

Kentucky Space Grant Consortium

Lead Institution: University of Kentucky

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Consortium URL: nasa.engr.uky.edu

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Lines of Business (LOBs): NASA Internships, Fellowships, and Scholarships; Stem Engagement; Institutional Engagement; Educator Professional Development

A. 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 **Kentucky** Space Grant Consortium is a **Designated** Consortium funded at a level of **\$760,000** for fiscal year 2016.

B. PROGRAM GOALS

The NASA Kentucky Space Grant Consortium goals are to develop expertise and capacity for aeronautics, space and science research and education in Kentucky. In fulfilling its mission, the NASA Kentucky program serves several constituencies – NASA, the U.S., and Kentucky, including Kentucky's university/college faculty, students, teachers, and the general public. The NASA Kentucky mix of program elements and emphases offers “Pathways of Opportunities” serving the educational and economic needs of Kentucky and its constituents, always aligned with NASA's mission.

The NASA Kentucky Space Grant Consortium objectives are to promote a strong STEM education base by preparing students and teachers; to maintain a network of universities contributing to aeronautics and space; to encourage collaborations among universities, aerospace industry, and government; to support aerospace training, research and public outreach; and to recruit and train U.S. citizens, especially women, minorities and disabled persons.

NASA Kentucky has developed SMART Objectives for each of five program areas: 1) NASA Internships, Fellowships, and Scholarships (NIFS); 2) Higher Education; 3) Research

Infrastructure; 4) Pre-College; and 5) Informal Education. NASA Kentucky has also established SMART Objectives for student, faculty and institutional diversity.

SMART objectives for the combined FY 2016 Space Grant Base and Augmentation proposal include quantitative targets for Year 2 in each program area as follows: 1) NIFS: 4.5 NASA Center Internships, 4 Graduate Fellowships (GF), 3.5 Undergraduate Fellowships (UF), 4 Team Fellowships (TF), and 5 Kentucky Industry Internships (KII); 2) Higher Education: 1 project award and 1 Higher Education Enhanced Mini-Grant (EMG-HE); 3) Research Infrastructure: 2 Research Initiation Awards (RIA); 4) Pre-College & Informal Education: 4 Mini-Grant awards (MG) and 1 Enhanced Mini-Grant award (EMG). Student diversity objectives for NIFS programs in Year 2 are at least 35% for female students and 14.6% ($\pm 2\%$) for underrepresented minority students. Diversity objectives for project leadership are at least 35% for female PIs and 14.6% ($\pm 2\%$) for underrepresented minority PIs in Year 2. Institutional diversity objectives are 80% Consortium participation for Affiliate institutions.

C. PROGRAM/PROJECT BENEFITS TO PROGRAM AREAS

Kentucky researchers are playing a key role in development of the necessary infrastructure and workforce in preparation for the 2021 advent of the Large Synoptic Space Telescope (LSST). Eight affiliates of the Consortium established KARL, the Kentucky Association of Researchers involved with LSST, led by Dr. Gerard Williger of the University of Louisville, to participate as a single entity in LSST. Dr. Williger represents KARL on the LSST steering committee that meets several times annually. KARL consists of Bellarmine University, Berea College, Eastern Kentucky University, Morehead State University, Murray State University, Northern Kentucky University, University of Kentucky, and University of Louisville. Faculty and students across Kentucky are developing expertise and experience with competitively awarded support under Kentucky's Space Grant Big Data theme. KARL activities supported by Space Grant include undergraduate research, such as the undergraduate thesis of Nicholas Duong (UofL) on shape modeling and mapping of the near-earth asteroid 1992 UY4, graduate research, and faculty travel to participate with LSST. Kentucky's astronomers are also using LSST as a centerpiece to pursue a statewide astronomy initiative; a constitution was developed and approved for a Kentucky professional astronomers society with leadership across Kentucky. Overall, Kentucky's astronomy researchers are building key infrastructure for LSST and for Kentucky.

The 2017 Solar Eclipse will have its point of maximum totality in western Kentucky. Consequently, a number of Kentucky Space Grant Eclipse projects are focused on this rare event. Multiple Mini-Grants and Enhanced Mini-Grants are supporting engagement of the public and precollege students at Western Kentucky University and the Kentucky Science Center, partnering respectively with public schools and Girl Scouts. Dozens of students across Kentucky are participating in the national Eclipse Balloon Live-Stream Event as part of four teams at the University of Kentucky, Bluegrass CTC, and Hopkinsville CC (MSI). Equipment development of specialty and national payloads, along with testing, has been the focus of this year's efforts, including flight operations of 8-10 balloon launches across Kentucky since Fall 2016. Collaborations with the project-based learning teachers at Trigg County High School in Cadiz, KY, resulted in a successful student payload on the 24 April balloon flight from there. Kentucky's

Mollye Malone developed the national Eclipse Balloon event Infographic. Kentucky is also hosting five teams from other states including Connecticut, Pennsylvania, Indiana, and Mississippi.

Years of hard work paid off this spring when the University of Louisville won NASA's Student Launch. Undergraduate students in the UofL Speed School of Engineering have been competing in NASA SLI since 2011, finishing in the top five each year and as runner-up the past two years. In that time the team has earned 10 awards, including Best Vehicle Design, Safety Award, Project Award and more. This year the team turned in its best performance to date and took top honors among more than 40 of the best "rocket science" schools in the country. River City Rocketry, as the team is known, was launched with support of Kentucky Space Grant Consortium Team Fellowships, eventually building towards a self-sustaining funding model via corporate sponsorships and crowdfunding that will serve as an inspiration and example to other student teams in the state. The KSGC Team Fellowship program has provided support for several Kentucky student teams that have successfully competed in NASA Challenges, including this year the Owensboro Community and Technical College Rover team that finished in the Top 25 of the NASA Human Exploration Rover Challenge at Marshall Space Flight Center.

D. PROGRAM ACCOMPLISHMENTS

- NASA Internships, Fellowships, and Scholarships (NIFS):

NASA Kentucky objectives for NIFS awards in Year 2 of the combined Space Grant Base and Augmentation proposal include: 4.5 NASA Center Internships, 4 Graduate Fellowships, 3.5 Undergraduate Fellowships, 4 Team Fellowships, and 5 Kentucky Industry Internships, with 35% diversity for female students and 14.6% ($\pm 2\%$) for underrepresented minority students among the NIFS programs. The Year 2 RFP received 14 NIFS proposals from Kentucky Space Grant Consortium institutions and awarded 6 GF, 4 UF, and 4 TF awards. In addition to programs funded through the RFP, NASA Kentucky awarded 6 NASA Center Internships and 6 Kentucky Industry Internships in partnership with state industrial partners Belcan and Space Tango. Year 2 NIFS award targets were met and most were exceeded. NIFS awards contributed the highest number of different institutions (7) among all project categories, including one community college (OCTC) and one minority serving institution (KSU). Self-reported demographic information from students in Year 2 NIFS programs indicate 41% female student participation and 23% underrepresented minority student participation.

- Higher Education projects:

NASA Kentucky objectives for Higher Education projects in Year 2 of the combined Space Grant Base and Augmentation proposal are for 1 new and 1 continuing Higher Education project as well as 1 Higher Education Enhanced Mini-Grant (EMG-HE) award. The Year 2 RFP received 3 EMG-HE proposals from Kentucky Space Grant Consortium institutions and awarded all three. These exceeded the awards target for Year 2. The Total Solar Eclipse project is continuing from Year 1 under the Higher Education program and the LSST project is underway as of Year 2. These met project targets for Year 2.

- Research Infrastructure projects:

NASA Kentucky objectives for Research Infrastructure projects in Year 2 of the combined Space Grant Base and Augmentation proposal are for 2 Research Initiation Awards (RIA). The Year 2 RFP received 3 RIA proposals from Kentucky Space Grant Consortium institutions and awarded all 3 proposals based on merit review. This exceeded the awards target for Year 2 and made progress against a low number of RIA proposals from the previous year. Funding not awarded to RIAs in Year 1 was reallocated towards 2 additional Higher Education Enhanced Mini-Grant (EMG-HE) awards in Year 2 due to a higher number of proposals received in that category.

- Precollege projects:

NASA Kentucky objectives for Pre-college and Informal Education projects in Year 2 are grouped together in the combined Space Grant Base and Augmentation proposal. Year 2 targets for these program areas include 4 Mini-Grant awards (MG) and 1 Enhanced Mini-Grant award (EMG). The Year 2 RFP received 4 MG proposals and 3 Pre-college/Informal Ed EMG proposals. All proposals were awarded, which met the annual target for MG awards and exceeded the annual target for EMG awards. Awards in Pre-college and Informal Education categories contributed the highest percentage (86%) of institutional diversity among all project categories and included the most award recipients (3) at organizations not classified as higher education institutions. Institutions in this category also included 2 community colleges (ACTC, HCC) and 1 minority serving institution (HCC). Diversity results of self-reported demographic information from PIs in Year 2 for these awards indicate 71% female participation (5 of 7 awards). Several projects include outreach to underserved rural and urban school districts in regions across the state.

- Informal Education projects:

Reporting on informal Education projects is included with Pre-college projects above.

E. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE GOALS

- **Diversity:**

Institutional diversity is measured as the number of affiliate institutions that are participating in Consortium programs. Affiliate participation in Consortium activities has a target of 80% participation. Target met – 96% of Kentucky Space Grant Consortium affiliates participated in proposal reviews, meetings or other Consortium business; PIs from 13 different affiliates across the state submitted proposals for the Year 2 RFP; PIs from 13 different affiliates received Year 2 awards.

Project leadership diversity is measured as the number of female and underrepresented minorities participating as PIs across all awards. Objectives in Year 2 include funding at

least 35% female PIs and 14.6% ($\pm 2\%$) underrepresented minorities. Participation of female PIs was 29% across all awards. Underrepresented minorities were not among PIs who chose to submit proposals to the RFP.

Student diversity is measured as the number of female and NCEES underrepresented minorities participating in NIFS programs, including Graduate Fellowships (GF), Undergraduate Fellowships (UF), NASA Internships, and Kentucky Industry Internships. Objectives include funding at least 35% female student participation in Year 2 and 14.6% ($\pm 2\%$) underrepresented minority students among the NIFS programs. Targets met – self-reported demographic information from students in Year 2 NIFS programs indicate 41% female student participation and 23% underrepresented minority student participation.

- **Minority Serving Institution Collaborations:**

Collaboration with two Kentucky MSIs continued, with participation of Consortium affiliates Kentucky State University (KSU) and Hopkinsville Community College (HCC), a minority-serving community college, in meetings, proposals, and other Consortium business. A KSU student was selected by NASA Kennedy Space Center for a Summer 2017 internship and funded under the Consortium's NASA Center Internship program. Although inquiries were made by KSU faculty regarding the Year 2 RFP, none chose to submit proposals. Hopkinsville Community College faculty and students have developed an active high-altitude balloon launch program following Space Grant MSI program balloon training at MSFC in early 2015. HCC successfully submitted and was competitively awarded a Mini-Grant in Year 2.

- **Office of Education Annual Performance Indicators:**

- API 2.4.1: ED-16-1 _____16_____
- API 2.4.2: ED-16-2 _____21_____
- API 2.4.4: ED-16-4 _____3, STEM Education partnerships include awards to the Aviation Museum of Kentucky, Kentucky Science Center/Challenger Learning Center, and the Living Arts & Science Center_____
- API 2.4.5: ED-16-5 _____24_____

F. IMPROVEMENTS MADE IN THE PAST YEAR

Improvements made in the last year included increased support from services at the host institution, the University of Kentucky (UK). These include an increase in research administration support at both the college and university levels, as well as support from the university proposal development office. Consortium activities have received additional support from UK Public Relations, that include media and social media coverage of several Consortium-funded activities.

G. CURRENT AND PROJECTED CHALLENGES

Current and projected challenges include effects from the economic outlook for Kentucky's state finances, which result from a combination of significant state financial obligations and projection of less than expected revenue. As a result, state agencies are undergoing financial restructuring including in areas that have traditionally supported Space Grant. The outlook for state support – via state agencies and educational institutions – remains to be determined, resulting in challenges to matching across the board as both cash match becomes less available and in-kind match becomes more restricted.

H. PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Academic Affiliates:

Ashland Community and Tech. College	Community/Technical College
Bellarmino University	Private, Parochial University
Berea College	Private, Work College
Bluegrass Community and Tech. College	Community/Technical College
Centre College	Private College
Eastern Kentucky University	Public Comprehensive University
Hopkinsville Community College	Community/Technical College, MSI
Kentucky State University	Public Comprehensive University, MSI
Morehead State University	Public Comprehensive University
Murray State University	Public Comprehensive University
Northern Kentucky University	Public Comprehensive University
Owensboro Community and Tech. College	Community/Technical College
Thomas More College	Private, Parochial College
University of Kentucky	Public Doctoral Granting University
University of Louisville	Public Doctoral Granting University
University of Pikeville	Private, Parochial University
Western Kentucky University	Public Comprehensive University

Non-Academic Affiliates:

Aviation Museum of Kentucky	Museum (STEM)
Innoviator, LLC	Industry
National Air & Space Education Institute	Non-Profit Organization
Kentucky Science and Technology Corp.	Non-profit Organization
Kentucky Science Center	Museum (STEM)
Kentucky Space, LLC	Industry
The Living Arts and Science Center	Museum (STEM)
Tribo Flow Separations, LLC	Industry