lead my own research under the guidance of scientists that are pioneering cutting edge technology in atmospheric laser remote sensing."

## NASA Unveils New Online Game to Engage Youth in Space

A new subscription-based massively multiplayer online (MMO) videogame, "Astronaut: Moon, Mars & Beyond," will help NASA engage the next generation with the excitement of space exploration and the Agency's future missions. In March 2009, NASA's Learning Technologies and Innovative Partnership Program Office selected game developers Virtual Heroes, Project Whitecard, and Information in Place to create a realistic virtual world that will allow gamers to explore the next 30 years of manned space exploration from the comfort of their homes. As part of this joint collaboration between the U.S. Government and the private game developers for a commercial, subscription-based MMO game, NASA will have instrumental input in determining storylines, art, and mission specifications.

The new game, which will be released in 2010, is being developed with input from past and current NASA astronauts as well as scientists, engineers, and professionals. As a result, all of the spacecraft, robotics, technology, and gadgets in the game will be based on current, realistic NASA prototypes. The game is planned to offer both individual challenges and team-based objectives to encourage players to use real-life STEM applications to unlock new in-game vehicles, spacesuits, robotics, and mining apparatus that will propel them further into space.

While primarily intended for entertainment gaming purposes, "Astronaut: Moon, Mars, and Beyond" will also be disseminated for formal use in schools and universities. Students aged 13 to 25 will engage in missions designed by instructors and facilitators for specific STEM classroom topics. Graduate students will even have the opportunity to receive college credit through the game. The Capstone Project Spaceship Design at the University of North Dakota's School of Aerospace will allow students to develop and test spaceships for use in the final videogame environment.

The NASA MMO is slated for release in 2010.



## NASA Selects High-Performing Interns as First Student Ambassadors

WASHINGTON—NASA is taking further steps to engage undergraduate and graduate students in NASA science, technology, engineering and mathematics, or STEM, research and interactive opportunities. In one such effort, NASA has inducted more than 80 high-performing interns into the newly unveiled NASA Student Ambassadors Virtual Community. This first group of students includes interns from 35 states and 64 different universities.

“As NASA prepares to develop and deploy a next generation of space vehicles, the agency requires greater depth of knowledge and pursuit of innovation than ever before,” said Joyce Winterton, assistant administrator for Education at NASA Headquarters in Washington. “To ensure success in meeting future exploration goals, NASA and the nation must adapt to the changing landscape and develop new strategies to cultivate its future workforce.”

NASA managers and mentors nominated the recipients from thousands of current interns and fellows across the agency. NASA provides internships that are among the most exciting research and education opportunities available to college students. This new online initiative further recognizes exceptional students.

Members of the NASA Student Ambassadors Virtual Community interact with NASA, share information, make professional connections, collaborate with peers, represent NASA in a variety of venues, and help NASA inspire and engage future interns. Through the community’s Web site, participants have access to tools needed to serve as a NASA Student Ambassador.

The Web site provides the latest NASA news, blogs, and announcements; member profiles, forums, polls, and NASA contact information; and links to cutting-edge research and career resources.

“The NASA Student Ambassadors Virtual Community will serve as an outreach vehicle to the nation’s students as well as a way to engage exceptional Gen-Y NASA students,” said Mabel Matthews, NASA’s Higher Education manager and lead for the community. “This innovative activity will be a leading effort to help NASA attract, engage, educate and employ the next generation.”

One of the many ways NASA is engaging these participants is through attendance at the space shuttle mission, STS-127, targeted for launch June 13 from NASA’s Kennedy Space Center in Florida. NASA’s Office of Education planned a pre-launch education forum titled “Strengthening the STEM Workforce: Strategies for Engaging Generation Y” and is inviting a number of Student Ambassadors to Florida to engage in discussions with leadership and other interns from NASA, industry and other federal agencies.

With this program and the agency’s other college and university programs, NASA will identify and develop the critical skills and capabilities needed to achieve its mission. This program is tied directly to the agency’s major education goal of strengthening NASA and the nation’s future workforce.



## Student-Designed Camera Provides New 'Global View' from Space

An event in November 2008 exemplified NASA's goal to leverage its education and exploration missions. Among the 32,000 pounds of cargo launched into space on the Space Shuttle Endeavor mission STS-126 was a camera that will help U.S. agriculture and provide unique educational opportunities for students.

Students and faculty at the University of North Dakota (UND), Grand Forks, built the agricultural camera, known as AgCam, that was installed on the ISS. The students will operate the camera from their campus and work closely with NASA engineers and station astronauts. AgCam will take images in visible and infrared light of growing crops, rangeland, grasslands, forests, and wetlands in the northern Great Plains and Rocky Mountain regions. "AgCam provides students with the opportunity to do real engineering that will protect our environment now and in the future," said George Seielstad, the director of AgCam and the Northern Great Plains Center for People and the Environment at UND.

AgCam is an example of a space-related research project that delivers direct benefits to the public. AgCam will relay useful data to agricultural producers in North Dakota and neighboring states, helping farmers, ranchers, tribal resource managers, and researchers. AgCam data will improve decision-making regarding fertilizer and chemical inputs as well as livestock capacity of rangelands that can reduce negative environmental effects and ecosystem damage from overgrazing and erosion. AgCam imagery also may assist in disaster management, such as flood monitoring and wildfire mapping. Images from the camera will be shared with educators throughout the country for use in their classrooms.

The launch of AgCam was the third UND-connected space mission during that year. During the previous March, the UND's Energy & Environmental Research Center sent specially designed materials into space. And in May, UND graduate and astronaut Karen Nyberg made her first space flight on the STS-124 mission to the ISS aboard Space Shuttle Discovery.

Other related UND programs include a space suit for Mars funded by NASA's Experimental Program to Stimulate Competitive Research

(EPSCoR) program, North Dakota's first rocket—Frozen Fury, an interactive training space capsule, and the North Dakota Space Grant Consortium housed at UND.

## Students Mark Day of Service and Remembrance with NASA

Nominated by President Barack Obama and confirmed by the U.S. Senate, retired Marine Corps Major General Charles Frank Bolden, Jr., began his duties as the 12th Administrator of NASA on July 17, 2009. Bolden has demonstrated a commitment to supporting education at NASA by actively participating in school visits and other education events. As part of the September 11 National Day of Service and Remembrance, Bolden visited students at the Davis Elementary School in Washington, DC. Bolden, along with Principal Joyce Thompson, Youth Service America President Steve Culbertson, and Scott Richardson of Learn and Serve America, encouraged the students to focus their educations on math and science.

Bolden stressed how important education is in every aspect of space travel, as well as in our daily lives. As part of the visit, NASA provided science-related education materials to each participating student and brought science, technology, engineering, and math curricula for teachers. Scholastic Books also donated a non-fiction book about the Wright brothers and early flight to all 120 students who took part in Friday's event. Bolden and one of the students read aloud from the book to the audience.

Bolden also answered questions from this excited audience of young people. He gave demonstrations of how the space shuttle launches into space and lands. He discussed how he came to be the NASA Administrator. He chatted with the students about serving in the military and being an astronaut. And he explained to the students that his parents, who were educators, encouraged him to study math and science at an early age.

In April, President Obama signed the Serve America Act, which officially recognizes September 11 as a National Day of service and remembrance. Bolden encouraged the students to use this day to serve their schools and communities.



## NASA Announces Competitive Grant Awards

Three competitive funding opportunities were announced by NASA in July 2008 in response to congressional direction: the K-12 Competitive Grants Opportunity for secondary school level teaching and learning; the Global Climate Change Education Opportunity for improvement of the quality of global climate change and Earth system science education at the elementary, secondary, and undergraduate levels; and the Competitive Program for Science Museums and Planetariums for enhancement of programs related to space exploration, aeronautics, space science, Earth science, or microgravity. The following highlights include updates related to these competitive funding opportunities.

**K-12 Competitive Grants Opportunity**—In March 2009, NASA awarded \$11.5 million in cooperative agreement awards to public school districts, state-based education leadership, and not-for-profit education organizations nationwide. The selected proposals illustrate innovative approaches to using NASA-themed content in support of secondary-level STEM teaching and learning, with a particular emphasis on high school education.

A total of nine proposals were selected for funding to school districts and organizations in the District of Columbia and eight states: California, Florida, Georgia, Illinois, Louisiana, Maryland, Massachusetts, and Virginia. Winning proposals were selected through a merit-based, peer-reviewed competition. The awards have a two-year period of performance and range in value from \$300,000 to \$1.4 million.

**Global Climate Change Education Grant**—NASA awarded \$6.4 million in grants to institutions of higher education and

not-for-profit education organizations nationwide to enhance learning through the use of NASA's Earth science resources. Each grant is expected to leverage NASA's unique contributions in climate science. The selected grant winners proposed ways to enhance students' academic experiences or improve educators' abilities to engage their students by providing opportunities to investigate the Earth system using NASA resources.

The selected proposals illustrate innovative approaches to using NASA content in support of elementary, secondary, and undergraduate teaching and learning. There is a particular emphasis on engaging students using NASA Earth observation data and NASA Earth system models. A total of 22 proposals were selected for funding to organizations in the District of Columbia and 14 states: Alaska, Alabama, California, Colorado, Georgia, Illinois, Massachusetts, North Dakota, Nebraska, New York, Oregon, Pennsylvania, Texas, and Virginia. The grants are part of a program Congress began in fiscal year 2008. Winning proposals were selected through a merit-based, peer-reviewed competition. The awards have up to a three-year period of performance and range in value from \$140,000 to \$500,000.

**Competitive Program for Science Museums and Planetariums**—NASA selected 13 informal education providers to share \$6.9 million in grants through this competitive grant program. Participating organizations include museums, planetariums, Challenger Centers, aquariums, and other institutions of informal education. Selected projects will partner with NASA's Museum Alliance, an Internet-based, nationwide network of more than 350 science centers, planetariums, museums, aquariums, zoos, observatory visitor centers, NASA visitor centers, nature centers, and park visitor centers.



Inaugural projects in the program will engage learners of all ages as well as educators who work in formal or informal science education. The projects will provide NASA-inspired space and STEM educational opportunities, including planetarium shows and exhibits.

The first group of projects began in fall 2009 in California, Colorado, Florida, Illinois, Iowa, Minnesota, Michigan, Montana, New York, North Carolina, Vermont, and Washington. The 13 grants have a maximum five-year period of performance and range in value from approximately \$100,000 to \$900,000 each. Selected projects work with the NASA Shared Service Center in Mississippi to complete the business review necessary before issuance of a NASA award. Proposals were selected through a merit-based, external peer-review process. NASA's Office of Education and mission directorates collaborated to solicit and review the grant applications. This integrated approach distinguishes NASA's investment in informal education. NASA received 70 proposals from 32 states and the District of Columbia. Congress funded the Competitive Program for Science Museums and Planetariums grants in 2008. Congress added additional funds in 2009 for new grants.

## Young Rocketeers Achieve Sky-High Success During NASA's 2009 Student Launch Projects

On April 18, more than 350 middle school, high school, college, and university students from 17 states filled the skies over North Alabama with flame and thunder concluding the most successful student launch event NASA's Marshall Space Flight Center (MSFC) in Huntsville, AL, has organized to date.

MSFC and its partners hosted 33 student teams for the 2008-2009 NASA Student Launch Projects. In both year-long rocket-building challenges, students constructed their own vehicle, complete with working science payload, and sought to fly it to an altitude of 1 mile and retrieve it intact.

In the months leading up to the launch, students also produced thorough written and oral presentations on their rockets, created

Web sites about their work, and planned and conducted rocketry- and education-related outreach efforts in their communities.

On launch day at Bragg Farms in Toney, AL, 32 rockets successfully lifted off—nearly twice as many rockets as have ever flown in a single day of NASA student rocketeering. On-board altimeters measured how high each rocket journeyed. Science experiments ranged this year from instruments that study temperature, air pollutants, and the behavior of the rocket itself to built-in water tanks designed to record the sloshing behavior of liquids subjected to ascent and freefall.

Marshall's Academic Affairs Office manages the projects, which are sponsored by the Exploration Systems Mission Directorate and the Space Operations Mission Directorate at NASA Headquarters in Washington, DC. ATK Space Systems of Magna, UT, provided corporate sponsorship. On launch day, the local, nonprofit Huntsville Area Rocketry Association provided technical launch support.

NASA held the first student launch event in 2001 to inspire students to pursue careers in STEM. As its popularity grew, in 2006 NASA created the tandem challenges of the Student Launch Initiative for middle schools and high schools and the University Student Launch Initiative for colleges and universities.

In May 2009, NASA announced that student rocketeers from Utah State University in Logan—who launched a sophisticated rocket of their own design to an altitude of 5,333 feet—were chosen as the 2008–2009 champions of the University Student Launch Initiative. They beat 18 other American college and university teams to clinch their second straight victory in the annual competition.

As the top winner, the Utah State team received \$5,000 from ATK and an invitation from NASA to attend a space shuttle launch at NASA's Kennedy Space Center, FL. The team previously was honored with two preliminary awards at the postlaunch banquet in April: "Best Vehicle Design," for the most creative, innovative, safety-conscious rocket; and the "Project Review Award," for delivering the best combination of written design and flight readiness reviews and formal presentations.

## NASA Awards Scholarships to 100 College Students

WASHINGTON—In June, 2009 NASA announced the selection of 100 full-time undergraduate students to receive a one-year college scholarship. NASA's Motivating Undergraduates in Science and Technology, or MUST, project awards scholarships and internships to students pursuing degrees in STEM. MUST is open to all undergraduates and is particularly focused on engaging students from underserved and underrepresented groups to enter STEM fields.

As part of the program, students benefit from year-round tutoring and professional development training, attendance at lecture series, and mentoring from STEM faculty and peers. Scholarship recipients who maintain the required minimum grade point average also are eligible for a paid internship at a NASA Center.

MUST scholars represent the following colleges and universities: Auburn University, Auburn, AL; Brown University, Providence, RI; California Institute of Technology, Pasadena, CA; California Polytechnic State University, San Luis Obispo, CA; California State Polytechnic University, Pomona, CA; Carnegie Mellon University, Pittsburgh, PA; Clark Atlanta University, Atlanta, GA; College of Saint Benedict, St. Joseph, MN; Duke University, Durham, NC; Fisk University, Nashville, TN; Florida Agricultural and Mechanical University, Tallahassee, FL; Georgia Institute of Technology, Atlanta, GA; Hampton University, Hampton, VA; Harvard University, Cambridge, MA; Massachusetts Institute of Technology, Cambridge, MA; New York University, New York, NY; North Carolina A&T State University, Greensboro, NC; Pennsylvania State University, State College, PA; Prairie View A&M University, Prairie View, TX; Princeton University, Princeton, NJ; Rice University, Houston, TX; Stanford University, Palo Alto, CA; Southern University and A&M College, Baton Rouge, LA; Southwestern University, Georgetown, TX; Swarthmore College, Swarthmore, PA; Tuskegee University, Tuskegee, AL; University of Colorado at Boulder, CO; University of Illinois at Urbana-Champaign, IL; University of Maryland, Baltimore County, MD; University of Maryland, College Park, MD; University of North Texas, Denton, TX; University of Pennsylvania, Philadelphia, PA; University of Pittsburgh, PA; University of Puerto Rico, Mayaguez, PR; University of Texas at Arlington, TX; University of Texas at El Paso, TX; University of Washington, Seattle, WA; Villanova University, Villanova, PA; Washington University, St. Louis, MO.

MUST and other NASA college and university projects support NASA's goal of investing in students to develop the skills and capabilities critical to creating a strong workforce for NASA and the Nation. The MUST project is managed at NASA's Glenn Research Center in Cleveland, OH and administered by a consortium of the Hispanic College Fund, the United Negro College Fund Special Programs, and the Society for Hispanic Professional Engineers.

## NASA Offers New Science Teaching Certificate

Among the participants in the Office of Education's STS-119 prelaunch education forum in March 2009 were members of a new group of NASA teacher fellows. NASA unveiled the Endeavor Science Teaching Certificate Project in late 2008, which will award more than 200 fellowships to educators during a five-year period. The goal of the project is to ensure that teachers across the country can use NASA's ongoing discoveries to inspire the next generation of explorers, scientists, engineers, astronauts, and innovators.

The Endeavor Science Teaching Certificate Project provides workshops, online and on-site graduate courses and NASA content and materials to teachers and students in K-12 classrooms. Educators accepted as Fellows are exposed to current NASA science and engineering, and supported in translating the information for use in classrooms. NASA will collaborate with state departments of education to ensure that participants can apply credit from project courses towards state certification requirements.

Fellows will earn a certificate of completion in Applied Science Education from Teachers College Innovations at Teachers College, Columbia University, NY, and graduate credit from other institutional partners.

Additional efforts by the project include assisting and training preservice science teachers to help improve science instruction in U.S. schools. The project is administered by the U.S. Satellite Laboratory Inc. of Rye, NY. Funding for the program is provided through the NASA Endeavor Teacher Fellowship Trust Fund, in tribute to the dedicated crew of Space Shuttle Challenger mission 51L.

## A Breath of Fresh Air

In the future, astronauts living on the Moon may have today's college students to thank for helping filter lunar dust out of habitats. This is the potential application of just one of many experiments tested by students in 2008 through NASA's Systems Engineering Educational Discovery, or SEED, project at NASA's Johnson Space Center in Texas.

Sponsored by NASA's Exploration Systems Mission Directorate, the project invites undergraduate students to participate in ongoing NASA projects that are related to systems engineering and reduced gravity. The experiments are conducted on a reduced-gravity aircraft. By flying a parabolic arc, the aircraft enables occupants to experience lunar gravity or microgravity for 18 to 25 seconds at a time. This process is done repeatedly during the flight.

According to SEED project manager Doug Goforth, the project supports NASA's goal of strengthening NASA's and



the nation's future workforce by engaging students not only in scientific research but also hands-on investigational design, test operations, and educational/public outreach activities.

Students from Wisconsin's Carthage College conducted an experiment that team member Caitlin Pennington described as "mission critical" to future NASA exploration. The team explored the efficiency of a cyclonic filtration system in a microgravity environment. The experiment tested the effect of lunar gravity on a cyclone used to filter lunar material out of living spaces.

The problem, Pennington explained, is that lunar dust is very, very fine and abrasive. "Astronauts on the Apollo missions had difficulty with the dust sticking to everything and getting in their lungs," she said. "On short missions like those, the lunar dust is just a nuisance; however, on more long-term missions . . . the dust could cause equipment to seize up and would likely cause severe health problems such as black lung disease."

The device tested by Carthage students is a potential solution for filtering lunar dust out of living spaces on the Moon without sending up large machines with many moving parts or sending up filters that would need to be replaced frequently.

"An apparatus utilizing a cyclone filtration system would require fewer moving parts and filters, and thus would be optimal for use in spacecraft and on the lunar surface," Pennington said. "Our experiment tested, for the first time, the efficiency of a cyclone in a lunar environment."

The students concluded that a cyclonic filtration system might actually work. The larger lesson, Pennington said, was experiencing what it is like to participate in a NASA mission.

"My whole team discovered that it takes a lot of hard work, an army of people and great coordination/communication to put together a project like this one," said the physics major. "It gave us great respect for all of the people who are working to reach NASA's many missions and goals."

## NASA and Lockheed Martin Celebrate Space Day 2009

NASA, Lockheed Martin, and learners of all ages celebrated Space Day 2009 beginning Friday, May 1. Space Day is an education and public outreach initiative that takes place annually on the first Friday of May. The theme for 2009 was "Celebrating Human Space Flight: Past, Present and Future." In formal and informal learning settings around the world, students, teachers, friends, and families celebrated the accomplishments of space exploration by engaging in math and science educational activities. Lockheed Martin sponsors Space Day.

Since Space Day's inception in 1997, people around the world have been introduced to space-related STEM. A national celebration occurred on Saturday, May 2, at the Smithsonian's National Air and Space Museum in Washington and included a visit from the astronaut crew of the recent Space Shuttle mission, STS-119, and a live conversation with an astronaut currently living aboard the International Space Station. Schools, scouting troops, and other educational organizations signed their names to large posters as part of the Student Signatures in Space program. Numerous other hands-on educational activities for kids filled the museum. The family event was free and open to the public.

Space Day in Your Neighborhood offers groups the opportunity to let the world know about their Space Day activities by registering them on the Space Day Web site. More than 180 events were registered in countries worldwide, including Canada, Chile, India, Japan, Germany, Pakistan, Brazil, and Australia. NASA and Lockheed Martin invite others to list their events.

The NASA and Lockheed Martin celebration of Space Day continues a strategic partnership that connects students, educators, families, and the public to NASA's mission. These joint activities provide a hands-on introduction to space-related STEM. The goal is to inspire students to learn more about these disciplines and ultimately pursue careers in science and engineering, strengthening the future workforce for NASA and the Nation.

## “Signatures in Space” Connects Kids to Space Day Celebrations

NASA and Lockheed Martin’s Student Signatures in Space (S3) program was one of the highlighted projects during the 2009 Space Day, celebrated annually on the first Friday in May. The mission of Space Day is to use space-related activities to inspire and prepare young people for careers in STEM.

Student Signatures in Space began in 1997 as a way to draw kids into space studies by giving them a personal connection to space. Participating schools are sent large posters for students to sign on Space Day. NASA and Lockheed Martin, of Bethesda, MD, are currently accepting school names for participation. The program is open to elementary, middle, and high schools, as well as science museums and regional Boy Scout and Girl Scout councils.

After schools return the posters to Lockheed Martin, the signatures are scanned onto a disk and flown aboard a Space Shuttle mission. Schools also receive lesson plans and information about the mission their signed posters are flying on.

Upon completion of the Shuttle flight, the posters are returned to the schools along with a photo of the astronaut crew that took the signatures to space and a NASA flight certification verifying that the signatures flew in space. Schools are allowed to participate in the signatures program once every six years.

Student Signatures in Space is limited to 500 schools per year, and schools are registered on a first-come, first-served basis. Schools that sign up after the maximum capacity is reached will be put on a list to participate in the following year’s program.

## High School Program Launches NASA Career

The challenge of launching rockets in high school helped propel Justin Junell into an engineering career, and now, as an analysis engineer at NASA’s John C. Stennis Space Center, he is helping astronauts launch into space.

As a junior at Fredericksburg High School in Texas, Junell began a two-year Principles of Technology program. He and his classmates designed, built, and launched a rocket that was almost five feet tall. During his senior year, the goal was more challenging: a 22-foot-tall rocket they designed to reach an altitude of 100,000 feet. The rocket was launched through the donated use of facilities at the U.S. Army’s White Sands Missile Range in New Mexico.

“Launching rockets at White Sands is not something high school students typically do, but this wasn’t your typical high school class,” Junell says.

While the rocket fell shy of its desired altitude—it reached only 36,000 feet due to a nozzle failure—Junell says launching a rocket

that size was exhilarating. “The rocket on the launch pad is the culmination of months of effort,” he said. “Even getting to that point represents a degree of success.”

Junell had no inkling he would be launching rockets in high school, much less end up as an engineer, until he joined the Principles of Technology Class at Fredericksburg High. He became enticed with the prospect of designing, building, and launching rockets, and by graduation he was engineering-bound.

He ultimately received a scholarship to Kettering University in Michigan. In 2002, he began participating in a NASA cooperative education program that brought him to work in the Test Operations Group at Stennis Space Center (SSC). Since graduating with a bachelor’s degree in applied physics, Junell has become a full-time employee at SSC in the Engineering & Science Directorate as an analysis engineer.



*Astronaut Dominic Gorie (left) stands with Silver Snoopy recipients (l to r): Terry Addlesperger of Ocean Springs, MS, lead test engineer for NASA’s Engineering and Test Directorate at Stennis; and Justin Junell of Fredericksburg, Texas, a theoretical simulation technologist for NASA’s Engineering and Test Directorate at Stennis.*

As part of the Systems Analysis and Modeling group, Junell has contributed to evaluations of the J-2X power pack that supplies propellants to the J-2X engine that was planned to power the upper stage of the Ares I rocket and the Earth departure stage of the Ares V rocket. Junell is also providing analysis for propulsion system acceptance testing for the AJ26 engine that will power the Taurus II space launch vehicle being developed by Orbital Sciences Corporation. The Taurus II will be flown in support of NASA’s Commercial Orbital Transportation Services cargo demonstration to the International Space Station.

Junell is also proud to be a part of the contributions SSC will make toward NASA’s future. Junell lives in Slidell, LA, and is working toward a master’s of mechanical engineering through Auburn University in Alabama.

Justin Junell was one of several Stennis employees who received the Silver Snoopy Award in 2009. The award, which depicts the comic strip character Snoopy, is the NASA astronauts’ personal award. Awardees have made contributions toward enhancing the probability of mission success, or made improvements in design, administrative/technical/production techniques, business systems, flight and/or systems safety or identification and correction or preventive action for errors.

## NASA Announces Education Research Program Awards Recipients

NASA has awarded approximately \$19 million to colleges and universities nationwide to conduct research and technology development in areas of importance to NASA's mission. In addition, the awards enable faculty development and higher education student support.

The selections are part of NASA's Experimental Program to Stimulate Competitive Research, known as EPSCoR. The program is designed to assist states in establishing an academic research enterprise directed toward a long-term, self-sustaining, and competitive capability that will contribute to their economic viability and development. The program helps develop partnerships between NASA research assets, academic institutions, and industry. The selected proposals support all four of NASA's Mission Directorates: Aeronautics, Exploration Systems, Science, and Space Operations. Proposals were chosen through a merit-based, peer-reviewed competition. The



maximum award is \$750,000 for a 3-year period. A one-to-one match of funds is required for every NASA dollar awarded.

A total of 27 proposals were selected from organizations in Alabama, Arkansas, Hawaii, Idaho, Iowa, Kansas, Louisiana, Mississippi, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Puerto Rico, South Carolina, South Dakota, Tennessee, Utah, Vermont, and West Virginia.

- Two proposals were selected from each of the following colleges and universities: New Mexico State University; South Dakota School of Mines & Technology; University of Alabama, Huntsville; University of Nebraska at Omaha; University of Puerto Rico; University of Vermont & State Agricultural College; Wichita State University, Kansas.

- One proposal was selected from each of the following organizations: College of Charleston, South Carolina; Louisiana Board of Regents Foundation; Montana State University; University of Arkansas at Little Rock; University of Hawaii Systems; University of Idaho; University of Mississippi; University of North Dakota; University of Northern Iowa; University of Oklahoma; University of Utah; Vanderbilt University, TN; West Virginia University.

This program and the Agency's other education programs support NASA's commitment to excellence in STEM, which will play a key role in preparing, inspiring, encouraging, and nurturing the Nation's future workforce.

## Students from NASA Schools Nationwide Meet in Houston

Students and teachers from throughout the Nation gathered at NASA's Johnson Space Center in Houston April 29–May 1, 2009 to research results of fellow students and NASA scientists and engineers. The 62 students and 31 educators represented 31 NASA Explorer Schools at an annual national student symposium.

The students learned more about NASA research and exploration through facility tours and presentations from astronauts, scientists, and engineers. Students also completed hands-on educational activities related to current NASA missions.

The NASA Explorer Schools Project establishes a three-year partnership between NASA and school teams to help fourth through ninth grade education communities improve teaching and learning in STEM. The project works primarily with diverse groups of students who are underrepresented in these disciplines or who are traditionally underserved in rural or urban parts of the country. The project joins educators, students, and families in sustained involvement with NASA's research, discoveries, and missions.



The opportunity to participate in the symposium was open to all current NASA Explorer Schools. Students were required to complete a research investigation focused on NASA missions or research interests, including science, aerospace, reduced gravity, robotics, plant growth in space, or living and working in space.

Regional virtual symposia were held in February and March 2009 at all 10 NASA Centers using NASA's Digital Learning Network. The regional symposia challenged students to present their research projects to a panel of NASA experts via videoconferencing. Schools then competitively selected students to represent their school at the national symposium based upon the results of the regional symposia.

The NASA Explorer Schools project continues the Agency's tradition of investing in the Nation's education programs with the goal of attracting and retaining students in STEM disciplines that are critical to NASA's future engineering, scientific, and technical missions. Since the inception of the Explorer Schools project in 2003, NASA has established partnerships with a total of 249 schools from diverse communities located in all 50 states, Washington, DC, Puerto Rico, and the Virgin Islands.



*Tereasa Washington, director of the Office of Human Capital at NASA's Marshall Space Flight Center in Huntsville, AL, displays the award naming Marshall a 2009 Top Supporter of Historically Black Colleges and Universities and Minority-Serving Institutions.*

## NASA's Marshall Center Honored for Support of HBCUs

NASA's Marshall Space Flight Center (MSFC) in Huntsville, AL, has been selected as a 2009 Top Supporter of Historically Black Colleges and Universities and Minority-Serving Institutions.

Selections were based on the results of U.S. Black Engineer & Information Technology magazine's seventh annual survey on the subject.

The award presentation luncheon was held at Howard University in Washington, DC. Tereasa Washington, director of the MSFC's Office of Human Capital, accepted the award on behalf of the Center.

"The Marshall Space Flight Center is honored to have been recognized for our recruitment and education programs, as well as our technical and employment relationships," Washington said. "We are proud of the contributions of Marshall's diverse team to the nation's mission in space, and these colleges and universities will continue to play a significant role in building our work force at a time when our challenges require greater innovation, diversity and perspective than ever before."

MSFC was among dozens of industry organizations and Government agencies that received the award in 2009. They were selected by the deans of 11 accredited college and university engineering programs—including those at Alabama A&M University in Huntsville and Tuskegee University in Tuskegee, AL. Award recipients were chosen based on several factors, including their support for infrastructure modernization and enhancement; participation on school advisory councils; research and development programs; and scholarship, co-op, and career opportunities for students and faculty at minority colleges and universities.

"The Marshall Center is committed to creating an inclusive work environment for its diverse work force," said Audrey Robinson, manager of the Marshall Center's Office of Diversity and Equal Opportunity. "We work hard to ensure that students from minority-serving colleges and universities—like every student we serve and support—have every possible opportunity to be exposed to potential careers in science, engineering and other technical fields, and to the exciting work being done here at Marshall and across NASA."

NASA MSFC's Academic Affairs Office actively supports projects and initiatives that are part of NASA's Minority University Research and Education Program. These projects and initiatives include competitive grants (University Research Center development grants and Curriculum Improvement Partnership Awards), fellowships (NASA Administrator's Fellowship Project, the Harriet Jenkins Pre-doctoral Fellowship Project, Pre-service Teacher Institute, NASA Science and Technology Institute for Minority Institutions), internships (Minorities in Science and Engineering, Tribal Colleges and Summer Research Experience, Society for Hispanic Professional Engineers Scholars Program, Achieving Competence in Computing, Engineering and Space Sciences, Langley Aerospace Research Summer Scholars, and National Action Council for Minorities in Engineering), outreach (Michael P. Anderson Summer Outreach Program, and Mi Futuro—My Future), and scholarships (Motivating Undergraduates in Science and Technology).



## A Wise Choice

In 1987, NASA and Spelman College partnered to work toward increasing the number of minority students earning advanced degrees in STEM. Of the more than 320 women who have participated in the Women In Science and Engineering program, known as WISE, more than half have received graduate degrees, and at least 40 have earned doctoral degrees. WISE scholars have gone on to work for NASA, STEM industries, and STEM education. The 2009 Women In Science and Engineering scholars served summer internships at NASA's MSFC in Huntsville, AL.

Located in Atlanta, GA, Spelman is a private, historically black, liberal arts college for women. From its inception, the NASA WISE program has used scholarships and unique opportunities such as NASA internships to recruit strong, science-focused students. The late Dr. Etta Falconer, a Spelman mathematics professor and one of the first black women in the country to receive a doctorate in mathematics, initiated the WISE program. The WISE program supports NASA's goal of strengthening the Agency's and the Nation's future workforce.

In addition to meeting its primary goal, the WISE program led to the expansion of Spelman's science offerings, which then benefitted all Spelman students. The college has since added a physics department, a computer science department, and a dual-degree engineering program.

While Spelman's chemistry department was formed nearly a decade before the WISE program, chemistry professor Albert Thompson, Jr. said WISE helped push chemistry to the forefront. Today, science majors represent about 30 percent of Spelman's 2,000 students. The college has more than 100 chemistry majors and graduates each year. "The WISE program was our premiere scholarship program," Thompson said, "and certainly it played a major role in putting us where we are in preparing outstanding graduates."

A 2008 survey by the National Science Foundation found that Spelman was No. 2 in the country for sending black students on to acquire doctoral degrees. The college was second only to Howard University, a considerably larger coed university. The success of the WISE program is seen not only in the numbers but also in the success stories of Spelman graduates.

Dr. Kelly Bolden received a bachelor of science in chemistry from Spelman College and a bachelor of chemical engineering from the Georgia Institute of Technology. She earned her medical degree from Baylor College of Medicine. She completed resident training in general surgery at Emory University. Bolden is currently a Plastic and Reconstructive Surgery Fellow at the University of Texas at Southwestern Medical Center.

"The contribution of the NASA WISE program to my current success is twofold," Bolden said. "First, NASA WISE provided me with a science and engineering background that has helped me throughout my medical and surgical career. With new technologies and surgical techniques that are emerging daily, my engineering background is vital to my success in the operating room every day. Whether I'm working with plating systems, prosthetic implants, biosynthetics, or rearranging native tissue, my chemistry and chemical engineering backgrounds provide me with a solid foundation to better understand synthetic products, thermodynamics, spatial orientation, etc.

"Second, NASA WISE enabled me to attend Spelman College, the institution that I attribute to helping me develop the confidence to compete in the male-predominated environment that I work in today. Attending an all female HBCU (Historically Black College and University) enabled me to grow and develop the maturity, self-confidence and self-awareness that have allowed me to excel at every level of my education. As an African-American female in Plastic Surgery (where less than 4 percent of all plastic surgeons are African-American and far fewer are African-American women), having the opportunity to be around so many motivated, intelligent and grounded African-American women empowered me to fight the tough battles and emerge victoriously."



## NASA Names 16th Annual Great Moonbuggy Race Winners

NASA's 16th Annual Great Moonbuggy Race, held April 3–4 2009 at the U.S. Space & Rocket Center in Huntsville, AL, challenged students to think like NASA engineers as they design, build, and race lightweight, human-powered buggies—inspiration, perhaps, to help NASA continue its exploration mission in coming decades.

NASA named its “off-world racing” champions in this year’s race: Rochester Institute of Technology in Rochester, NY, won the college division; Erie High School Team 2 from Erie, KS, and Huntsville Center for Technology Team 2 from Huntsville, tied for first place in the high school division. The three teams bested a field of competitors that included 68 teams from 20 states, Puerto Rico, Canada, Germany, India, and Romania.

The winning teams posted the fastest vehicle assembly and race times in their divisions and received the fewest on-course penalties. The winning Erie High School and Huntsville Center for Technology teams finished the roughly half-mile course—twisting curves, treacherous gravel pits, and other obstacles simulating lunar surface conditions—in just 3 minutes 25 seconds. The team from Rochester Institute of Technology posted a time of 3 minutes 30 seconds.

First-place winners in each division received a trophy depicting NASA’s original lunar rover, along with cash prizes, commemorative medals, and other prizes. NASA also gave plaques and certificates to every participating team.

NASA’s Great Moonbuggy Race is inspired by the original lunar rover designed by engineers at MSFC. Apollo 15 astronauts David Scott and Jim Irwin piloted the first rover across the Moon’s surface in July 1971. The moonbuggy continued to chart new lunar territory during the Apollo 16 and Apollo 17 missions.

Today, student racers face design challenges similar to those overcome by Apollo-era rover engineers. Teams build their vehicles from the ground up, typically using bicycle or light motorcycle tires, aluminum or composite-metal struts and parts, and the best drive trains, gears, suspension, steering, and braking systems they can find or devise.

“This year’s race proved once again that offering students a unique challenge, such as building their own moonbuggy, can inspire and engage them—turning an engineering project into the best fun you can have on wheels,” said Tammy Rowan, manager of MSFC’s Academic Affairs Office, which organizes the moonbuggy race each year.

The race is hosted by the U.S. Space & Rocket Center, and sponsored by NASA’s Space Operations Mission Directorate in Washington, DC. Major corporate sponsorship is provided by Lockheed Martin, The Boeing Company, Northrop Grumman Corporation, Teledyne Brown Engineering, and Jacobs Engineering Science Technical Service Group, all of Huntsville.



## A Girl Scout Takes Flight

When 17-year-old Frenchcesca is in the cockpit of an airplane, she is in a world of her own.

Frenchcesca was introduced to flight at NASA Ames's Launch into Technology Aeronautics Institute and now wants to be a pilot. The California teenager became excited about flying after participating in a special NASA project called Launch into Technology. The summer residential program at NASA's Ames Research Center (ARC) in Moffett Field, CA, teaches teenage girls about science and technology.

Girls select a science topic supported by the Aeronautics Institute, Robotics Institute or Astrobiology Institute. For one week during the summer, they meet and work with NASA scientists.

Frenchcesca chose aeronautics. She and other girls learned how airplanes are designed and what makes them fly. They visited an air traffic control tower where they observed planes landing, taxiing, and taking off. They learned how air traffic controllers direct aircraft on the ground and in the air.

The girls toured the Moffett Field airfield, saw a variety of aircraft, and talked to NASA engineers and pilots about their careers. The teenagers learned how the shape and style of an airplane's wing can affect flight and made paper airplanes with different wing designs. Participants helped conduct tests at a NASA wind tunnel testing facility, where scientists and engineers were testing aircraft designs.

The following summer, Frenchcesca was awarded a scholarship to attend the Aviation Challenge program at the U.S. Space & Rocket Center in Huntsville, AL.

"That's where I got hooked," she said. "That's where I learned to really like it. I've flown in planes, but I've never been behind doing the flying."

These experiences sparked Frenchcesca's interest in science and computers. She has since taken college-level biology and physics courses with the goal to pursue a college degree in physics. She wants to be a doctor. But first she wants to go to a nearby junior college and earn her aviation certificate and pilot's license. She hopes to begin flying before she even graduates from high school!

Frenchcesca attended Launch into Technology again in 2008. This time, she was part of the project's Astrobiology Institute, studying microorganisms to learn more about the origins of life. She and other participants studied the origin, evolution, and distribution of life in the universe, and conducted microbial experiments to determine what kind of environments life can tolerate.

"This program really opened up our eyes to all the smaller things in the world that we can't see with our eyes," she said. The study of microbes is relevant to the search for water and the components needed for life on other planets.

Launch into Technology is part of a larger partnership between NASA and the Girl Scouts of the USA aimed at motivating and encouraging girls to do their best. The partnership supports Girl Scouts' Girls Go Tech national initiative to encourage girls to explore careers in STEM and NASA's goal of attracting and retaining students in STEM disciplines. Girls are introduced to a variety of careers, some they may never have heard of or considered, said Jean Fahy, Girls Go Tech program director for the Girl Scouts of Northern California. According to Frenchcesca, her NASA experiences "really opened my eyes to a lot of things I didn't know I could do before, but now I know I can."

Many girls who participated in Launch into Technology have gone on to other NASA student opportunities, including the INSPIRE internship project for high school students, the NASA Robotics Academy, and the NASA Robotics Alliance Project.

Frenchcesca has become a bit of an ambassador for the Girl Scouts of the USA and NASA. She is active with her troop's Girls Go Tech planning committee and encourages others in her community to participate. "Girl Scouts has made a huge difference in my life."

"It's been an amazing opportunity, and I'm just so grateful for it."

## NASA Education Goals and Framework

In 2006 and beyond, NASA will continue to pursue three major education goals:



### Strengthening NASA and the Nation's future workforce

NASA will identify and develop the critical skills and capabilities needed in aeronautics, Earth and space science, and space operations to ensure achievement of the U.S. Space Exploration Policy. To help meet this demand, NASA will continue contributing to the development of the Nation's science, technology, engineering, and mathematics (STEM) workforce of the future through a diverse portfolio of education initiatives that target America's students at all levels, especially those in traditionally underserved and underrepresented communities.



### Attracting and retaining students in STEM disciplines

NASA will pursue the minds, imaginations, and career ambitions of America's youth. The Agency will focus on engaging and retaining students in STEM education programs to encourage their pursuit of educational disciplines critical to NASA's future in aeronautics, Earth and space science, and space operations and for participation in engineering, scientific, and technical missions.



### Engaging Americans in NASA's mission

NASA will build strategic partnerships and linkages between STEM formal and informal education providers. Through hands-on interactive educational activities, NASA will engage students, educators, families, the general public, and all Agency stakeholders to increase Americans' science and technology literacy.

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## The Guiding Education Strategic Framework

The Education Strategic Coordination Framework is an Agency portfolio approach to education that builds upon the above education goals that were identified in the Agency 2006 Strategic Plan. It aligns NASA's total education portfolio with the strategic plan; provides a coordination structure; and creates an Agency-wide strategic planning, implementation, and evaluation framework for the Agency's investments in education.

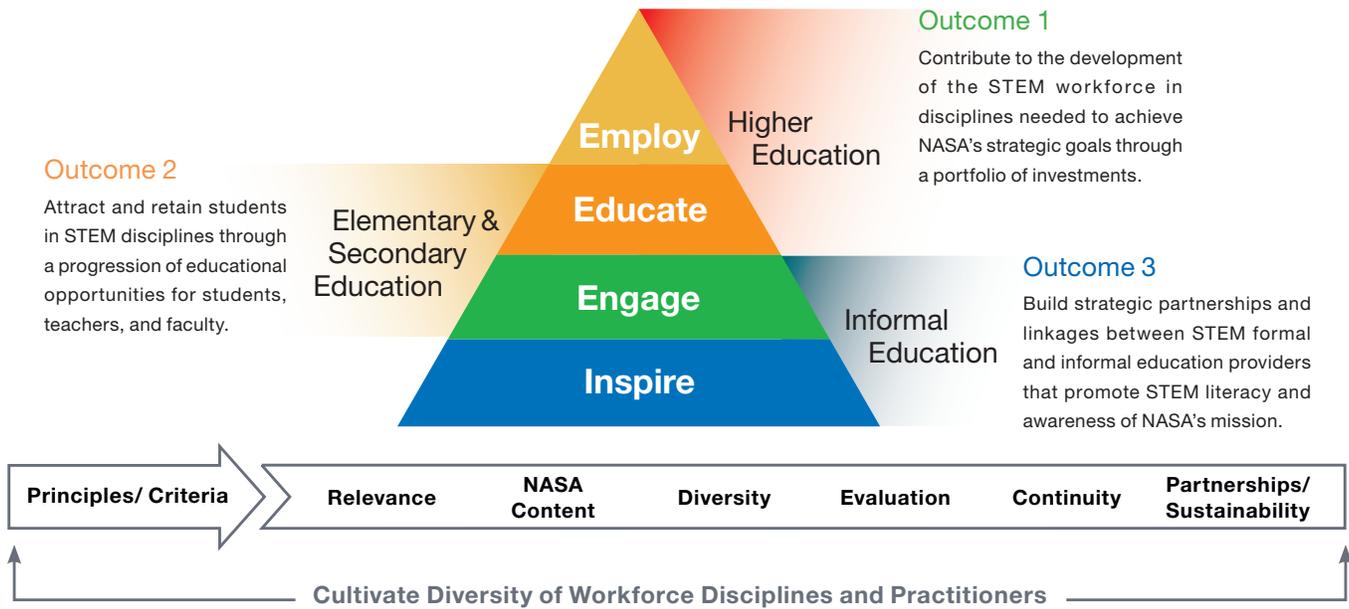
NASA delivers this comprehensive portfolio through its Office of Education, Mission Directorates, and Field Centers, and contributes to our Nation's efforts in achieving excellence in STEM education.

The Education Strategic Framework chart depicted in Appendix B provides a conceptual basis for examining, guiding, and coordinating the NASA education portfolio. It is a strategic management tool that allows the Agency to monitor participant movement through education activities, with each category leading to the next. Education programs and projects draw from the category below them as a key source for participants, and they connect participants to the category above them, providing a more experienced and focused group, and creating a measurable pipeline.

More information about the NASA Education Strategic Framework can be found at <http://education.nasa.gov/about/strategy/>

# NASA Education Strategic Framework

A Clearly Defined and Coordinated Portfolio Approach



**Overarching Philosophy (Cultivate Diversity):** The cultivation of diversity is both a management philosophy and core value for all NASA education efforts. Diversity of the skills and talents needed in our future workforce is critical to our success. Potential at both the individual and organizational levels will be maximized by fostering awareness, understanding, and respect for individual differences. The knowledge, expertise, and unique background and life experiences—including ethnicity, gender, race, religion, and cultural identity—of each individual strengthen the Agency.

**Relevance:** To effectively strengthen the Nation’s STEM workforce, NASA must implement activities that are useful to the education community and that enhance its ability to engage students in the STEM pipeline.

**Content:** Education investments use NASA content, people, or facilities to involve educators, students, and/or the public in NASA science, technology, engineering, and mathematics.

**Diversity:** NASA strives to ensure that underrepresented and underserved students participate in NASA research and education programs to encourage more of these students to pursue STEM careers. Programs and projects are representative of American demographics; engage underrepresented and underserved minorities, women, and persons with disabilities; and reflect an atmosphere of equity, balance, and inclusiveness. NASA will continue to focus on enhancing the capabilities of Minority Serving Institutions to contribute to the research needs of the Agency.

**Evaluation:** Education investments document their intended outcomes and use metrics to demonstrate progress toward and achievement of these outcomes and of annual performance goals. Evaluation methodology is based on reputable models and techniques appropriate to the content and scale of the targeted activity, product, or program.

**Continuity:** Projects and activities draw from audiences who have already demonstrated interest in NASA and connect participants to the next level of engagement. A blend of projects and activities encourages continued student affiliation with NASA throughout their academic careers.

**Partnerships/Sustainability:** Education investments leverage and achieve sustainability through their intrinsic design and the involvement of appropriate local, regional, and/or national partners in their design, development, or dissemination. As appropriate, key aspects of projects and activities are replicable, scalable, and demonstrate potential for continuation beyond the period of direct NASA funding.

# NASA Education Categories of Involvement

## Four Categories of Involvement

### **Inspire**

Activities focused on promoting awareness of NASA's mission among the public, primarily through informal education and outreach activities. This category is heavily supported by the outreach activities of other NASA organizations, such as the Office of Public Affairs. Inspire-level efforts are broad, with the goal of reaching a large number of people. This category forms the base of an education structure that becomes more focused at progressively higher levels of the framework pyramid.

### **Engage**

Education activities that in some manner incorporate participant interaction with NASA content for the purpose of developing a deeper understanding. Participants are strategically identified and targeted.

### **Educate**

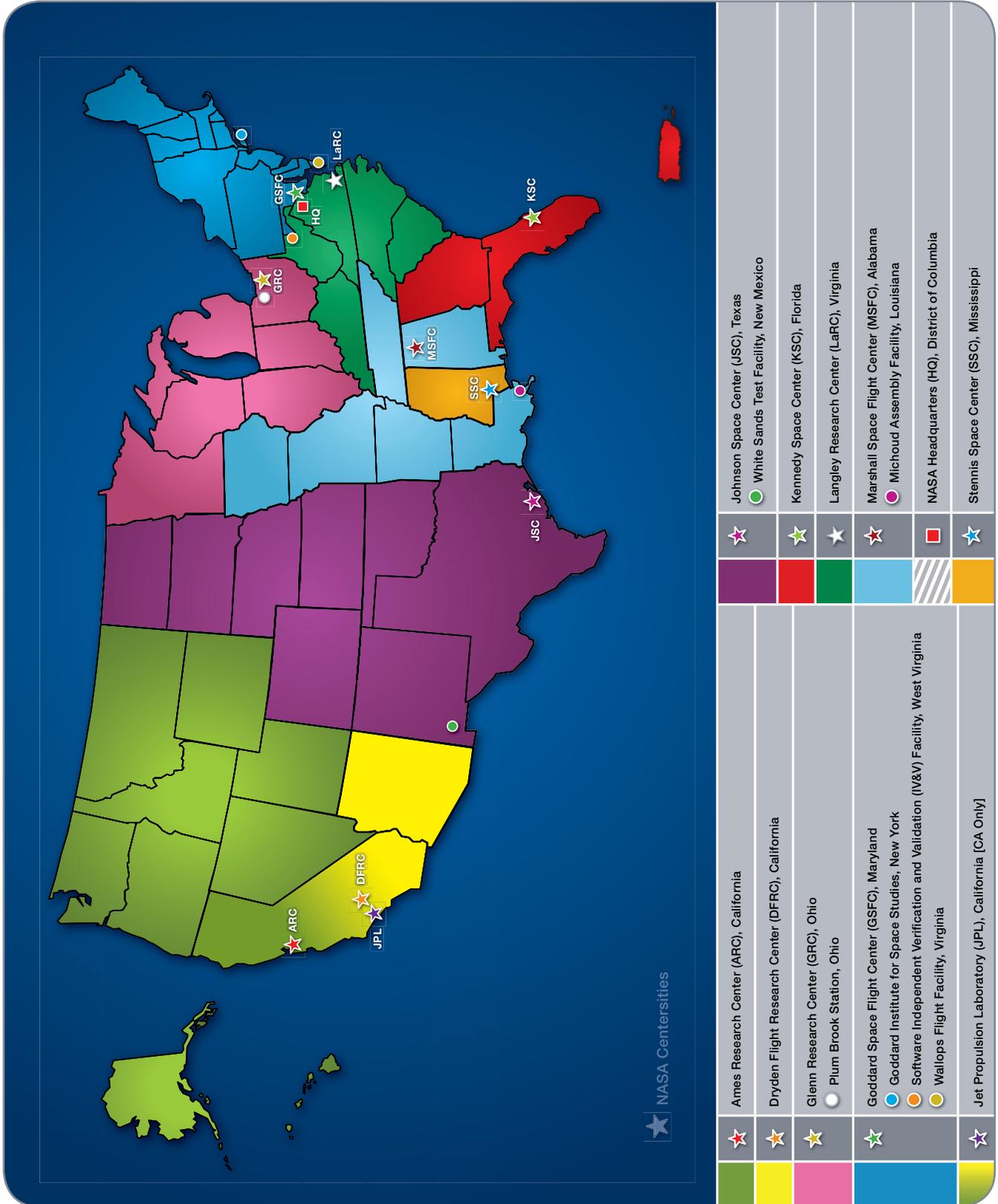
Focused education support that promotes learning among targeted populations. Education activities focus on student learners or pre and inservice educators and are designed to develop and/or enhance specific STEM knowledge and skills using NASA resources. These activities promote new knowledge acquisition and strengthen an individual's skills. NASA's elementary and secondary education efforts are supplementary to formal classroom instruction. NASA's higher education efforts may include development of specific university curricula in support of the NASA mission and student-built instruments.

### **Employ**

Targeted development of individuals who prepare for employment in disciplines needed to achieve NASA's mission and strategic goals. Through internships, fellowships, and other professional training, individuals become participants in the Vision for Space Exploration and NASA science and aeronautics research. At the apex, they have acquired sufficient mastery of knowledge for employment with NASA, academia, industry, or within STEM fields of teaching.



# NASA Education K-12 Service Areas



## For More Information

For more information, please visit [www.nasa.gov](http://www.nasa.gov).

The NASA Web Site is the single point of entry to NASA public content and the most popular Government site on the Web. It serves as the gateway for information regarding content, programs, and services offered by NASA for the general public and, specifically, for the education community.

Visit [www.nasa.gov](http://www.nasa.gov) to find out more information about NASA's mission, research, and activities; NASA Education strategy and programs; and NASA Mission Directorates and Field Centers.





“Let us think of education as the means of developing our greatest abilities, because in each of us there is a private hope and dream which, fulfilled, can be translated into benefit for everyone and greater strength for our nation.”

—John F. Kennedy, the 35th President of the United States





“1961 was the year of my birth -- the year that Kennedy made his announcement. And one of my earliest memories is sitting on my grandfather’s shoulders, waving a flag as astronauts arrived in Hawaii. For me, the space program has always captured an essential part of what it means to be an American -- reaching for new heights, stretching beyond what previously did not seem possible.”

—Barack Obama, the 44th President of the United States

