



## **NASA Delaware Space Grant Consortium**

### **Strategic Plan for the Years 2006-2010**

#### **INTRODUCTION**

The Delaware Space Grant Consortium (DESGC) is part of NASA's National Space Grant College and Fellowship Program, authorized by the US Congress in 1987. Consortia are now operating in all 50 states plus the District of Columbia and Puerto Rico. DESGC was formed in 1991 with the University of Delaware as the lead institution. Subsequently, the consortium expanded to also include Delaware State University, Delaware Technical and Community College and Wilmington College. Representatives from industry and non-profit organizations serve on the Advisory Board.

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## **I. PURPOSE**

In the present document, we set forth, in a Strategic Plan, the overall goals of DESGC for the five year period from January 2006 to December 2010. The goals are based in part on the Improvement Plans which were developed by DESGC affiliates in response to NASA's 15-year review of DESGC.

## **II. GUIDING PRINCIPLES**

**Reason for DESGC's existence:** To serve the people of the State of Delaware in ways which are consistent with NASA's long-term mission.

**DESGC Vision No. 1:** To encourage young people in the State of Delaware to consider careers in areas which will ensure that NASA will have access, in the years ahead, to a technically literate aerospace workforce.

**DESGC Vision No. 2:** To enrich the education of students from kindergarten through college years, independent of career choices, with a broad understanding of science.

**DESGC Mission:** To take advantage of NASA funding to instill a spirit of wonder, exploration, and discovery in students, teachers, and citizens of the State through education, research, and public outreach in the areas of Science, Technology, Engineering, Mathematics, and Geography (STEM-G).

The present plan relates to the broad objectives of DESGC for the five year interval 2006-2010. Specific plans are developed by the Director, with input from all Affiliates, Associate Directors, and Members of the Advisory Board when the budget call is announced for each program year.

## **III. GOALS, SPECIFIC ACTIONS, AND METRICS**

### ***Category 1: FELLOWSHIP/SCHOLARSHIP PROGRAM***

**Goal:** To administer a program which offers educational and research opportunities to college students, undergraduate and graduate, who are pursuing degrees in STEM-G- related fields.

**Objective:** *Competitiveness.* Ensure the fair distribution of funds for scholarships and fellowships to affiliate universities and colleges.

*Action 1:* A centralized consortium-wide call for Undergraduate Scholarship Applications is in January of each year. Each scholarship award is for up to \$2K, with possibility of matching funds from the affiliate institution. The call is distributed by e-mail/snail mail and materials are made available on the DESGC website. The Director will communicate by phone in a timely manner with all affiliate representatives to ensure that all campuses are aware of the opportunity. Each affiliate representative forwards to the Director a list of recommended students, rank-ordered by local evaluators.

*Metric:* We seek to have at least one undergraduate academic year scholarship awarded on each campus of the consortium. We seek especially that at least one student be supported each year on all four campuses of Delaware Technical and Community College, and also at our HBCU, Delaware State University.

*Action 2:* A call for Graduate Fellowship Applications is made in January of each year to the two campuses of DESGC with graduate programs. Each fellowship is a 12-month award, with a stipend of up to \$19K. Associate Directors and affiliate representatives ensure that students in all relevant departments are aware of the opportunity. Fellowship applicants typically have published papers, have an excellent GPA, are already working on a thesis, and must justify the relevance of their work in the context of NASA's mission. A Fellow may apply only once for a renewal: no student is awarded a DESGC Fellowship for more than two years.

*Metric:* We seek to have at least one Graduate Fellowship each year be awarded to students at each of the two research universities in the consortium.

*Action 3.* Applications for fellowships and scholarships are due in March, and are reviewed by a panel consisting of members of the Advisory Board, the Associate Directors, and the Director. Each application is reviewed by at least 6 members, and attention is paid to avoiding conflict of interest in the process. Selections are made in April. US citizenship is required.

*Metric:* We seek to improve participation by panel members to 7 or more in order to ensure that the review process is as broad-ranging and fair as possible.

**Objective:** *Diversity.* Ensure funding for fellowships and scholarships to women, under-represented minorities, and persons with disabilities.

*Action:* The Director and Associate Directors will make personal visits to the administrators of minority programs on the campuses of affiliate colleges, to publicize the scholarship opportunities which Space Grant offers, during the academic year and also during the summer. Minority students will be encouraged to apply for Space Grant funds.

*Metric:* We seek to have at least one graduate fellowship awarded annually to a student at our HBCU affiliate. We seek to have at least one underrepresented minority student receive funding for summer research.

**Objective:** *Preparation for the Workforce.* Prepare students for the workplace by ensuring that they can communicate technical material clearly.

*Action:* Require students who have been funded in research activities (both undergraduate and graduate) to present their results at the annual Delaware Space Grant Research Symposium.

*Metric:* 100% of all student researchers funded through DESGC will present results each year.

**Objective:** *Publicity Among Student Peers.* Expect student scholarship and fellowship awardees to give some return to the DESGC for the funding they receive.

*Action:* Require all DESGC graduate fellows to staff the Delaware Space Grant Office (Room 106 Sharp Lab, University of Delaware) for a number of hours each week while classes are in session. This will allow other students to learn about DESGC activities from their peers.

*Metric:* 100% of all graduate fellows will record the number of hours they have spent each week in the office.

**Objective:** *Longitudinal Tracking.* All students who have received funding in excess of \$5K from DESGC will be subject to longitudinal tracking.

*Action:* Questionnaires in hard-copy format, or via e-mail, will be used to track the progress of graduate fellows and recipients of NASA summer research programs through first employment or beginning of advanced degree.

*Metric:* Development and use of a web-based system will improve DESGC's ability to maintain contact with graduates of the program.

## **Category 2: RESEARCH INFRASTRUCTURE**

**Goal:** To promote the improvement of research programs and capabilities of affiliate members with an emphasis on the NASA-related interest areas of aerospace, remote sensing, space science, and supporting STEM-G disciplines.

**Objective:** *Initiate a NASA EPSCoR Program.* DESGC was informed in 2005 that Delaware has been designated as a NASA EPSCoR (Experimental Program to Stimulate Competitive Research) eligible State.

*Action 1:* Establish the necessary committee structure and state organizational collaborations necessary to develop and submit a proposal for NASA EPSCoR funding when the RFP becomes available. The DESGC Director will assemble the committee, prepare the proposal, and (following NASA requirements) serve as PI for the NASA EPSCoR proposal.

*Metric:* Initiate at least one new EPSCoR-funded research program for young faculty members on one of the DESGC affiliate campuses.

*Action 2:* Use the opportunity provided by NASA's EPSCoR program to reach out to colleges in the state which are not currently affiliated with DESGC, but which are already involved in the NSF EPSCoR program. Invite such colleges to affiliate with DESGC.

*Metric:* Addition of one new college affiliate to DESGC.

**Objective:** *Support of On-Going NASA-Related Research.* Support new and developing research, especially multidisciplinary and collaborative projects, in fields which are aligned with NASA's mission. To achieve this objective, DESGC will award competitive seed grants to affiliates.

*Action 1:* Provide DESGC funds to support studies of the coastal zone in the Delaware Bay. The studies rely on the Center for Remote Sensing in the UD College of Marine and Earth Studies, and include UD graduate students, as well as undergraduate interns from the DESGC affiliate HBCU (Delaware State University).

*Metric:* DESGC will fund one graduate student on a full-year stipend, and one undergraduate supported on summer research.

*Action 2:* Provide DESGC funds to support research in laser spectroscopy and non-linear optics at the Applied Optics Center at Delaware State University

*Metric:* DESGC will fund at least one graduate fellowship to Delaware State during each academic year, and one summer research scholarship to an undergraduate at Delaware State.

*Action 3:* Provide DESGC funds to support student participation in research on Micro-Aerial Vehicles with flapping wing technology. The research is performed in the Robotics Center in the UD Department of Mechanical Engineering. Space applications of the Micromechanical Flying Insects include explorations of Mars using robotic insects.

*Metric:* DESGC aims to fund at least one female minority engineering graduate student in the Robotics Center.

*Action 4:* Support faculty and student travel to NASA Centers and industrial laboratories for purposes of developing new research projects.

*Metric:* At least two travel grants for research development will be awarded each year from DESGC and/or NASA EPSCoR funds.

*Action 5:* Establish on-site collaboration between UD students and researchers in solar wind turbulence at NASA/GSFC.

*Metric:* At least one graduate student spends a two-week visit at NASA Goddard collaborating on solar wind turbulence.

*Action 6:* Research partnership in stellar astrophysics between UD and DESGC affiliate Villanova University.

*Metric:* At least one member from each research group will attend a joint meeting to discuss research collaboration.

**Objective:** *New Research Proposals.* Increase the number of research proposals submitted by DESGC institutions in fields aligned with NASA's mission.

*Action:* Distribute announcements of research opportunities in NASA-related fields to faculty at affiliate institutions.

*Metric:* At least 5 research announcements are distributed among appropriate DESGC institutions each year. At least one NASA-related research proposal is submitted each year as a result of DESGC coordination.

### **Category 3: HIGHER EDUCATION**

**Goal:** Use DESGC funding as leverage in academia to enhance the quality of course work in STEM-G-related fields on college campuses.

**Objective:** *Rockets for Schools Payload Project.* Students and teachers in the Engineering Technology Program at Delaware Technical and Community College (DTCC) build instrument packages to serve as a payload on a High Altitude Dart rocket which is launched each year at the Rockets for Schools program.

*Action 1:* DESGC is committed to supporting growth in the DTCC ET rocket payload project.

*Metric:* Increase in attendance at the DTCC Rockets for Payload project by 10% per year.

*Action 2:* The next step after the rocket payload work is to develop a balloon payload course. DESGC will support attendance by students and instructors at the Colorado SGC Balloon-Sat program which is offered during the summer months.

*Metric:* At least 3 students and/or instructors should attend the Balloon-Sat program in Boulder CO in July 2007.

**Objective:** *Undergraduate on-campus Summer Research Program.* Offer hands-on research opportunities to undergraduates on campuses of the DESGC. An important element in preparing a student who may in future be interested to seek employment in a NASA-related position is to expose the student to the excitement of cutting-edge research in a STEM-G-related area. Summer

programs, either on the local campus, or on another campus belonging to the DESGC, provide essential opportunities.

*Action:* Calls for Application for summer research positions are circulated consortium-wide as the opportunities arise. Research experiences for undergraduates on the campuses of various affiliates are typically administered by Undergraduate Research Program (URP) . The DESGC Director is in contact with the URP Director on the UD campus, with the information that DESGC funds up to \$3K are available to support students who have secured approval from the appropriate faculty member for a summer research position in STEM-G-related areas. Announcements for summer research are circulated as soon as they are received to all affiliate representatives by e-mail and on the DESGC website. With consultation from Associate Directors, the DESGC Director rank orders applicants for summer research funds.

*Metric:* We seek to have at least one student from each of the affiliate research campuses participate in summer research activities, either on his/her own campus, or elsewhere.

**Objective:** STEM-G-Related Curriculum Development at the College Level. DESGC Associate Director Prof. Harry Shipman, winner of an NSF Distinguished Teaching Scholar's Grant, is a major liaison at the Higher Education level between DESGC and Teacher Development. Prof. Shipman is a member of a UD faculty team which has developed a five-course Program of Study for Science (PSS) so that teachers in Delaware may satisfy the standards of the Federal "No Child Left Behind" program.

*Action:* DESGC is committed to assisting with the purchase of books and supplies for in-service teachers as they attend all five of the 3-credit graduate level PSS courses.

*Metric:* Increase teacher attendance by at least 5 in one or more of the five PSS courses which blend science pedagogy with science content.

**Objective:** Curriculum Development for State Geography Standards at the College Level. To implement Delaware's Geography Standard No. 2 (interaction between humans and the environment), the UD Geography Department is integrating satellite-derived products into ongoing curriculum development. Key areas for curriculum materials at the K-12 level include climatic awareness and remote sensing technology. Enhancement of collegiate teaching and training is also part of the program.

*Action:* DESGC is committed to supporting college students in the development of geography curriculum in line with Delaware standards.

*Metric:* One undergraduate student will be supported during the summer, and one graduate student will be supported on a full-year stipend.

**Objective:** Student Research at NASA Centers. Exploit the high-quality research environment of a NASA center to offer hands-on research experiences in an off-campus setting to students at undergraduate and graduate levels.

*Action:* Calls for application to NASA for various summer research positions at Goddard Space Flight Center (e.g. NASA Academy) and other centers typically are announced by program managers at NASA in January. The response time is often short. Information about these is promptly circulated by e-mail to all affiliate representatives, with a request that a ranked list of potential applicants be forwarded to the Director. The list is forwarded to the program manager at NASA, and that manager makes the final selection. Each award is typically for \$4K, with up to \$500 for travel.

*Metric:* At least one student from Delaware should participate in a NASA Center program each summer. 100% of all such students will report at the annual DESGC Symposium.

**Objective:** Engineering Design Projects and Industrial Internships. Exploit resources offered by NASA's Exploration Systems Directorate in support of engineering education.

*Action:* DESGC will respond promptly to announcements of opportunity by NASA for funds in support of engineering design projects on campus, as well as for industrial internships.

*Metric:* DESGC will place at least one engineering student in an industrial internship in academic year 2006-2007, or during summer 2007.

#### **Category 4: K-12 (PRE-COLLEGE) EDUCATION**

**Goal:** To increase awareness of, and access to, education and career opportunities in, aerospace, earth science, and supporting STEM-G disciplines.

**Objective:** Professional Development of K-12 Teachers.

*Action 1:* DESGC is committed to continuing support of a broad spectrum of teacher development programs which operate under the aegis of DASEF (Delaware AeroSpace Education Foundation), founded and operated by Dr Stephanie Wright. Included among these programs are in-service workshops, NASA/Goddard Teacher Workshops, Kennedy Space Center Teachers Conference, and the Rocketry Challenges for Teachers.

*Metric:* DESGC will award travel grants to two K-12 teachers to attend the Kennedy Space Center Teachers Conference.

*Action 2:* DESGC is committed to assisting the State of Delaware implement its standards in science education. Prof. Shipman leads a team which is preparing a curriculum kit to teach the science standards during 2006-2007.

*Metric:* Increase teacher attendance at the curriculum kit training program so that at least 50% of the State's science teachers will be trained by summer 2007.

*Action 3:* DESGC is committed to supporting Dr Wright's operations at ITEC (Innovation, Technology & Exploration Center), a major new center of educational opportunities for citizens of Delaware. ITEC was formally opened in April 2006 by Educator Astronaut Barbara Morgan. DESGC is committed to teacher enhancement programs at ITEC that will focus on Telescope and Weather Station core materials, including teacher packets.

*Metric:* Increase attendance at the Telescope and Weather program by at least 3 teachers each year.

*Action 4:* DESGC wishes to award travel grants to K-12 teachers, both in-service and pre-service, to attend national teachers meetings, including NSTA (National Science Teachers' Association) and ITEA (International Technology Education Association).

*Metric:* DESGC seeks to have at least two pre-service teachers and two in-service teachers attend a national meeting during each school year.

**Objective:** Help to Sustain Delaware's NASA Explorer School(s).

Currently, one of NASA's Explorer Schools (NES) is in operation in Smyrna, Delaware. In future years, further Delaware schools may be successful in achieving NES status.

*Action 1:* DESGC is committed to providing financial support to the Smyrna NES so that the team can avail themselves of the Distance Learning Network (DLN) which was purchased in

the first year of NES funding. DESGC support will allow video conferencing with astronauts on the ISS.

*Metric:* At least one video conference should occur at the Smyrna NES during each school year.

*Action 2:* DESGC will award travel grants to members of the Smyrna NES team to attend educator workshops at NASA Centers and also to attend national meetings of Science and Math teachers.

*Metric:* At least one NES team teacher should attend a NASA workshop, and one NES team teacher should attend a national meeting during each school year.

*Action 3:* DESGC is committed to encouraging secondary-education majors in STEM-G-related areas at affiliate universities to consider the NES school in Delaware as a site for their in-class student teaching semester.

*Metric:* Smyrna NES School should remain operative, with a team of committed teachers, in academic year 2007-2008 (and following years) when NASA funding is no longer available.

**Objective:** *Solar System Ambassador for Delaware*

*Action:* DESGC is committed to supporting the NASA/JPL Program of Solar System Ambassadors. The DE representative is currently Mary Matthes, a teacher in Rehoboth DE.

*Metric:* The Ambassador should attend a NASA-related workshop each summer.

**Objective:** *Use E/PO Funds from NASA Research Grants in K-12 Classrooms*

NASA research grants provide to the Principal Investigator (PI) a component of funding which is targeted on Education and Public Outreach (E/PO) activities. For the NASA grants which are currently active in Delaware, E/PO components provide, in principle, funds amounting to tens of thousand of dollars, if partners can be found to bring the concepts into the K-12 classrooms.

*Action:* The DESGC office is committed to serving as a clearing house where contacts can be made between the PI's and K-12 teachers who are interested in putting the funds to use in the classroom.

*Metric:* The E/PO component on one NASA grant at UD will be put at the disposal of a K-12 teacher program during each academic year.

**Category 5: GENERAL PUBLIC**

**Goal:** Support outreach activities which convey to the public, using the many successful programs that NASA operates, a sense of wonder about the universe in which we live.

**Objective:** *Increase Public Awareness of the Delaware Space Grant Program.*

*Action 1:* DESGC will seek to develop a presence at Science Fairs and/or Science Days at local, county and state levels.

*Metric:* DESGC will have a booth at one science fair or science day in Delaware during the academic year 2006-2007.

*Action 2:* The DESGC webpage will be structured so as to provide to the public easier access to the latest information about NASA and DESGC activities.

**Objective:** Use E/PO Funds from NASA Research Grants in Public Outreach

NASA research grants provide to the Principal Investigator (PI) a component of funding which is targeted on Education and Public Outreach (E/PO) activities. For the NASA grants which are currently active in Delaware, E/PO components provide, in principle, funds amounting to tens of thousand of dollars, if partners can be found to bring the concepts to the public.

*Action:* the DESGC office is committed to serving as a clearing house where contacts can be made between the PI's and the DESGC Outreach Coordinator (Dr Stephanie Wright).

*Metric:* The E/PO component on one NASA grant at UD will be put at the disposal of Dr Stephanie Wright for one of her outreach programs during each academic year.

**Objective:** Build on the Strengths of Existing Outreach Programs

Under the aegis of DASEF and ITEC, Dr Stephanie Wright operates a number of successful outreach programs in the State of Delaware.

*Action:* DESGC is committed to continuing support of DASEF and ITEC activities in the areas of public outreach.

*Metric:* During academic year 2006-2007, DESGC looks forward to having the astronomical observatory at ITEC become operational, and become available to the citizens of Delaware.

**Category 6: EXTERNAL RELATIONS**

**Goal:** To enhance the connections between the academic members of DESGC and other stakeholders in the educational enterprise in the State of Delaware. To achieve this, DESGC plans to explore various new contacts with industry and other groups in order to support and provide opportunities for DESGC faculty, staff, and students. Such activities could build into collaborative projects suitable for other categories listed above.

**Objective:** Establish Contact with a NASA Broker Facilitator

NASA has established a number of broker facilitators who are charged with ensuring that NASA-related materials of an educational nature are made readily available to educators within their region. The broker facilitator office also serves as a contact point for speakers who might be invited to an educational event within the region. The State of Delaware lies in the region which is administered by Dr Laurie Ruberg, at the Center for Educational Technologies at Wheeling Jesuit University.

*Action:* DESGC will contact Dr Ruberg and request materials which will be used to stock the bookshelves of the DESGC office at 106 Sharp Lab on the UD campus.

*Metric:* At least one new NASA-related poster and one new instructional DVD, will be displayed in the DESGC office during each academic year.

**Objective:** Expand Contacts with Industry

DESGC has had valuable working contacts with the E. I. DuPont Company, as well as with ILC Dover, since DESGC began. Expansion to include other industries which are involved in aerospace and related technologies contacts is desirable. The Director of DESGC is committed to establishing contacts with industrial companies with the assistance of affiliate representatives.

*Action:* The DESGC Director will, with the assistance of Outreach Coordinator Dr Stephanie Wright, attempt to establish links with one nearby industrial company which has close

ties with NASA. ATK Thiokol, a company which makes engines for NASA rockets, has a plant that is only a few miles from the UD campus.

*Metric:* At least one new industrial partner will be added to the DESGC roster during the academic year 2006-2007.

**Objective:** Explore Contacts with the US Air Force et al.

One of the primary employers in the State of Delaware is the Dover Air Force Base. Historically, DESGC has had no contacts with the US Air Force. Although aeronautics is a subject of prime interest to NASA, DESGC has not hitherto had any significant activity in that area. It seems worthwhile to explore ways in which the activities and interest of DESGC might benefit from contacts with the Air Force in the State, or with the Air Force Association (AFA), or with members of the Civil Air Patrol (CAP).

*Action:* The DESGC Director will, with the assistance of Dr Stephanie Wright, who is the Aerospace Education Coordinator for the State of Delaware, attempt to establish links with the USAF, and/or AFA, and/or CAP.

*Metric:* At least one new aeronautics-related partner will be added to the DESGC roster during the academic year 2006-2007.

#### IV. MANAGEMENT

**Goal:** Ensure quality and fairness in all DESGC programs, and alignment with the needs of NASA, the affiliate organizations, and the State of Delaware.

DESGC operates by means of a Management Team consisting of a Program Coordinator, the DESGC Director, Associate Directors in a variety of academic disciplines, and an Advisory Board. Day-to-day operations are handled mainly by the Program Coordinator and the Director. Other members of the Team provide input via twice-yearly meetings, and on other occasions as necessary.

**Objective:** Fair, Open, and Equal Access to All. Personal contacts between the DESGC Director and affiliate representatives are key to ensuring that Delaware citizens throughout the State have fair and equal access to DESGC funds.

*Action:* The DESGC Director and/or other members of the Management Team will visit the affiliate representatives at their home base at least once per year.

*Metric:* At least one of the Associate Directors will accompany the Director on a visit to an affiliate outside New Castle County.

*Action:* The Management team will faithfully represent the diverse interests and resources of the affiliate institutions.

*Metric:* One scholarship will be awarded each year to a student on at least 4 of the 6 Delaware campuses in the consortium.

**Objective:** Timely Reporting to NASA HQ.

*Action:* All reports will be submitted by the Management Team on time and in accord with NASA guidelines.

**Objective:** Participation in the Regional and National Space Grant Network. The Director, or one of the Associate Directors, attends every National Directors meeting. The Program Coordinator attends at least one of the Space Grant National Director's Meetings each year.

*Action:* At least one of the Associate Directors will attend upcoming regional and national meetings.

**Objective:** Principal Tasks of the Director. The Director's central emphasis for the 5-year plan will be as follows:

- i. Continue to encourage and fund the excellent programs that are already in place in Delaware in areas of Higher Education, Teacher Development, and Research;
- ii. Increase the participation in DESGC by all 2-year and 4-year colleges; throughout the State, by means of regular personal visits to faculty and administrators;
- iii. Help to establish Delaware as a NASA EPSCoR State;
- iv. Raise the awareness of DESGC among minority programs on all affiliate campuses by personal visits to the administrators of those programs
- v. Establish contacts with members of the Delaware Department of Education to ensure that DESGC goals are aligned with state educational planning
- vi. Establish and/or broaden contacts with industrial enterprises whose goals overlap the NASA mission
- vii. Broaden the Aerospace component of DESGC by establishing contacts with the US Air Force in the State, including Dover Air Force Base, Air Force Association, or Civil Air Patrol.

*Metric:* Before the end of the 5-year plan, raise DESGC to a Designated State program, if NASA HQ Office of Space Grant provides the opportunity to compete.