

**Oklahoma Space Grant Consortium**  
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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 Oklahoma Space Grant Consortium (OSGC) is a Designated Consortium funded at a level of \$580,000 for fiscal year 2008.

**PROGRAM GOALS**

The program goals for the Oklahoma Space Grant Consortium within our Program Elements – Fellowships, Higher Education, Research Infrastructure, Precollege and General Public are aligned with Outcomes 1, 2, and 3. Our Workforce Development Goals intersect all of our Program Elements.

**OKLAHOMA GOALS FOR NASA OUTCOME 1**

**WORKFORCE DEVELOPMENT GOAL:** *To enhance state economic and workforce development in aeronautics and space, while providing applied learning experiences for students and faculty.*

Objectives to achieve Goal:

1. Develop linkages between Oklahoma aerospace industry, researchers, and students that foster the creation of market driven technology products.
2. Award competitive grants/fellowships to faculty and diverse student populations to facilitate hands-on learning related to state economic and workforce development.
3. Provide University Career Services personnel support to increase their knowledge of employment opportunities within aerospace-related industry and at NASA Centers.

**FELLOWSHIP GOAL:** *To use the NASA mission, facilities, human resources, and programs to provide information, experiences, and research opportunities for students at all levels to support the enhancement of knowledge and skills in the areas of science, mathematics, engineering, technology and geography.*

Objectives to meet Fellowship Goal:

1. Educate students at all levels by encouraging and supporting interdisciplinary and multi-disciplinary research experiences and education programs.
2. To provide support to the science and technology workforce pipeline by including greater participation of individuals who are underrepresented in science, mathematics, technology, and geography in NASA student programs.
3. To increase the number of NASA student support opportunities through partnerships and industry collaboration and cooperation

**HIGHER EDUCATION GOAL:** *To use the NASA mission, facilities, human resources, and programs to provide exposure and experiences to educators and faculty, to support the enhancement of knowledge and skills, and to provide access to NASA information in science, mathematics, engineering, technology, and geography.*

Objectives to meet Higher Education Goal:

1. To provide NASA mission-based programs to demonstrate the integrated education applications of science, mathematics, engineering, technology, and geography for use in student learning activities.
2. To provide access to and promote utilization of NASA-related materials and information resources.
3. To increase the participation of underserved and underutilized individuals and groups.

**RESEARCH INFRASTRUCTURE GOAL:** *To enhance the research capabilities in the state of Oklahoma in areas related to NASA interests, by supporting research involving students and faculty.*

Objectives to meet Research Infrastructure Goal:

1. To identify potential NASAS related research projects that may be “seed funded”.
2. To align projects with workforce and economic development goals and objectives.

**OKLAHOMA GOAL FOR NASA OUTCOME 2**

**PRECOLLEGE GOAL:** *Increase the number of teachers and students, especially those in underserved and underrepresented communities, who are involved in NASA-related education opportunities.*

Objectives to meet Precollege Goal:

1. Develop opportunities for elementary and secondary education teachers to learn effective use of NASA-content, STEM based, materials and programs in the classrooms.
2. Introduce students to Space Exploration to encourage an interest in STEM disciplines.

**OKLAHOMA GOAL FOR NASA OUTCOME 3**

**EXTERNAL RELATIONS GOAL:** *Improve public understanding and appreciation of science and technology, including NASA aerospace technology, research and exploration missions.*

Objective to meet External Relations Goal:

1. Provide instructional materials and technologies derived from NASA research and scientific activities that meet the needs and requests from within the community.

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

**Outcome 1: Engineering Design Fellowships**

In the previous reporting period we discussed the aviation world records set by *Oklahoma State University (OSU)* Space Grant fellowship students in an electric powered aircraft they designed and nicknamed “The Dragonfly”. As an outcome of that success, the faculty advisor for “The Dragonfly”, Dr. Andy Arena, was contacted by California Space Grant Consortium faculty at California State University at Los Angeles to collaborate on another unmanned airplane in what is called the F-5S category. The two consortia affiliates collaborated on an aircraft nicknamed “Pterosoar” which is entirely electric powered using a hydrogen fuel cell, and weighs 11 lb. The airplane was designed to set records for range and endurance, and uses a combination of very lightweight composite construction, with state of the art propulsion systems. On one of its first test flights, the aircraft broke the record for distance to goal and return. The world record was officially ratified by the Federation Aeronautique International which is the organization that sanctions all world aviation records. Further record attempts will be conducted in 2009.

**Outcome 1: Research Infrastructure Programs**

*Gon-Topper*

OSGC faculty collaborations with General Aircraft Modifications, Inc. (GAMI) produced two patents currently in the application phase as a measurable outcome of the OSGC supported research. Several OSGC faculty and students were involved in collaborations with Klutts Equipment and applied NASA-related research to develop a new product, “Gon-Topper”, which is in the final stages of receiving a patent. The railway system at Kennedy Space Center is one of the targeted customers for the vehicle. Dr. Larry Hoberock, Director of Applications Engineering Program, states: *Production of the Gon-Topper will result in nine immediate Oklahoma jobs, and 90 expected future jobs and an increase of \$15 to \$20 million in domestic revenues after the completion of a new, 10,500-sq.-ft. production facility now under construction in Muskogee.*

## **Outcome 2: Precollege**

In a cooperative effort with the Cherokee Nation, an informal education affiliate of OSGC, STARBASE, provided three week long programs for children of the Cherokee Nation. These programs were tailored to the learning styles of Native American children and the lead instructor is a member of the Cherokee tribe. Sixty-seven children in grades 4 – 8 attended at the Camp Gruber location for the 3 five day sessions.

## PROGRAM ACCOMPLISHMENTS

### **Outcome 1: NASA Center Internships through Space Grant Fellowships**

Collaborating with our Career Services helped OSGC establish on-going relationships directly with NASA Centers. Site visits allowed NASA personnel to become familiar with the Oklahoma Space Grant Consortium and for the students to become familiar with the culture and environment of NASA. One of the visits resulted in immediate internships to three students *within several days* of returning to Oklahoma: KSC offered OSGC sponsored internships to OSU aerospace engineering students Jenna Root and Thomas Hays and to OU electrical engineering student Khuong Tran. Prior to the Site Visits, most of the students had not considered a NASA career or felt it was not achievable. Based on affiliate surveys following the Site Visits, **30%** of the participating students made working for NASA or the aerospace industry their career goal. (Note: Following his eight months at KSC, Khuong Tran wrote in a letter to the OSGC Director . . . *I just hope Congress will continue to see how important Space Grant is to the future of America. Before the group trip to KSC, I never even thought about working for NASA. Now I know that is where I belong!*)

### **Outcome 1: Research Infrastructure**

#### *MARS Inflatable Wing Aircraft*

We are focusing on verifying one specific technology: inflatable wings. The goal was the development and testing of inflatable wing technology to a TRL of 6/7 which is verification in a relevant operational environment. This will be accomplished by testing the final design in the only environment on Earth that simulates the correct conditions: 100,000 feet above sea level.

#### *Tissue Equivalent Detectors for Space Crew Dosimetry and Characterization of the Space Radiation Environment*

This project was a joint NASA OSGC and Oklahoma NASA EPSCoR effort. In this project there is both a science goal, and an educational goal.

**Science Goal:** Develop, fabricate, and test progressively sophisticated compact, tissue-equivalent ionization chambers and proportional counters in order to investigate alternative tissue equivalent and tissue-like materials, anode designs, spectrometer circuitry, and approaches to neutron/charged particle discrimination for real-time space radiation dosimetry. Initial testing will be accomplished with high-altitude balloons. Later testing will be accomplished through ground-based particle accelerator facilities.

**Educational Goal:** The ionization chamber developed in the early part of this project will form the core of a Near Space Standard Science Platform (NS3P) for use by high school and college students conducting experiments with high altitude balloons.

#### *Remote Sensing Research*

Using Landsat imagery to access tornado damage, NASA Space Grant supported Center for Spatial Analysis faculty research (through matching funds from the University of Oklahoma) to examine the use of NASA Landsat Imagery to access tornado damage as an example to demonstrate the usefulness of satellite based imagery for rapid, cost-effective hazard damage assessment.

### **Outcome 1: Higher Education**

#### Langston's Integrated Network College for Science, Technology, Engineering, and Mathematics (LINC)

OSGC is a partner in this Langston University (an Historically Black College and University) created program. LINC represents a "linked network" of university partnerships, pre-college and college programs dedicated to increasing the numbers of Langston graduates in the areas of STEM, and the number of graduates who receive advanced degrees. It provides an opportunity for undergraduate minority students to prepare for success within the STEM fields through special short courses in topics such as learning how to conduct research and writing a research paper

International Aerospace Design/Build/Fly Competition -This project involved approximately 45 students from the freshman to graduate level and a faculty mentor. Groups of students formed multi-disciplinary teams to **design, build, and flight test** an aerospace vehicle to enter into the world's largest collegiate design competition for aerospace engineering. The contest attracts over 50 teams from around the world representing five countries.

Field Methods and Geotechniques in Modern Geographical Research at East Central University is presented each semester with OSGC support. ECU, a new affiliate, is a four-year regional university emphasizing quality teaching and student achievement. Of the total 4,400 enrolled students, the ethnic demographics reflect a 25% minority population: 17% Native Americans, 4% African Americans, 2% Hispanics, and 2% representing other minorities. The three-day program took students to unique geographic regions of Oklahoma to teach the integration of classroom instruction with field research in Earth Science.

### **Outcome 2: Precollege**

Mission to Planet Earth Summer Institute – Inter-consortium project -Summer of 2008 the OSGC conducted its 13<sup>th</sup> annual summer ten day in-residence institute at the University of Oklahoma for pre and in-service teachers and also focused on teacher preparation. The educators were taught how to utilize NASA content to motivate and inspire students while meeting district wide objectives and the Oklahoma Department of Education Priority Academic Student Skills (PASS) objectives.

Aerospace Education – A View From Above focuses on teacher preparation. The teachers complete 30 hours of inquiry-based curriculum, which they expand once they return to their classroom to continue the learning and exploration process.

### **Outcome 3: External Relations**

Spatial Perspective on Analysis for Social Science Curriculum Enhancement (SPACE) OSGC developed programs that involved faculty from different academic disciplines and institutions from across the country. In cooperation with the Center for Spatially Integrated Social Science at the University of California Santa Barbara, the Center for Spatial Analysis developed, coordinated and led, Spatial Perspective on Analysis for Social Science Curriculum Enhancement (SPACE) Workshop on Remote Sensing and GIS Technologies for 13 university-level social science faculty.

Geospatial Extension Services Government Agency Training- This 3-day program provided continuing education and spatial literacy for working professionals and assist with geospatial solution implementation.

### PROGRAM CONTRIBUTIONS TO PART MEASURES

- **Longitudinal Tracking:** Total scholarship and fellowship awards = 117. Our grant period dates (August 15 - August 14) necessitate the awarding of higher education and research infrastructure funds in the spring and summer of 09. Forty of the total awards represent underrepresented minorities. Five students have accepted positions in space related industry, 3 are employed within K-12 STEM academic fields and 3 are employed in “other” STEM academic fields.
- **Course Development- *ASTRO Introduction to Aerospace Engineering:*** Atmospheric and Space Threshold Research Oklahoma (**ASTRO**) became a new course in the aerospace engineering curriculum to provide hands-on experiences for incoming freshmen. *Introduction to Robotics* is a one-hour course initiated by another new affiliate, Southwestern Oklahoma State University (SWOSU) and fully funded by OSGC. The course targets students in the Cheyenne and Arapaho Tribal College (**CATC**) newly hosted on the SWOSU campus. *Geospatial Summer Institute – Inter-consortium project*- This annual institute provides excellent opportunities for students from five regional universities, a private university, and two state research universities, in a class working side by side, to learn remote sensing, GIS, and GPS.
- **Matching Funds:** OSGC leveraged NASA funds 2:1 for the reporting period.
- **Minority-Serving Institutions:** The interactions between Langston University, an HBCU, and the Oklahoma Space Grant are best highlighted through our Scholarship program:
  - OSGC Scholarship opportunities were provided to thirty Langston University students during the past year.. These awards were scholarships, financial support for tuition and books, and stipends.

- Six Langston OSGC scholars were selected to participate in a Pre-Service Poster Session Conference during the fall and spring semester in Alexandria, VA sponsored by NASA, the University of Maryland Eastern Shore, and the National Institute of Aerospace. The students also presented their lesson plan entitled “Making a Difference”: Creating Pathways to Inspire the Next Generation of Explorers” during the Research Day Symposium held May 2008 at Langston University. Research Day at Langston is open to the public.
- Each year students participate in a Research symposium on Langston University’s campus. Out of the (40) forty students participating eight (8) were OSGC students.
- OSGC students were paired with faculty members in their respective areas of study to provide services, mentoring and research during the school year.
- The State of Oklahoma held EPSCOR Research Day at the Capitol during the month of March 2008. Two OSGC students were selected in the activity this year from students across Oklahoma.

#### IMPROVEMENTS MADE IN THE PAST YEAR

- Added a new Informal Science Education affiliate – Stafford Air & Space Museum
- Added an amendment to our 1991 Founding Charter to provide new affiliates the ability to apply for Program Funds in addition to Fellowship funding
- Developed brochure that can be utilized by all affiliates to advertise Space Grant opportunities

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

*OSGC represents a state-wide partnership of universities, a Cooperative Extension Service, State Government, City Government, industry, an aerospace education organization, and a major science museum to enhance opportunities for Oklahomans to understand and participate in NASA’s Mission by supporting programs in science, technology, engineering, mathematics, and other aeronautics and space-related disciplines throughout the State.*

Every OSGC affiliate played an active role in moving **OSGC** toward our Vision Statement. We achieved many of our accomplishments by exploiting Oklahoma’s unique NASA-related assets: 1) over 350 small to medium aerospace companies, and, 2) GeoEye (formally Space Imaging), the world’s most comprehensive supplier of earth imagery and derived geographic information and services, including one of three worldwide tracking stations located in Norman, Oklahoma. Our Consortium capitalized on these unique State assets to develop activities that targeted **three core categories – State Economic and Workforce Development, Geographic Information Sciences (GIScience), and Fellowships.**

#### University Affiliates

The University of Oklahoma – lead institution  
 Oklahoma State University  
 Cameron University  
 Langston University – an Historically Black College and University  
 East Central University  
 Southeastern Oklahoma State University  
 Southern Nazarene University  
 Southwestern Oklahoma State University

#### Academic Affiliates

Application Engineering Program  
 Center for Spatial Analysis

#### Industrial Affiliates

Frontier Electronic Systems Corporation  
 Science Applications International Corporation

#### Informal Science Education Affiliates

Tom Stafford Air and Space Museum  
 STARBASE Oklahoma, Inc.

#### City Government Affiliate

Norman Economic Development Coalition