Maryland Space Grant Consortium
Johns Hopkins 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 Maryland Space Grant Consortium is a Designated Consortium funded at a level of $575,000 for fiscal year 2011.

PROGRAM GOALS

SCHOLARSHIPS AND FELLOWSHIP

GOAL I: To offer financial support to those higher education students enrolled in Maryland Institutions that wish to pursue a career in space-related STEM fields. Objective #1: The MDSG Scholarship Committee will continue to recruit qualified students for scholarships among the seven degree-granting institutions in the consortium, *viz.*, JHU, MSU, UMCP, TU, UMES, UMBC, Capitol College and HCC. Objective #2: The Scholarship Committee will continue to emphasize the recruitment of students from groups underrepresented in STEM disciplines. Objective #3: Continue to use the MDSGC Observatory, which is located on the roof of the Bloomberg Center for Physics & Astronomy on the Homewood campus of JHU, for student training and public outreach.

HIGHER EDUCATION

GOAL II: Provide Higher education students with opportunities to enhance their education in STEM areas and to promote their entry into aerospace related disciplines. Programs that provide relevant hands-on experience will be given high priority. Objective #1: Continue to support and enhance the MDSGC Balloon Payload Program (BPP) that provides students with access to near-space. Objective #2: Provide strong support to internships programs for undergraduate and graduate students on an ongoing basis, either through direct funding or through partnerships with organizations such as GSFC. Objective #3: Support a portfolio of programs that recruits students to STEM related studies and retains their interest to the point that it eventually carries over into

employment in STEM careers in general, and especially careers needed by NASA and the aerospace community. Objective #4: Continue to develop MDSGC capabilities and procedures to conduct longitudinal tracking of students who have received significant support from MDSGC, in order to determine the efficacy of our programs.

RESEARCH INFRASTRUCTURE

GOAL III: Support projects that provide opportunities for students to participate in aerospace-related research. Objective #1: Provide funding for programs that directly support students in gaining aerospace-related research experience. Objective #2: Ensure that research opportunities are made available to a diverse group of highly qualified students.

PRE-COLLEGE

GOAL IV: Support programs that provide substantive training to Maryland teachers that allow them to incorporate NASA-related content into effective teaching strategies. Objective #1: Facilitate the delivery of training that develops teacher's skills in the use of, and access to, earth and space science related data and discoveries, which will then inspire students to pursue careers in science, technology, engineering, and mathematics (STEM). Objective #2: Provide additional opportunities beyond the current earth and space science certification program for providing current content knowledge to in-service and pre-service teachers. Objective #3: Support programs that provide for hands-on, aerospace-related activities for middle school students.

INFORMAL SCIENCE

GOAL V: Increase the content knowledge of Maryland educators through training in informal science venues.

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

Outcome 1: Explicitly addressing Objective #1 of Goal I, the MDSGC Scholarship Committee awarded scholarships to students with majors in STEM fields that relate to aerospace workforce needs. These scholarships were awarded at affiliate institutions of MDSGC. In all, 43 students were awarded scholarships in this program. Of the 43 students, 14 (33%) were female and 17 (40%) were underrepresented minorities. Additional fellowship/scholarship awards were made through competitive programs, including summer internships. A total of 60 students received fellowship and scholarship funds. Of these 60 students, 20 (33%) were female and 23 (38%) were underrepresented minorities. These numbers represent a decrease from previous years since only the 2011 baseline funding is reported here, whereas the 2010 reporting covered the baseline and the augmentation funding. This will be generally true throughout this report. MDSGC has not yet received its augmentation funding for 2011.

PROGRAM ACCOMPLISHMENTS

Outcome 1: Percentage of students whom have taken their next step and have been successfully tracked though their next step vs. last year of SG support.

- 85% for 2006
- 100% for 2007
- 100% for 2008
- 100% for 2009
- 100% for 2010
- n/a for 2011 – all participants sill enrolled
- 94% for 2006-2011

89% of students significantly supported by MDSGC went on to next steps in STEM disciplines.

Outcome 1: MDSGC met a major goal by completing the pilot test of the Science Mission Directorate/Space Grant Working Group's plan to place student interns with NASA missions that were not located at NASA Centers. The Assistant Director of MDSGC served as the Co-Chair of this Working Group and managed the pilot program. As a result, the Working Group is funding continuing the program and hopes to expand it. The interns were very enthusiastic in their response to the program, as were the mentors. As an example, at the Chandra X-Ray Observatory, the two interns who were placed there last summer wanted to return, and Chandra wanted them back, so we have returned them for another summer.

Outcome 1: Several proposals to MDSGC resulted in additional funding at the significant level for three students. One graduate student in aerospace engineering at UMCP was supported half time to manage the Balloon Payload Program. One graduate student was supported at UMES to conduct research on developing a web-based, user-friendly model of the Chesapeake Bay. He successfully defended his master's thesis in March, and gave a presentation about his work at the Mid-Atlantic SG meeting. This project has created a product that can be readily used by STEM teachers. It is worth noting that he completed his degree while serving as a full-time STEM teacher.

Outcome 1: MDSGC provided seed money to fund a postdoc at the University of Colorado node of the NASA Lunar Science Institute. This was a part of the NCSGD's SMD Working Group effort. The postdoc works on the public science program, MoonZoo. As a result of Space Grant providing half of his support for his first year, the NLSI decided to pick up the continuing support for this postdoc. The postdoc gave a presentation at the National Council meeting this past spring.

Outcome 1: 19 students (both graduate and undergraduate) were trained to use the MDSGC Observatory. These students (from Johns Hopkins University and Morgan State University) were then certified to use the telescope for their own projects.

Outcome 1: As an example of the many powerful responses that we receive regularly from the students who participate in our program:

"The grant helped me tremendously as it allowed me to begin research that I carried on throughout college. I eventually submitted the research I conducted to an International Conference and took 2nd place. I have since graduated and one of the reasons I was hired at my current job was because of my experience with basic and applied research and development that I conducted thanks to the Maryland Space Grant." This former student is currently working as an aerospace engineer at the Naval Air Warfare Center, Aircraft Division.

Outcome 2: Meeting Objective #3 of Goal IV, MDSGC funded several projects, in partnership with the National Center for Earth and Space Science Education, which were part of the Student Spaceflight Experiments Program. In each case, the teams supported were successful in competing for berths on STS-134, STS-135, and Mission 1 to the International Space Station. The STS-134 flight experiment was conducted by Esperanza Middle School students from St. Mary's County, Maryland. The STS-135 experiment came from students in Charles County. MDSGC hosted members of the crew of STS-134 visited Johns Hopkins for a presentation and reception. Over 325 people attended, including one of the student Principal Investigators who had the experiment on STS-134. She briefly described her experience and met the astronauts.

Outcome 2: MDSGC has committed funds to once again sponsoring the Girls in Engineering program at Hagerstown Community College. This program is specifically targeted at Middle School girls and draws from a rural part of Maryland's western panhandle, which is rather remote from many of the aerospace activities in the state.

Outcome 3: MDSGC has not yet supported projects related to Outcome 3. This is due to the fact that we have not received any fund-worthy proposals in this area. In addition, this activity was budgeted for the Augmentation portion of FY11 funds, which have not yet been received.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Student Data and Longitudinal Tracking:

Total awards = 63; Fellowship/Scholarship = 60, Higher Education/Research Infrastructure = 3; 38% of the total award represent underrepresented minority F/S funding. During the FY11 program year 12 are pursuing advanced degrees in STEM disciplines, 2 accepted STEM positions at NASA contractors, 7 accepted STEM positions in industry, 4 accepted positions at NASA, 1 accepted a STEM position in K-12 academia, 1 accepted a STEM position in academia, and 4 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: Two of our affiliates are HBCUs and several others (UMBC, CC, UMCP) have significant percentages of students from underrepresented populations. All of these institutions are active and sending proposals regularly, which have enjoyed reasonable levels of success. Our member ship also includes a community college and both small and large institutions, both public and private. Recruiting of students

for scholarships strongly encourages women and underrepresented students for these positions. We make use of such channels as the Center for Minorities in Science and Engineering at UMCP to be sure that we reach a broad spectrum of capable students. Two of the MDSGC staff (all four of us) are female and one is Native American.

- Minority-Serving Institutions: Two of the eleven members of MDSGC are HBCUs. They are both fully engaged members of MDSGC, as are all affiliates.

- NASA Education Priorities:

 Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities.

MDSGC sponsors research internships at NASA Centers that are all hands-on science and engineering projects. In the summer of 2011 MDSGC sponsored two students at GSFC, one at GRC, one at MSFC, and two at LRC (through the LARSS program).

MDSGC operated a pilot program for the National Council of Space Grant Directors Science Mission Directorate Working Group. This project was aimed at placing interns at NASA missions that were not located at NASA Centers (and hence did not have the mechanism for supporting interns). Assistant Director Teays is the Co-Chair of this working group, and managed the pilot program. Five students were awarded internships under this competitive program, paid for by the Space Grants from which they came. Two interns were placed with the spacecraft engineering group at the Chandra X-Ray Observatory, one of which was funded by MDSGC. Another was placed with the NASA Astrobiology Institute at the Penn State node. Two were placed with the NASA Lunar Science Institute at its University of Colorado node. One intern was also placed during the academic year at Space Telescope Science Institute, funded by MDSGC.

Students are also supported to participate in our student exchange program. In this program two engineering students from each of three affiliates (for a total of 6) are sent to one of the other affiliates to work on a NASA-related research project for the summer. The affiliates involved are the University of Maryland College Park, the University of Maryland Eastern Shore, and Morgan State University. Projects this summer will include such topics as determining the minimum level of visibility required to fly and land a helicopter, design and construction of the interior layout for a full-scale Lunar habitat, aerial imaging and remote sensing for precision agriculture, and robot platforms for coastline environment studies.

The MDSGC Balloon Payload Program continues with regular launches. The construction, launch, recovery, and data analysis for payloads launched on a weather balloon has been an integral part of the curriculum for freshman aerospace engineers at University of Maryland College Park, with support from MDSGC. Similarly, the balloon program is incorporated into two classes at Morgan State University that develop

payloads and participate in launches. The BPP team is also focused on advanced payloads that they have successfully obtained flight berths on NASA HASP balloon flights for the past several years, and are working on a payload for the upcoming flight.

 Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering disciplines (see above).

MDSGC, working in partnership with the Johns Hopkins University School of Education, provides support for Maryland teachers to take a series of courses that lead to a certificate in earth & space science. Currently 10 teachers are taking the courses; the majority of them are from Baltimore County, which was a targeted recruitment area for this past year. (Objective #2, Goal IV)

 Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers.

As part of this summer's Balloon Payload Program, Morgan State University will use students and faculty from the BPP to host a two-week summer camp for high school students, in which the students will build and fly balloon payloads. These students will be selected from Baltimore City and will focus on recruiting students from underrepresented populations.

 Community Colleges – develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges.

Hagerstown Community College is an affiliate of MDSGC and anchors much of our efforts in the Western Maryland panhandle. They are active participants in all MDSGC activities and programs. They receive scholarships and are regularly successful in proposals for projects.

Capitol College was awarded a small grant to repeat its successful Emerging STEM Leaders Program. This project brought students from Prince Georges Community College and the Community College of Baltimore County to the Capitol College campus. The main goal of the workshops was to strengthen the interest and provide information to students from underrepresented groups about STEM majors and careers. Topics included robotics, spacecraft operations, and cybersecurity. Keynote speakers from NASA, industry, and academia will be part of each workshop. Part of this second effort includes paying small stipends to Capitol College students to serve as mentors on this project.

 Environmental Science and Global Climate Change – research and activities to better understand Earth's environments.

One of the research infrastructure awards made in 2011 was to the University of Maryland Eastern Shore. This award follows on a previously successful project to develop a low-cost remote controlled, self-propelled boat that collects water samples. During this academic year and the summer of 2012 students will provide additional engineering enhancements to the vehicle and collect samples along the Assateague and Chincoteague coastal areas. The data may also be integrated into a companion NSF-funded project at UMES for studies of phytoplankton and macro-algae species.

 Diversity of institutions, faculty, and student participants.

Two of the eleven affiliates (18%) of the MDSGC are HBCUs. Our practice is to have affiliate members who are very actively engaged in the work of MDSGC, participating in its programs, and receiving student scholarship funds, as is the case for University of Maryland Eastern Shore and Morgan State University.

There were 13 unique faculty that participated in the funded proposals. Of those, 6 were female, and 3 were from underrepresented populations.

Student awardee numbers are noted above.

IMPROVEMENTS MADE IN THE PAST YEAR

MDSGC added a new affiliate, Capitol College, this year. Capitol College followed the usual route in becoming an affiliate, *viz.*, it had submitted several excellent proposals that were funded by MDSGC, and it executed these programs well and reported on them effectively. They have begun participation in all aspects of MDSGC, including programs, proposals, strategic planning, the Program Committee, the Scholarship Committee, and the Oversight Committee.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Johns Hopkins University – Lead Institution
Capitol College
Hagerstown Community College
Johns Hopkins University Applied Physics Laboratory
Morgan State University
Space Telescope Science Institute
Towson University
United States Naval Academy
University of Maryland Baltimore County
University of Maryland College Park
University of Maryland Eastern Shore

All members are actively involved with MDSGC. Each institution has a member on the Program Committee, which reviews proposals for funding and advises the program. The Program Committee meets 4-5 times per year. Each institution provides a senior staff member who serves on the Oversight Committee, which meets annually with the Director to review the program. Scholarships are provided to students at JHU, HCC, MSU, TU, UMBC, UMCP, CC and UMES, all of which have one or more members on the Scholarship Committee who are actively engaged in recruiting and selecting students.