

The National Space Grant Office requires two annual reports, the Annual Performance Data Report (APD – this document) 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.

Delaware Space Grant Consortium
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Consortium URL: www.delspace.org
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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 Delaware Space Grant Consortium is a Program Grant Consortium funded at a level of \$430,000 for fiscal year 2014.

PROGRAM GOALS

Consortium Goals and SMART Objectives from your 2010 base proposal and budget (or as amended in subsequent annual report submissions)

Utilize NASA funds to serve students and teachers in the State of Delaware in a variety of educational and training projects in areas which are related to STEM-G. At the college level, provide fellowships and scholarships to students attending 2-year and 4-year colleges throughout the State and to aid in professional development of STEM-G related educators. Enhance research opportunities on and off-campus, during the academic year and summer. Recruit and provide support for the education and training of professionals especially women, underrepresented minorities, and persons with disabilities for careers in fields which will meet NASA's needs in the 21st century.

As an indication of the program goals which have been achieved, we may cite results from our Longitudinal Tracking: the percentage of students who have been successfully tracked through their next career step versus their last year of SG support, we can report

that this percentage is 80% for 2006, 72% for 2007, 71% for 2008, 50% for 2009 and 100% for 2010, 2011, 2012, and 2013. Figures are not available yet for 2014: all participants are still enrolled. A total of 89% of students significantly supported by DE Space Grant went onto next steps in STEM disciplines.

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

Provide concise, meaningful highlights or anecdotes (no more than three) that are directly related to work completed in 2014, highlighting student and/or project accomplishments. Specify alignment to each of the three Outcomes.

(1) In the area of Outcome 2 (“*Attract and retain students in STEM disciplines*”), DESGC in FY 14 has made significant progress in the area of Diversity. In 2013, NASA/SG at HQ required DESGC to submit a “Diversity Improvement Plan” (DIP) in order to address a significant deficit in the number of UMs among DESGC awards. The DIP which DESGC submitted included a large contribution from Associate Director, Dr. Chad Starks, who was a faculty member at Delaware State University (DE’s HBCU) from September 2012 until June 2014. Although Chad is not personally involved in STEM research or activity (he is an Assistant Professor in the Department of Criminal Justice), his African-American heritage enables him to connect with underrepresented minorities (UMs) with credibility. The first chance to measure if any success had been achieved with our DIP occurred when 34 applications were received for DESGC undergraduate tuition scholarships (UTS) in early 2014: the percentage of UM applicants among these 34 turned out to be 26%. This is larger than the percentage of UMs which had previously occurred among applicants: in previous years, the UM percentages among DESG awardees were typically no more than 15%. However, the percentage of UMs in 2014 still did not rise to the level of 29%, which NCES statistics indicate for the student body in DE colleges. But in its first year of operation, the DIP was at least moving in a favorable direction towards the goal that NASA HQ requires. Even better news emerged from the applications which were received in early 2015: this time, the percentage of UMs among the 31 applicants was 42%. This alone is more than enough to satisfy the NCES statistics. But even better news emerged once the applicants were reviewed by a panel of referees and ranked in order to select winners for UTS awards. As regards the number of UTS awards, DESGC had in its budget requested funding for 11 UTS. But the Director of DESGC determined that there were enough funds unexpended from earlier years to fund one more UTS. Out of 12 awards, the referees concluded that a total of 6 were to be awarded to UMs. This 50% awards rate to UMs suggests that the DIP is leading to results which are in line with NASA’s expectations.

(2) In the area of Outcome 1 (“*Contribute to the development of the STEM workforce in disciplines needed to achieve NASA’s strategic goals*”), DESGC is proud to report on Jeffrey Szczubelek, who is currently a graduate student in Math Education at Wilmington U. Jeff is a veteran of the Armed Services, and is disabled as a result of a bomb blast during his time in battle. The first contact that Jeff had with DESGC was in 2012 when, as a student at Delaware Technical Community College, he participated in NASA’s Reduced Gravity program, with an experiment on ballistics in reduced gravity. In summer 2014, Jeff received a DESGC summer internship award to attend an aeronautics academy at NASA/Langley. Here is what he had to say about the experience:

“This summer I had the opportunity to intern at the Langley Research Center in VA. I was thrilled when I was selected to the Langley Aeronautics Academy. Our group of 12 from all over the US was challenged to design, build, and test fly a dual-use UAS. The mission requirements were in precision agriculture and also in search and rescue. In only 10 weeks our team overcame many obstacles and challenges to pass our Flight Safety review board and fly our creation. The first time I saw our plane take off was one of the most thrilling moments of my life. I learned about NASA, air planes, teamwork, leadership, problem solving, and most importantly that though my brain injury has changed the path of my life, and left me with some challenges, that I can still reach my life long dreams, and that working with/for NASA is not out of my reach.”

When Jeff returned to Delaware, he came into the DESGC office and presented a 30-minute power-point show about his experience. In my 9 years of working as DESGC Director, I have never encountered a student who, without being asked, has come in to give a report. Moreover, at very short notice (following the surprise withdrawal of another student who had volunteered to present), Jeff attended the Mid-Atlantic Regional SG meeting in Williamsburg VA in September 2014 in order to report on his experience at Langley. Jeff is among the most unique students I have had the privilege to encounter through DESGC.

PROGRAM ACCOMPLISHMENTS

Refer directly to the consortium goals and SMART objectives in your 2010 base proposal when describing your accomplishments.

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA’s strategic goals: (Discussion of achievements and progress related to your Fellowship, Scholarship, Internship, Higher Education and Research Infrastructure programs). (Employ and Educate)*

(1) Graduate Fellowships

Five Graduate Fellowships were awarded in a competitive process in May 2014, one of whom was female. Funds had been set aside for a sixth graduate student in UD Department of Geography, but things did not work out in this case: the student who had received DESGC funds the previous year had not performed satisfactorily. In discussions between DESGC Director and the Chair of Geography, it was decided to withhold the funds for 2014-2015 until a better student could be identified. None ever was, so these funds will be carried over to enable DESGC to fund an extra graduate student in 2015-2016.

Metric (Number of grad students supported): In Year 5 of our FY10 base proposal, DESGC had set as a goal full funding for 4.5 graduate fellows plus 0.5 grad students supported by Bartol Research funding. **We met this goal.+**

Metric (Diversity, gender): Of the five graduate students supported in FY14 by DESGC, one (20%) was female. NASA’s goal for female representation is 40%. **We did not satisfy this goal. -**

Metric (Diversity, ethnicity): In FY14, none of the five grad awardees were underrepresented minorities. According to NCES data, the total percentage of underrepresented minorities (UMs) enrolled in DE colleges is 29.0%. **We did not satisfy this goal.** – (We have been very much aware of our deficiencies in the Diversity area during FY14, and we have focused a lot of energy in improving the number of awards to UMs.)

(2) Undergraduate Summer Research

Metric (DESGC support of undergraduates performing summer research on affiliate campuses): In Year 5 of our FY10 proposal, our goal had been to offer DESGC support to five summer research students on affiliate campuses. In FY14, we supported six students in summer research. **We exceeded our goal.** ++

Metric (DESGC Summer research Program for undergraduates at NASA Centers). In FY10/Year 5, we proposed that DESGC would support one student in a summer program at a NASA center. **In FY14, we exceeded this goal:** in FY14, two students were funded by DESGC at NASA centers, one at Goddard SFC and one at Langley RC. ++

Metric (Diversity, gender): Among the eight students in FY14 Undergrad Summer Research programs, three (38%) were female. This comes close to **satisfying NASA's goal of 40% females.** +-

Metric (Diversity among campuses): Among the eight students in FY14 Undergrad Summer Research programs, four campuses were represented: DSU (four students), Wesley (one student), Wilmington (one student), UD (two students). **We exceeded our expectations in this area.** ++

Metric (Diversity, Underrepresented Minorities): Among the eight students in FY14 Undergrad Summer Research, four (50%) were underrepresented minorities. **We exceeded the goal of reaching the DE state percentage of underrepresented minorities in college (29%).** ++

(3) Research Infrastructure Development

Because of the need for funds in other categories (including graduate fellows and salary support for Assoc Director Dr. B. C. Starks), DESGC Director decided for the first time in FY14 not to allocate any funds for DESGC/RID. The state of DE is fortunate to have NASA/EPSCoR as a back-up to provide young researchers with more RID funds in one year (\$125K) than have ever been provided in a single year by DESGC.

Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty: (Discussion of achievements primarily focused on your Higher Education programs not discussed in Outcome 1 and your Precollege programs). (*Educate and Engage*)

Outcome 2: Higher Education

(a) DESGC funding for Community College students in rocket/balloon launch programs.

Metric: In Year 5 of FY10 proposal, our goal was to provide rocket-launch funding to two students at DE's 2-year college (DTCC). **We exceeded this goal.** + In FY14, we provided DESGC funds to two students from DTCC and one student from DSU, in the company of their professors, Mr. Joseph Pent (Instructor of Physics and Engineering Technologies at DTCC Dover) and Mr. Michael Cimososi (Instructor of Physics at DSU), to attend the RockOn! Workshop at NASA's Wallops Island launch facility.

(b) Undergraduate tuition scholarships

Metric (Number of awards): The goal in our Year 5 DESGC base proposal was to spend a total of \$7,500 for undergraduate tuition scholarships (UTS) to three students at DTCC (Delaware's Community College) and \$21K for seven awardees at non-DTCC campuses. In FY14, we awarded only two UTS to DTCC students. **We did not satisfy our goal in UTS awards to DTCC students.** – The reason for our failure in this regard is, in part, due to the fact that the state of Delaware now offers a very generous scholarship package (covering 100% of tuition) to students who graduate from schools in DE and enter into DTCC as full-time students right after graduation. As a result, DTCC students need DESGC support less than they used to.

As regards UTS for non-DTCC students, **we satisfied the metric for the Year 5 proposal for non-DTCC students:** DESGC in FY13 provided UTS to seven students at non-DTCC schools. **We satisfied this goal.** +

Metric (Distribution among affiliates): As regards the nine awardees, two were at DTCC, two were at Del State (our HBCU), two were at Wesley College, and three were at UD. **We satisfied the goal of distributing UTS widely among affiliates.** +

Metric (Diversity, ethnicity): Of the nine awardees, four (44%) were UMs (2 African-Americans, one Hispanic, and one Hispanic/African-American). The percentage of underrepresented minorities (UMs) in DE colleges is 29%. **We exceeded this metric in UTS awards in FY14.** ++

Metric (Diversity, gender): Of the nine UTS awardees in FY14, four (44%) were female. **We exceeded NASA's goal for female awardees in this category.** ++

Metric (DSU Diversity): The goal for DESGC in FY14 was to have at least one UTS awarded to a UM at Del State University (Delaware's HBCU). In FY14, we actually awarded two UTS awards to UMs at DSU. **We exceeded this metric.** ++

Summary of Metrics: Counting all FY14 significant awards, a total of 37% were UMs and 37% were females.

Outcome 2: Pre-college Programs.

DESGC Programs which are aimed at professional development of teachers are operated by Dr. Stephanie Wright, founder and CEO of the Delaware Aerospace Educational Foundation (DASEF). Her reports will be provided to NASA via OEPM.

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission:* (Achievements and progress of Informal Education programs). (*Engage and Inspire*)

DESGC funds informal education opportunities to engage and inspire by way of programs offered by Dr. Stephanie Wright (see previous paragraph). Her reports will be provided to NASA via OEPM.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Diversity:** *of institutions, faculty, and student participants (gender, underrepresented, underserved)*

Detailed aspects of Diversity among awardees have been presented above in previous sections (see Outcome 1, Outcome 2).

- **Minority-Serving Institution Collaborations:** *Summarize interactions with MSIs within the consortium, and describe projects/activities.*

Links with HBCU, especially through Dr. B. C. Starks in our Diversity Improvement Plan, have been described in detail above in Program/Project Benefit, item (1).

- **NASA Education Priorities:** *Accomplishments related to the "Current Areas of Emphasis" stated in the 2010 Space Grant solicitation. Report on areas that apply to work proposed in your proposal and budget.*

- 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.

In FY14, DESGC sponsored a UD undergrad mechanical engineering student, Joseph Esposito, to attend the 2014 Helicopter UAV Workshop, sponsored by the Space Grant programs of Connecticut and North Carolina.

- 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).

Dr. Stephanie Wright will report on these activities, funded by DESGC, via OEPM

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

Nothing to report in FY14.

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

DESGC has strong connections with 3 of the 4 DTCC colleges throughout the state. Unfortunately, as regards the fourth campus (in Georgetown DE), with which

DESGC had very fruitful collaborations in previous years, things are not so good these days. Since the previous affiliate rep (Dr. Doug Hicks) retired in December 2013, the DESGC Director has not been successful in engaging the interest of any other faculty members on that campus.

- Aeronautics research – research in traditional aeronautics disciplines; research in areas that are appropriate to NASA's unique capabilities; directly address the fundamental research needs of the Next Generation Air Transportation System (NextGen).

No effort along these lines occurs in DE.

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

An FY14 DESGC Graduate Fellowship (GF) recipient (Jesse Samluk, UD Electrical & Computer Engineering) is working on a PhD dissertation using an electromagnetic induction instrument to determine the thickness of sea ice. Mr. Samluk is one of a small group of students who have won two GFs (the maximum number allowed). He reported on his work at the DESGC Annual Research Symposium in March 2015.

- Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.

We reported above (Outcome item (3)) why funds for DESGC/RID have been reduced.

IMPROVEMENTS MADE IN THE PAST YEAR

Succinctly describe improvements and/or adjustments made last year that demonstrate significant change(s) within the consortium. The improvements and/or adjustments that brought about change may have been in management, resource allocation, project design, project evaluation, etc.

A significant change which occurred to DESGC in summer 2014 concerns the Diversity Improvement Plan (DIP). The DIP had been submitted by DESGC in April 2013 to NASA HQ in response to a “mid-course correction” required by then-SG Program Manager Diane de Troye (see Program/Project Benefit to Outcome, item (1) above). An important contributor to the DIP is Dr. B. C. Starks, who was in 2013 an Assistant Professor of Criminal Justice at DE’s HBCU (Delaware State University; DSU). As a result of the DIP, applications from UMs in 2014 contained a larger fraction of UMs than in previous years. The significant change we report here is a programmatic one: in summer 2014, Dr. Starks decided to leave DSU to take up a faculty position at Lynchburg College, in VA. However, he keeps in contact with UM students at DSU: in 2015, the fraction of UMs among applications for DESGC funding is even larger than in 2014. Thus, the DIP continues to work well with Dr Starks’ participation.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

List the institutions that comprise the consortium; include the name, type of institution, key characteristics, and role in consortium activities/operations.

(1) 4-year academic institutions:

(a) The lead institution of DESGC is the University of Delaware (UD). UD is classified by the Carnegie Foundation for the Advancement of Teaching as a research university with very high research activity, a designation accorded to fewer than three percent of the more than 4,200 degree-granting institutions in the USA. Currently, UD has 18,222 undergrads and 3,729 grad students enrolled, and offers bachelor degrees in all STEM-G subject areas. Most of the DESGC graduate fellows are UD students from a variety of colleges: Arts & Sciences (Departments of Physics & Astronomy), Engineering (Departments of Chemical, Electrical, and Materials Science), and Earth, Ocean & Environment (Oceanography). UD undergraduates from a variety of colleges have benefitted from DESGC-funded tuition scholarships and summer research opportunities. Researchers in various colleges (Engineering, Earth, Ocean & Environment, Arts & Sciences) and the Delaware Biotechnology Institute (DBI) have benefitted since 2005 from DESGC Research Infrastructure (RID) Funds.

(b) Delaware State University (DSU), an HBCU, has 4,061 undergrads, 444 grad students, and offers bachelor degrees in at least one STEM-G area. The student body is 73% underrepresented minorities. In FY14, two DSU undergrads were awarded a DESGC tuition scholarship, and four students were the recipients of summer research funding.

(c) Wilmington University (10,992 undergrads, 6,757 grads) offers a range of bachelor degrees which includes one or more of the STEM-G disciplines. In FY14, one WU undergrad (disabled male) was sponsored by DESGC when he was selected to participate in the Aeronautics Academy at NASA Langley Research Center. WU's student body is 66% female and 27% underrepresented minorities.

(d) Wesley College, an MSI with 1,600 undergrads, offers a range of bachelor degrees in the STEM-G disciplines. 45% of the undergraduate student body are underrepresented minorities, and 53% are female. In FY14, two Wesley students were awarded a DESGC tuition scholarship, and DESGC supported one undergrad (female) in summer research.

(e) Swarthmore College, with 1,534 undergrads, offers bachelor degrees in at least two STEM areas. The student body is 20% underrepresented minorities and 51% female.

(f) Villanova University (6,554 undergrads, 3,617 grads) is a DESGC affiliate in SE PA.

(2) **2-year Academic Institutions**

Delaware Technical Community College (DTCC) has a total of nearly 15,000 students on four campuses distributed widely across the State. The average student body includes 34% underrepresented minorities and 61% female. In FY14, two DTCC students received DESGC-funded tuition scholarships.

(3) **Delaware AeroSpace Education Foundation** (DASEF) is an enterprise founded in 1989 by Dr. Stephanie Wright (at one time, Delaware's Teacher in Space) to create an exceptional learning environment that inspires children and their families with an appreciation of the Earth and its place in the universe. DASEF has contributed to the academic development of over 300,000 students, educators, and the general public through the delivery of context-based activities consistent with current aerospace research and development.

(4) **Industrial affiliates:** ILC Dover (makers of space suits for NASA), E.I. DuPont de

Nemours, and Orbital ATK supply active members to DESGC's Advisory Board. Activities of these board members include reviewing applications for DESGC Graduate Fellowships and providing a detailed statistical analysis of the results to ensure a lack of bias among reviewers.