

**North Carolina Space Grant Consortium**  
**North Carolina State University**  
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### **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 **\$730,000** for fiscal year 2008.

### **PROGRAM GOALS**

NC Space Grant's FY2008 program goals and objectives, as described in the Consortium's 2005-2010 Strategic Plan are aligned with NASA's Education Framework. A common thread is to expand programs to more citizens of NC and involve women, underrepresented minorities, and persons with disabilities.

#### *Fellowships and Scholarships (NASA Outcome 1)*

Equip the future STEM workforce by (1) engaging 15 to 25 students per year in hands-on aerospace-related research projects, (2) engaging 10 to 20 students per year in aerospace-related study projects, (3) facilitating positive mentor relationships between 25 to 45 students and faculty members per year, and (4) providing venues for 25 to 45 students to conduct research presentations annually. ***All were exceeded in FY2008.***

#### *Research Infrastructure (NASA Outcome 1)*

Strengthen North Carolina's aerospace-related research infrastructure by (1) providing 5 seed grants per year to new or transitioning faculty members whose research is directly aligned with NASA's priorities, and (2) facilitating research collaborations between NC Space Grant member institutions and NASA field centers. ***All were exceeded in FY2008.***

#### *Higher Education (NASA Outcomes 1 and 2)*

Better equip the future STEM workforce by (1) providing 10 to 15 extramural, aerospace-related work/study experiences to students per year, (2) facilitating positive mentor relationships between 10 to 15 students and faculty members per year, (3) providing venues for 10 to 15 students to conduct research presentations annually, (4) developing 4 sustainable interdisciplinary and/or distance learning courses which engage 10 to 20 students each and are focused on enriching students understanding of complex aerospace

issues (*Outcome 1*). Enhance Precollege educators' knowledge of aerospace issues by providing professional development workshop and training opportunities for 25 precollege educators per year (*Outcome 2*). ***All were met or exceeded in FY2008.***

*Informal Education and Public Outreach (NASA Outcome 3)*

Enhance informal educator knowledge of aerospace issues by providing professional development training for 25 informal educators per year by partnering with organizations such as museum, science centers, and civic groups, to provide informal educator development workshops and training opportunities. ***Exceeded in FY2008.***

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

The following anecdotal highlights demonstrate the impacts of NC Space Grant programs on students:

My research experiences at Pavilion Lake and in the Arctic will inevitably help launch me into a career in astrobiology. Perhaps the most important aspect of my summer was the astounding array of people I met. I was inspired by every member of the research teams in British Columbia and the Arctic. I am thrilled to say that I have been invited back to Pavilion Lake, with the offer to head up the efforts to characterize the molecular biology of the lake. (Zena Cardman, UNC-Chapel Hill, 2008 Undergraduate Research Internship – NASA Ames)

The experience I have obtained during my internship at Lord Corporation has been an invaluable part of my ongoing education. This has been my first exposure to mechanical engineering and electromechanical systems. My research required me to use skills from almost all of the physics classes I've taken at UNC. All of the engineers I interacted with are experts in their field and knowledgeable about every aspect of engineering. (Raheel Mahmood, UNC-Chapel Hill, 2008 NC Space Grant/LORD Corporation Summer Internship)

The Space Grant program has helped me develop the skills necessary to organize very large data sets into manageable and interpretable formats. Furthermore, participation in this program has taught me to analyze these data sets from an objective scientific stand point, as well as, to present the results in an understandable manner. (Ralph McGee, UNC-Charlotte, 2008 Undergraduate Research Scholar)

**PROGRAM ACCOMPLISHMENTS**

Below is a summary of NC Space Grant's FY2008 program accomplishments as they correlate with the NASA Education Strategic Framework:

**Outcome 1:**

*Fellowships and Scholarships:*

Provided **12 Graduate Research Fellowships** and **24 Undergraduate Research Scholarships** to students representing all of its member institutions. **NC Space Grant affiliates supported an additional 72 students** involved in research and higher education efforts on their respective campuses under the direction of a research

mentor. Nine of these research projects had significant partnerships with NASA centers that included a NASA research mentor and the students working on-site at the NASA center (NASA Ames, Goddard, Kennedy, Langley and Marshall).

Provided **19 Undergraduate Scholarships and 2 Community College Transition Scholarships**, providing lower division students an opportunity to explore STEM-related research on their campus.

Partnered with the State of NC Undergraduate Research and Creativity Symposium (SNCURCS) to provide a statewide platform for Undergraduate Research Scholar presentations. **29 NC Space Grant Research Scholars and Fellows participated in the symposium**. In addition to SNCURCS, **a total of 53 students presented their research at other symposia** across the state and region.

Of the **129 awards** to students, 35 (27.1%) went to students from historically underrepresented groups. This meets the target ratio of 27.1% set by the 2005-2010 NC Space Grant Strategic Plan and is consistent with the enrollment percentage of minority students in NC (27.9%) as published in the National Center of Education Statistics Digest (US DoED, 2006).

NC Space Grant **partnered with the LORD Corporation** to develop a summer internship program for undergraduate and graduate students. LORD is a worldwide leader in adhesives and coatings, vibration and motion control, and magnetically responsive technologies. This program provided support for four students (included in F/S student data) to participate in a 10-week internship at LORD.

The partnership continued with the Pisgah Astronomical Research Institute (PARI) through support of **NC Space Grant/ J. Donald Cline Astronomy Scholarship**. The scholarship gives the student an opportunity to engage in research at PARI.

*Research Infrastructure:*

Supported **nine New Investigations awards** to faculty to conduct projects directly aligned with NASA priorities. All projects involved undergraduate and/or graduate students, which provided practical training for future aerospace workforce opportunities (see student research award data). Two projects are described below:

- Dr. Guodong Guo, an Assistant Professor of Mathematics and Computer Science at NC Central University, is developing a stress recognition system using both visible and infrared cameras to capture the human behaviors and stressors experienced by astronauts performing mission-critical tasks during space missions.
- Dr. Jeffrey McBride, an Associate Professor of Biomechanics at Appalachian State University, studies resistive whole body vibration exercises in a simulated microgravity environment and determine if this type of physical activity might be utilized for maintaining muscle strength and function with space travel.

*Higher Education Course Development:*

**Awarded four higher education course development projects.** One example is:

- Dr. Daniel Reichart, an Associate Professor of Physics and Astronomy at UNC-Chapel Hill, is modernizing their introductory astronomy course using the PROMPT telescopes in Chile and the Skynet control system. Over 600 students will have direct access to telescopes in both North and South America through the first online version of this laboratory course.

## **Outcome 2:**

**Awarded two K-12 Professional Development** awards and collaborated with partners to achieve its strategic goals of equipping the future STEM workforce and enhancing precollege educator knowledge of aerospace issues. The funded projects are described below:

- Dr. Michael Ruiz, Professor of Physics at UNC-Asheville, **developed and conducted two online interactive K-12 teacher workshops for 33 teachers** to study and use NASA satellite imagery.
- The Morehead Planetarium and Science Center implemented Project OBSERVE (Observation Based Student Experience in Research Via Exploration) by **training 25 high school earth/environmental science and astronomy teachers** in observational astronomy, remote telescope control, and image processing.

## **Outcome 3:**

**Awarded four Informal Education and Public Outreach awards** that were highly leveraged through partnerships with informal education venues and community groups. Two of these partnerships are described below:

- Provided funds to UNC-Pembroke's 'Weightless Lumbees' team to participate in NASA's Reduced Gravity Student Flight Opportunities Program. Throughout the year, the team made six outreach presentations to approximately 1,200 largely Native American youth.
- Participated in Astronomy Days at the NC Museum of Natural Science in January 2009. This annual two-day event brought over 14,500 visitors to the museum.

## **PROGRAM CONTRIBUTIONS TO PART MEASURES**

- **Student Data and Longitudinal Tracking:** All 129 supported students in 2008 remain enrolled in the degree that they were pursuing while they received their Space Grant award. For all 272 students that were significantly supported from FY2006-FY2008, 37% have graduated and are pursuing advanced STEM degrees, 29% are employed by non-NASA contractors, 14% are employed in academia (STEM), 10% are employed by a NASA contractor (STEM), 5% are employed by NASA, and the remaining 5% have not yet received their degree.
- **Course Development:** A total of three new courses were developed in FY2008. These include two senior design courses and an astronomy laboratory course.
- **Matching Funds:** In FY2008, the NC Space Grant leveraged \$1.20 in matching funds for each NASA dollar. Matching funds came primarily from waived overhead from the member universities and from funds provided by the NC General Assembly.

- **Minority-Serving Institutions:** Diversity of the member universities has enabled the successful recruitment of underrepresented minority students to its programs. The Consortium's four HBCUs collaborate with other HBCUs via STEM-related national professional organizations and conferences. For example, Winston-Salem State University actively participates in the Association of Departments of Computing and Engineering at Minority Institutions, Grace Hopper Conference for Women in Computing, Minority Access to Research Careers in Life Science, National Association of Mathematicians, and National Society of Black Engineers.

## **IMPROVEMENTS MADE IN THE PAST YEAR**

In FY2008, NC Space Grant made great strides in cultivating relationships between students, faculty, and industry. Through leveraged partnerships with industry and research centers, NC Space Grant made available \$70,000 beyond its core funding to student internship programs providing more hands-on research opportunities for students in industrial settings.

## **PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION**

NC Space Grant has adopted an efficient organizational structure that proactively enables each member university to play a significant role in management of the program. Overall direction, policies, rules of governance, and budgetary priorities are established through consensus by the Consortium Executive Board (CEB), which consists of the Campus Directors from each of the following universities:

Appalachian State University	UNC - Asheville
Duke University	UNC - Chapel Hill
Elizabeth City State University (HBCU)	UNC - Charlotte
NC A&T State University (HBCU)	UNC - Pembroke
NC Central University (HBCU)	Winston-Salem State University (HBCU)
NC State University, Lead Institution	

In addition, the consortium has key partners throughout the state and region that provide programmatic guidance and support to help NC Space Grant achieve its strategic goals and objectives. Consortium partners include:

Kenan Institute for Engineering, Technology & Science (Nonprofit)

\*LORD Corporation (Aerospace industry)

NASA Langley (Government)

NC Community College System (State Government)

NC Department of Transportation, Division of Aviation (State Government)

NC Museum of Natural Science (State Government)

\*Pisgah Astronomical Research Institute (Nonprofit)

University of North Carolina General Administration (Education)

Virginia Space Grant (Education)

*\*In FY2008, these partners provided leveraging funds to NC Space Grant to provide opportunities for students to engage in research opportunities.*