North Carolina Space Grant Consortium (NCSG)
Lead Institution: North Carolina State University
Director: Christopher S. Brown
Telephone Number: 919-515-4240
Consortium URL: http://ncspacegrant.org
Grant Number: NNX10A168H

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The North Carolina Space Grant Consortium is a Designated Consortium funded at a level of $575,000 for fiscal year 2012.

PROGRAM GOALS

NCSG's goals and objectives (listed below) are part of the Consortium's five-year strategic plan (FY2010-14) and are aligned with NASA's Education Framework:

Goal 1: To deliver a competitive Fellowship/Scholarship program that provides research and education opportunities to students in science, technology engineering, and mathematics (STEM) disciplines at NCSG Affiliate institutions. (NASA Outcome 1)

Objectives: (1.1) Support Graduate Research Fellowships and Undergraduate Research Scholarships; (1.2) Support Undergraduate Scholarships; (1.3) Support Community College Scholarships; (1.4) Support STEM Teacher Education Scholarships; (1.5) Ensure competitive distribution of F&S funds; (1.6) Leverage support from industry, research organizations, and other Space Grant partners for other F&S projects.

Goal 2: To strengthen North Carolina's aerospace-related research infrastructure and capabilities. (NASA Outcome 1)

Objectives: (2.1) Provide start-up funding to early career faculty; (2.2) Encourage research collaborations between faculty and NASA centers/industry; (2.3) Ensure competitive distribution of research funds.

Goal 3: To provide groups of students with opportunities to engage in NASA-mission and STEM-based academic research and coursework. (NASA Outcomes 1 and 2)

Objectives: (3.1) Engage student groups in NASA-related research/design projects; (3.2) Develop STEM courses aligned with NASA's research direction and corresponding Mission Directorates; (3.3) Ensure competitive distribution of higher education funds.

Goal 4: To deliver activities that facilitate the National Space Grant College and Fellowship Program's focus on involving underrepresented groups and persons with disabilities in all higher education program areas (NASA Outcome 1-3).

Objective: (4.1) Pursue and increase the participation of women, underrepresented minorities, and persons with disabilities in NC Space Grant program areas of Fellowship/Scholarship, Student Research and Course Development, and Research Infrastructure.

Goal 5: To equip NC pre-service and in-service educators with tools to inspire the future STEM workforce to pursue education and careers in aerospace-related fields. (NASA Outcome 2)

Objectives: (5.1) Provide professional development opportunities for precollege educators; (5.2) Ensure competitive distribution of precollege education funds.

Goal 6: To increase interest in and understanding of NASA-mission and STEM activities by inspiring and engaging individuals of all ages throughout North Carolina. (NASA Outcome 3)

Objectives: (6.1) Provide professional development opportunities for informal educators; (6.2) Ensure competitive distribution of informal education funds.

Goal 7: To expand the geographic diversity and awareness of NC Space Grant.

Objectives: (7.1) Increase the number of Affiliates and Partners; (7.2) Increase the funding base for NCSG to allow for expanded programming; (7.3) Increase public awareness of NCSG activities.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, & 3)

The following anecdotes/highlights demonstrate the impact of NC Space Grant programs in North Carolina:

Outcome 1 – Fellowship and Scholarship:

"The Space Grant program gave me confidence in doing programs with NASA. After receiving my first award I applied for NASA's National Community College Aerospace Scholars program and was the only North Carolina student selected. This grant has also helped me pay for my education, allowing me to work less hours and concentrate more of my time on school." (Elizabeth Belton, NC State University: 2011 NCSG Community College STEM Scholarship, 2012 NCSG Undergraduate Scholar)

"Not only have I gained confidence, but I have learned so many additional skills through my NC Space Grant research I would not have been exposed to during my normal classroom activities. Also, I have met other scientists at research facilities in the US and Europe that I know will prove to be valuable contacts for my future." (Ashley Roberts, Appalachian State University graduate: 2007 and 2008 NCSG Grant Undergraduate Research Scholar, 2010 and 2012 NCSG Graduate Research Fellow)

"The Space Grant program allowed me to take on a leadership role much earlier in my life than I otherwise would have been able to. It ultimately gave me the confidence and skill set to successfully start my first company in 2012." (Jason Ethier, Duke University graduate: 2007 NCSG Undergraduate Scholar, 2008 NCSG Industry Internship, Cepheron Consulting LLC - Founder and President)

Outcome 1 – Research Infrastructure:

Dr. Jeffrey Wilcox, FY12 New Investigator research award recipient, recently received a grant from the U.S. Fish and Wildlife Service to build upon the project started with NCSG research

seed funds. Only 13 projects were funded nationwide, and his proposal ranked first. According to Dr. Wilcox, "I am positive that the work already begun under the NC Space Grant was a big reason for (this funding). So thank you!! This is part of what could end up being a 5-year, cooperative agreement pending future USFWS funding."

Outcome 3 – Informal Education:

In FY12, NCSG provided support to the NC Science Festival (http://www.ncsciencefestival.org/) to host a Statewide Star Party on April 5, 2013. The NC Science Festival is the largest statewide STEM festival in the nation. The addition of the first-annual Statewide Star Party event will expose the general public to amateur astronomy and allow them to participate in data-gathering for GLOBE at Night, an international citizen science project collecting light pollution data from around the world. To support the Star Party hosts, kits were distributed that included NASA and other materials to educate the public about astronomy and space science, and also training materials to support the hosts in delivering their Star Party. In combination with the NASA resources, the kits included star charts, light pollution demonstration kits, a children's book that explained light pollution, and a hands-on star wheel activity that the general public can take home. The hosts also received tips on hosting successful sky watching sessions and lists of suggested targets for naked-eye, binocular and telescope observing.

Participants gathered at 45 host sites (organized by astronomy clubs, state and local parks, planetarium and nature centers) across North Carolina to gaze into the night sky and learn how to identify objects, and enhance their knowledge of the solar system, galaxy and universe. At the time of this report, participant data, photos, stories, and evaluation data from the event hosts are still being gathered. So far, a number of hosts have reported attracting anywhere from 100-800 attendees per site (http://www.wwaytv3.com/2013/04/05/star-party-kicks-off-north-carolinas-science-festival).

PROGRAM ACCOMPLISHMENTS

Below is a summary of NCSG's FY 2012 program accomplishments as they relate to NASA Education Strategic Framework Outcomes. It is important to note that all NCSG funded projects will conclude June 30, 2013. Therefore, affiliate data that is presented in this APD report is an approximation based on the activity proposed by the Affiliate institution.

NASA EDUCATION OUTCOME 1:

Fellowships and Scholarships

NCSG competitively awarded 64 fellowships and scholarships to students at Affiliate institutions.

- Awarded 11 Graduate Research Fellowships and 21 Undergraduate Research Scholarships to students representing all 12 university Affiliates. Eleven of these research projects had significant partnerships with NASA centers that included a NASA research mentor and the students working on-site at the following NASA centers: Ames (NASA Academy), Glenn (NASA Academy), Goddard (Lunar Planetary Sciences Academy), Kennedy (Internship), Marshall (NASA Academy), Langley (NASA LARSS).
- NC Space Grant continued its partnership with the LORD Corporation to offer a summer internship program for undergraduate and graduate students. NCSG leveraged funding from

LORD to provide support for 9 students (counted in F/S student data) to participate in a 10-week internship at LORD. LORD is a worldwide leader in adhesives and coatings, vibration and motion control, and magnetically responsive technologies.
- Awarded 6 STEM Teacher Education Scholarships to pre-service teachers enrolled in elementary, middle or secondary education degree programs.
- Awarded 8 Undergraduate Scholarships and 9 Community College STEM Scholarships, enabling lower division students an opportunity to explore STEM-related research on their respective campuses.

NCSG Fellowship and Scholarship programs contributed to NCSG Goal 1. Objectives 1.1 and 1.5 were met. Objectives 1.2, 1.3 and 1.4 were below target due to a lack of funding beyond the base award.

Research Infrastructure

Five 'New Investigators' awards were competitively granted to early career university faculty who are conducting research that is directly aligned with NASA's research direction. All projects involved undergraduate and/or graduate students, which provided practical training to students as well as opportunities to present research at professional conferences (10 students engaged through New Investigators program).
- Dr. Rachel Smith, Assistant Professor, Department of Physics and Astronomy, Appalachian State University, *Investigating Solar System Evolution Using High-Resolution Spectroscopy and Radiative Transfer Modeling* (1 student supported)
- Dr. Cynthia Waters, Assistant Professor, Department of Mechanical Engineering, NC A&T State University, *Methods and Characterizations and Titanium Metal Foams for Space Applications* (1 student supported)
- Dr. Sun Yi, Assistant Professor, Department of Mechanical Engineering, NC A&T State University, *Overcoming Communication Time-Delays in Spacecraft Formation Flying* (2 students supported)
- Dr. Philip Bradford, Assistant Professor, Department of Textile Engineering, Chemistry and Science, NC State University, *Novel Composite Thermal Interface Materials for Heat Transfer in Aerospace Structures* (3 students supported)
- Dr. Jeffrey Wilcox, Assistant Professor, Department of Environmental Studies, UNC-Asheville, *Remote Thermal Imaging and On-Site Hydrologic Data Collection to Delineate Groundwater Flow to Seepage Wetlands in Western North Carolina* (3 students supported)

Nine NCSG Affiliate colleges/universities supported an additional 42 students to participate in STEM-related research through research assistantships under the supervision of a faculty /industry mentor. Research was either conducted on campus or at other facilities including Indiana State University, Pisgah Astronomical Research Institute, and Sartorius Stedim Biotech (NY).

NCSG Research Infrastructure programs contributed to NCSG Goal 2. Objective 2.1 was partially met (the number of faculty seed grant awards were below target due to lack of additional funding; student target met). Objectives 2.2 and 2.3 were met.

Higher Education Programs

Three 'Higher Education/Course Development' awards were competitively granted in FY12 resulting in the development of one new course hypersonic technologies) and two enhanced courses (active learning introductory astronomy course and undergraduate research in microgravity). A total of 26 students were engaged in Higher Education Course Development activities.

- Dr. Daniel Reichart, Associate Professor of Physics and Astronomy at UNC-Chapel Hill, converted ASTR 101, a traditional lecture-based introductory astronomy course, into an active learning course. The redesigned course involved assigning video lectures ahead of class so that class time can be better utilized for review, group work, problem solving, and introduction of current topics in astronomy. A total of 965 students participated in the revised course in FY12.
- Dr. Fred DeJarnette, Professor of Aerospace Engineering at NC State University, developed a graduate/senior level course in hypersonic technologies that can be taught on-line by multiple instructors from several organizations.
- Dr. Tim Ritter, Professor of Physics at UNC-Pembroke, developed a two part course sequence for advanced microgravity studies for undergraduate students (science and non-science majors) to develop and conduct research as part of NASA's Reduced Gravity Student Flight Opportunities Program. Students spent the academic year conducting research on the effects of microgravity on the Cori cycle.

In FY12, NCSG implemented two new competitive higher education grant programs: Senior Design and Team Competition. These programs provide support for student groups to participate in a variety of higher education activities that emphasize workforce development through the incorporation of interdisciplinary research collaboration. Fourteen competitive awards were granted in FY12 (7 Senior Design, 7 Team Competition) to teams at Guilford Technical Community College, NC A&T State University, NC State University and UNC-Charlotte, reaching 83 undergraduate students. Team competition activities included:

- SAE Aero Design East Competition (March 2013): NC A&T State University.
- IEEE SoutheastCon Hardware Competition (April 2013): UNC-Charlotte.
- NASA Undergraduate Student Launch Initiative (April 2013): NC State University (High Powered Rocketry Club) and UNC-Charlotte.
- National Intercollegiate Flying Association's SAFECON Competition (May 2013): Guilford Technical Community College.
- NASA Lunabotics Competition (May 2013): UNC-Charlotte.
- Association for Unmanned Vehicle Systems International's Student Unmanned Air Systems Competition (June 2013): NC State University (Aerial Robotics Club).

Additionally, NCSG Affiliates provided leveraged support to teams on their respective campuses:

- Duke University: provided support for the team to participate in the Shell Eco-Marathon Challenge (April 2013). The Duke Eco-marathon Team placed third overall (out of 64 teams) in the prototype (battery electric) competition.
- Mitchell Community College: participation in RockSatC, a program for students to design, build, and fly a payload on a sounding rocket launched from NASA Wallops (Spring 2013).

NCSG Higher Education programs contributed to NCSG Goal 3. All Goal 3 Objectives were exceeded (3.1) or met (3.2-3.3).

Of the 225 students supported in FY12 through Fellowship/Scholarship, Research Infrastructure, and Higher Education programs, 48 (21%) went to students from historically underrepresented minority groups and 59 (26%) to females. *(NCSG Goal 4, Objective 4.1)*

- NCSG minority student participation does not meet the target of 28.3% set by the NCSG FY2010-14 Strategic Plan (and based on the enrollment percentage of minority students in NC as published in the National Center of Education Statistics Digest). *It is important to note that the data reflected in this report may not represent all students engaged. Final student data reports will be provided by Affiliates after the conclusion of their FY12 performance period (June 30, 2013).*
- The percentage of female participants fell short of the 55% target set by the NCSG 2010-14 Strategic Plan (Outcome Indicator: 55% of awards will be made annually to female applicants. The 55% target was derived from the enrollment of female students in NC degree-granting institutions as published by the National Center for Education Statistics). This strategic target, however, is not reflective of the number of female students enrolled in STEM degree programs.

NASA EDUCATION OUTCOME 2:

Three 'K-12 Professional Development' awards were competitively awarded in FY12. Funded projects involved collaboration with partners to achieve its strategic goals of equipping the future STEM workforce and enhancing precollege educator knowledge of aerospace issues.

- Dr. David Pugalee, Professor and Director of the Center for STEM Education, UNC-Charlotte, *STARS – Science Teacher Astronomy Research Sessions* (25 in-service middle school teacher participants)
- Dr. Eric Marland, Professor, Department of Mathematical Sciences, Appalachian State University, *High Country Robotics* (30 in-service middle and high school teacher participants)
- Dr. Jose D'Arruda, Professor, Department of Physics, UNC-Pembroke, *Bringing Robotics into the Classroom*, (15 in-service middle and high school teacher participants)

FY12 was the final year of NCSG's partnership on a two-year NASA K-12 Cooperative Agreement Notice awarded to the NC Science, Mathematics and Technology Education Center, initiated in 2010. *Flight Fellowships: STEM in Aerospace Science and Aeronautics* was an innovative professional development model brought together a coalition of high school teachers, research scientists and industry leaders in North Carolina. A total of 21 expert teachers (in two cohorts FY10-FY12) were competitively selected to learn about contemporary aerospace science and develop innovative, locally relevant curriculum using NASA educational resources to motivate students to pursue STEM study and careers in aerospace. Each Flight Fellowship included a mentored summer research externship, professional development institutes, and a mid-year professional development workshop.

In the final FY12 cohort, eleven teachers were selected for Flight Fellowships at the following institutions: U.S. Navy's Fleet Readiness Center East, Elizabeth City State University, NC A&T State University, Pisgah Astronomical Research Institute, Spirit AeroSystems, NC State

University, and the Morehead Planetarium and Science Center at UNC-Chapel Hill.

NCSG Affiliates provided support for NASA/STEM resource sharing and discipline training opportunities on their local campuses through activities such as teacher fellowships and interdisciplinary workshops. Projects included:

- Funding for one in-service teacher to work alongside Appalachian State University undergraduate students to conduct hands-on physics research.
- Earth Science professional development for five Elizabeth City State University pre-service science teachers and 5 in-service teachers.

NCSG precollege education program contributed to NCSG Goal 5. Objectives 5.1 and 5.2 were met.

NASA EDUCATION OUTCOME 3:

Four 'Informal Education and Public Outreach' awards were competitively awarded through partnerships with informal education venues and community groups. Participant data for these activities were not available at the time of this report (FY12 projects conclude June 30, 2013).

- Dr. Tonya Coffey, Department of Physics and Astronomy at Appalachian State University, *Mobile Nanoscience Laboratory Outreach Program*
- Dr. Tim Ritter, Department of Chemistry and Physics, UNC-Pembroke, *Engaging NC's American Indian Youth with Microgravity Science*
- Mr. Jonathan Frederick, Director, NC Science Festival, Morehead Planetarium and Science Center at UNC-Chapel Hill, *Statewide Star Party*

NCSG and its Affiliates provided funds to support local/regional events that engage students and the general public in STEM careers and NASA activities. Projects included:

- Support for aerospace activities onboard the NC Community College System's *Mobile Career Launch Pad*, a large mobile laboratory that visits middle schools, high schools and community colleges to promote the STEM education pathways critical to North Carolina. The lab includes hands-on equipment, demonstrations, and computer-based 3-D simulation career exploration tools.
- Support for two visually impaired high school students to participate in the National Federation of the Blind's 2012 Youth Slam. This five-day academy engages and inspires the next generation of blind youth to consider careers in STEM. While staying on a college campus, students are mentored by blind role models during hands-on activities designed to build confidence and increase science literacy.
- Support for Guilford County School's participation in the Student Spaceflight Experiment Program. A team of students from Johnson Street Global Studies middle school were selected to fly an experiment to the International Space Station on the first operational flight of the SpaceX Dragon, which was launched in the fall of 2012.
- Support for UNC-Chapel Hill's chapter of 'Students for the Exploration and Development of Space' to host the Carolina Space Symposium in April 2013. The Symposium will be themed around the intersection of current astronomy and physics research with progress in the space

industry (private and government) and will feature a weather balloon launch, planetarium shows, and speakers from the space industry.
- Support for a public lecture at East Carolina University featuring Captain Mark Kelly, Commander of the Space Shuttle Endeavor's final mission.

NCSG informal education and public outreach program contributed to NCSG Goal 6. Objectives 6.1 and 6.2 were met.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- Student Data and Longitudinal Tracking: Total awards = 225; Fellowship/Scholarship = 64, Higher Education/Research Infrastructure = 161; 48 of the total awards represents underrepresented minority F/S and HE/RI funding. During the FY12 program year, 41 students who were being longitudinally tracked took the following 'next step': 25 are pursuing advanced degrees in STEM disciplines, 3 accepted STEM positions at NASA contractors, 33 accepted STEM positions in industry, 1 accepted STEM positions in K-12 academia, 15 accepted STEM positions in academia, and 6 went on to positions in non-STEM disciplines. The remaining students have not yet received the degree that they were pursuing while the received their Space Grant award.
- Diversity: NCSG Affiliates include: 6 four-year baccalaureate through doctorate institutions, 5 four-year baccalaureate through masters institutions, and 1 four-year baccalaureate institution. Of the 12 NCSG university Affiliates, 4 are Minority Serving Intuitions. Furthermore, the NC Community College System is an Affiliate and is comprised of 58 two-year associate degree granting institutions. All students and faculty attending a NCSG Affiliate institution were eligible to compete for NCSG support in FY12. Of all students receiving direct support, 21% were minority students and 26% were female.
- Minority-Serving Institution (MSI) Collaborations: NCSG has 4 MSIs that are active Affiliates of the consortium: Elizabeth City State University (ECSU), NC A&T State University (NCA&T), NC Central University (NCCU), and Winston-Salem State University (WSSU). Each of these universities received funding from NCSG in FY12 to implement programs on their campuses that contribute to NASA and NCSG.
  - ECSU: awarded one Undergraduate Research Scholarship for a student to participate in NASA LARSS program (Outcome 1); supported 4 student research scholarships (Outcome 1); hosted an in-service teacher professional development workshop on planetary geology (Outcome 2); provided funds for the ECSU Planetarium and Port Discover Science Museum to implement astronomy programs in the community (Outcome 3).
  - NCA&T: awarded two Graduate Research Fellowships (one of the students participated in the NASA Academy at Ames) through NCSG competition (Outcome 1); supported senior aerospace design activities and team participation in the Lockheed Martin/SAE Aero-Design competition (Outcome 1); provided support to Win-Win Resolutions BOTSO/LOTSO after school mentoring program (Brothers/Ladies Organized to Serve Others) to send a group of middle and high school students to NASA Langley (Outcome 3).
  - NCCU: supported one student to participate in the NCSG/LORD Corporation Summer Internship program (Outcome 1); supported 3 minority students in hands-on research activities mentored by faculty (Outcome 1).

- WSSU: awarded one Undergraduate Scholarship through NCSG competition (Outcome 1); provided support for 6 students to present their research at national professional conferences (Outcome 1); student-led outreach in the local community (Outcome 3).

- NASA Education Priorities: NCSG accomplishments related to the "Current Areas of Emphasis" include:
  - Authentic, hands-on student experiences in science and engineering disciplines: project examples described in 'Program Accomplishments – Outcome 1.'
  - Diversity of institutions, faculty and student participants: as described in NCSG Goal 4, a common thread throughout all programming areas is to increase the participation of women, underrepresented minorities, and persons with disabilities. The composition of NCSG Affiliates (4 of which are Minority Serving Institutions) provides opportunities for minority populations to engage in NCSG programs. In FY12, 21% of student receiving direct support were from underrepresented minority groups and 26% were female. Furthermore, of the 20 faculty receiving direct NCSG support, 25% were females.
  - Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise: 3 projects funded that support middle school professional development (described in 'Program Accomplishments – Outcome 2').
  - Summer opportunities for secondary students on college campuses: NCSG did not perform any programs in this area of emphasis in FY12.
  - Community Colleges: NCSG offers the competitive Community College Scholarship program to students attending any NC campus and are majoring in a STEM discipline. NCSG also supports student teams from Guilford Technical and Mitchell Community Colleges to participate in national competitions (described in 'Program Accomplishments – Outcome 1'). Using NCSG funds, the NC Community College System supports aeronautics activities associated with the Mobile Launch Pad outreach across the state (described in 'Program Accomplishments – Outcome 3').
  - Aeronautics research: Faculty at NC A&T State University (NCAT) are actively engaged in research related to NASA's Next Generation Air Transportation System and engage students in research activities (through collaborations at NASA Glenn Research Center and the Air Force Research Laboratory at Wright Patterson Air Force Base) (Outcome 1). NCAT's NASA funded Center for Aviation Safety (CAS) conducts engineering research and education in three major areas (Advancing Composites and Structures; Integrating Vehicle Health Management and Advancing Aeromechanics and Propulsion) to address the challenges of NASA's Aeronautics Research Mission Directorate's Fundamental Aeronautics and Aviation Safety Programs. NCA&T's CAS faculty served as mentors for a NASA Flight Fellowship (described in 'Program Accomplishments – Outcome 2').
  - Environmental Science and Global Climate Change: NCSG provided funds to support a 'New Investigators' faculty research project (Dr. Jeffrey Wilcox, 'Program Accomplishments – Outcome 1'). Three Earth Science majors at UNC-Asheville began field work in August 2012 with Dr. Wilcox to install monitoring wells, collect hydrologic data, and use infrared imagery to assess the conditions supporting seepage wetlands in western North Carolina. All three students attended the 2012 Geological Society of American annual conference in November and were co-authors on a poster entitled "Toward a better understanding of hydrologic controls on mountain wetlands in the southern Appalachians." Since late fall, each student focused on one of the wetlands that the team had begun to characterize in the fall of 2012, resulting in three independent student research

projects: (1) a project entitled *Delineating the water source of two ponds flowing into a mountain bog in the Southern Appalachians*, with work conducted at a wetland site owned by the Nature Conservancy, (2) a project at Bluff Mountain, a rare mountain fen just north of Boone, NC. This student was accepted to participate in a highly competitive soil science internship at the Mountain Horticultural Research & Extension Center, and (3) a project at a site in Henderson County that involved the installation and monitoring of over a dozen groundwater monitoring wells.

– Enhance the capacity of institutions to support innovative research infrastructure activities: the NCSG 'New Investigators' program is designed to strengthen North Carolina's aerospace-related research infrastructure by providing startup funding to early career university faculty who are conducting research that is directly aligned with NASA's Strategic Framework. Five 'New Investigator' projects were awarded in FY12 (described in 'Program Accomplishments – Outcome 1').

IMPROVEMENTS MADE IN THE PAST YEAR

- In FY12, NCSG initiated a new competitive funding opportunity for Senior Design and Team Competition grants. In order to funds these new programs, NCSG reallocated funds from the Higher Education Course Development program (thus reducing the number of awards made in in this program area in FY12). The Senior Design/Team Competition programs were developed in response to the NASA Office of Education 'STEM Engagement' line of business and NCSG's need to expand engagement into our Higher Education portfolio. In the first year of implementation, 14 projects (8 teams) were supported, reaching 83 students (11 community college and 72 undergraduate students). Student teams competed in RockSAT, NASA Lunabotics, NASA USLI, and other national STEM competitions ('Program Accomplishments – Outcome 1').
- In FY12, NCSG leveraged $90,000 ($60,000 in FY11) beyond its core Fellowship and Scholarship funding to support student internships in aerospace industry at the LORD Corporation.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

NCSG has an organizational structure that enables each Affiliate member to play a significant role in project development and implementation of programs. Overall direction, policies, rules of governance, and budgetary priorities are established through consensus by the Consortium Executive Board, which consists of the NCSG Director and Campus Directors from each of the following thirteen Affiliate institutions:

Appalachian State University is a 4-year, Baccalaureate and Master's degree granting public university. ASU facilitates programs that contribute to NASA Education Outcomes 1-3.

East Carolina University is a 4-year, Baccalaureate, Master's and PhD degree granting public university. ECU facilitates programs that contribute to NASA Education Outcomes 1-3.

Elizabeth City State University is a 4-year, Baccalaureate degree granting public university and is classified as a HBCU. ECSU facilitates programs that contribute to NASA Education Outcomes 1-3.

Duke University is a 4-year, Baccalaureate, Master's and PhD degree granting private university. Duke facilitates programs that contribute to NASA Education Outcome 1.

North Carolina Agricultural and Technical State University is a 4-year, Baccalaureate, Master's and PhD degree granting public university and is classified as a HBCU. NCA&T facilitates programs that contribute to NASA Education Outcomes 1 and 3.

North Carolina Community College System is comprised of 58 campuses across the state; 2-year Associate degree granting institutions. The NCCCS facilitates programs that contribute to NASA Education Outcomes 1 and 3.

North Carolina Central University is a 4-year, Baccalaureate and Master's degree granting public university and is classified as a HBCU. NCCU facilitates programs that contribute to NASA Education Outcome 1.

North Carolina State University is a 4-year, Baccalaureate, Master's and PhD degree granting public university. NCSU facilitates programs that contribute to NASA Education Outcomes 1-3.

University of North Carolina at Asheville is a 4-year, Baccalaureate degree granting public university. UNCA facilitates programs that contribute to NASA Education Outcomes 1-3.

University of North Carolina at Chapel Hill is a 4-year, Baccalaureate, Master's and PhD degree granting public university. UNCCH facilitates programs that contribute to NASA Education Outcomes 1-3.

University of North Carolina at Charlotte is a 4-year, Baccalaureate, Master's and PhD degree granting public university. UNCC facilitates programs that contribute to NASA Education Outcomes 1-3.

University of North Carolina at Pembroke is a 4-year, Baccalaureate and Master's degree granting public university. UNCP facilitates programs that contribute to NASA Education Outcomes 1-3.

Winston-Salem State University is a 4-year, Baccalaureate degree granting public university and is classified as a HBCU. WSSU facilitates programs that contribute to NASA Education Outcomes 1 and 3.

In addition, partnerships with industry, government and nonprofit agencies help NCSG achieve its strategic goals and objectives. Consortium partners include:

Industry Partner:
LORD Corporation is a worldwide leader in adhesives and coatings, vibration and motion control, and magnetically responsive technologies. Operating from world headquarters in Cary, North Carolina, LORD Corporation has 17 manufacturing facilities in nine countries and 90 strategically located sales and support centers worldwide. NCSG partners with LORD to offer the NCSG/LORD Corporation Summer Internship program. Since 2008, 36 students have

participated in the program, which is fully funded by LORD. LORD contributes to NASA Education Outcome 1.

Education Partners:
North Carolina Science, Mathematics and Technology Center (SMT) promotes innovation in science, mathematics, and technology learning in the state's elementary and secondary public schools. NCSG partners with the SMT Center to implement the NASA Flight Fellows program. SMT contributes to NASA Education Outcome 2.

Kenan Fellows Program (Kenan Institute for Engineering, Technology & Science) promotes teacher leadership, addresses teacher retention and advances K-12 science, technology and mathematics education. NCSG partners with the KFP to implement the NASA Flight Fellows program. The KFP contributes to NASA Education Outcome 2.

Pisgah Astronomical Research Institute (PARI) is a not-for-profit foundation dedicated to providing hands-on educational and research opportunities for a broad cross-section of users in science, technology, engineering and math (STEM) disciplines. NCSG partners with PARI to provide opportunities for students to conduct astronomical and/or engineering-based research projects. PARI activities contribute to NASA Education Outcome 1.

North Carolina Museum of Natural Sciences (NCMNS) is a state-funded museum that provides opportunities for visitors to explore the natural world through hands-on exhibits and programs. NCSG annually participates in the museum's Astronomy Days event. NCMNS activities contribute to NASA Education Outcome 3.

Student Spaceflight Experiments Program (SSEP) is an initiative by the National Center for Earth and Space Science Education, in partnership with NanoRacks, LLC, that provides opportunities for students to design, build and fly experiments in low Earth orbit. NCSG partners with SSEP to provide opportunities for NC middle school students to participate in the program. NCSG SSEP activities contribute to NASA Education Outcome 3.

Virginia Space Grant Consortium (VASGC) is part of the National Space Grant College and Fellowship Program. The Director of the VASG serves as a member of the NCSG Advisory Board.

Government Partners:
NASA Langley Research Center (LARC) provides opportunities for students and faculty to engage in aerospace research. NCSG activities at NASA LARC contribute to NASA Education Outcome 1.

University of North Carolina General Administration oversees the multi-campus university system composed of 16 public senior institutions of higher education and the NC School of Science and Mathematics. NCSG partners with UNCGA to ensure that strategic goals and programs align with North Carolina education priorities for higher education.

The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.