NASA Connecticut Space Grant Consortium
University of Hartford, Lead Institution
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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 **NASA CT Space Grant Consortium** is a Capability Enhancement Consortium funded at a level of **$590,000** for activity in fiscal year 2010.

PROGRAM GOALS

The NASA CT Space Grant Consortium's goal is to further the efforts started through NASA's Education Strategic Framework by creating program initiatives with three intended major outcomes:

1. Development of the Science, Technology, Engineering and Math (STEM) workforce in disciplines useful to NASA,
2. Attraction and retention of students in STEM disciplines,
3. Partnerships which promote STEM literacy and awareness of NASA's mission.

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

Outcome 1 - The CTSG Consortium presently has membership composed of higher education and research institutions along with industrial partners, and informal education outlets. With 13 member schools, we are clearly committed to support Outcome 1, development of a STEM workforce. We leverage our financial resources by partnering with a wide range of groups that have complementary interests in our state. Our broad-based efforts in support of Outcome 1 this year have included:

- An undergraduate and graduate student fellowship program, in which students work on projects related to NASA's mission.
- Senior Capstone Project Grants, Undergraduate project grants, travel grants, and an intensive week-long helicopter workshop.
- Faculty research grants that provide important student research assistant opportunities, as well as expand the body of scientific knowledge within STEM.
- Internships (summer full time, as well as academic year part-time positions) within numerous local aerospace companies (e.g. Pratt & Whitney, Hamilton Sundstrand,

etc.). Our consortium has just begun to tap the potential available from numerous smaller aerospace supply companies within our state's borders (such as our industrial affiliate HABCO, Inc. or our non-academic affiliate Connecticut Center for Advanced Technology). These companies provide internship opportunities as well as varied projects for our students.

Outcome 2 - The CTSG Consortium will continue our existing ties with elementary and secondary education groups in order to strengthen the ability of our consortium to influence Outcome 2, attraction and retention of students in STEM fields. These groups include state-wide science groups, as well as magnet schools. CT magnet schools have seen significant growth in student enrollment over the last decade. A number of these schools focus on STEM fields and we plan to align with them since we believe in the importance of supporting creative and innovative programs that reflect our strategic interests. **The goal is for our activities to inspire students to pursue STEM in college.**

- Attracting Students to STEM: By concentrating on magnet schools, which boast a diverse student population, we work to increase the diversity of the student population within STEM fields in colleges.
    - We have reached out to individual schools throughout the state (magnet high school and primary school in New London, middle schools in Hartford), and the University High School of Science and Engineering (located on the campus of our Consortium's lead institution) to expand student awareness of STEM. This year we have implemented a voluntary K-12 outreach component to all of our student grants.
    - We have reserved two seats within the summer helicopter training workshop for gifted, underrepresented high school students from CT to help further inspire these students to pursue STEM majors in college, and to spread the word about STEM within their peer base. One of these students will be selected from the Connecticut Pre-Engineering Program (CPEP).
- Efforts to Retain Students in STEM Majors: The Consortium has also implemented:
    - A new STEM bridge program at Southern Connecticut State University to inspire underrepresented students to pursue STEM majors by exposing them during this 5-week summer enrichment program to STEM-specific activities.
    - Faculty Curriculum Development Grants provide faculty with resources to improve and expand existing curriculum to help keep students interested, challenged and successful in STEM academic pursuits.

Outcome 3 - The Consortium has maintained existing community links within the informal education field (e.g. museums and science centers) and seeks new partnerships in order to impact Outcome 3, promotion of STEM literacy. Community-involvement partnerships include our longstanding affiliation with the New England Air Museum (NEAM), as well as working with the Connecticut Science Center. As Connecticut is a geographically small state this science center is within 25 miles of most consortium members.

PROGRAM ACCOMPLISHMENTS - At the time of this writing, our consortium has now completed its first round of selections for student and faculty awards. Early indicators of our success in awarding this year include the following:

OUTCOME 1 & 2 - During summer of 2010, CT successfully ran two new hands-on STEM programs.

- Summer Bridge Program for Students Underrepresented in STEM – This CTSG sponsored program provides these students with extra information, guest speakers, hands-on STEM-related projects and rationale for selecting STEM majors. Our goal is for this cohort to increase the number of diverse undergraduate students selecting STEM majors in Connecticut affiliated colleges. The summer Bridge program is a 5-week residential program that strongly attracts diverse students. It is housed at SCSU, in the 3rd most populous city in Connecticut.
- Applied Rotary Wing Engineering Helicopter Workshop– Open to students affiliated with all 52 of the nation's state consortia. Workshop included classroom instruction and hands-on, immersive experimentation on the following topics; Aerodynamics, helicopter aerodynamics, principles of helicopter flight, wind tunnel testing, UAV design, RC aircraft design, VTOL aircraft design and construction, as well as networking opportunities within Sikorsky Aircraft and KAMAN Aerospace.

We will run the Bridge Program again in summer 2011, and the helicopter workshop will be expanded to include a run-on fully registration-funded week-long program dedicated to faculty who wish to enhance/developing curriculum within their states.

OUTCOME 3 – Students and faculty award recipients have responded well to our new request that they volunteer as mentors, speakers or hands-on workshop visiting presenters within CT's urban K-12 classrooms, and or Boys and Girls Clubs to help us inspire young students to pursue STEM studies. CT's new Assistant Director is building key relationships within the K-12 STEM teacher population to facilitate this initiative.

NASA 2010 EDUCATION PRIORITIES – *Note: Connecticut falls a year behind other states in its NASA funding. This report contains activity for the GFY 2010 period of performance, but was developed and run under GFY09 funding. Therefore, our goals for this reporting period did not align with the goals requested within GFY2010 Funding parameters. However, we have included those 2010 Education Priorities here, and have reported CT's performance that aligns to those.*

- **Authentic, hands-on student experiences in science and engineering disciplines:** CT student awards all involve an independent research component. We actively partner with industry to create as many internship opportunities as possible and work to connect students with faculty, NASA Centers and industry contacts who are willing to oversee student projects. We run two summer enrichment programs for students (the helicopter training workshop and the bridge program) that immerse students in intensive hands-on STEM activities. The 2011 summer Bridge program participants will engage in enrichment activities at NYCRI/NASA GISS.

  Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. –CT will underwrite its 4th PLAN Academy this year, in partnership with Connecticut Center for Advanced Technology. This Academy is an in-service teacher workshop that provides curriculum in Photonics, Lasers, Aerospace, and Nanotechnology for use within these teacher participants' inner-city classrooms. Also, CT affiliate, Eastern Connecticut State University, is the home of CT's NASA Educator Resource Center. Our Consortium's new Assistant Director is

working to 1) build a stronger relationship with this critical resource and 2) expand our mentoring/speaker voluntary program's effectiveness within K-12.

- **Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers.** – Our current grant funds two summers (2010 and 2011) of a new 5-week long, hands-on STEM Bridge Program that is being run by CT academic affiliate Southern Connecticut State University.
- **Community Colleges** – We are partnering with our Connecticut Community Colleges Campus Director to strengthen our relationship with Capitol Community College students and faculty. She is leading a new STEM scholarship initiative at this MSI and we will evaluate its effectiveness in the summer 2011.
- **Aeronautics research/NextGen** – CT faculty grants all require a research contact within NASA or aerospace industry. Preference points are awarded to all grant proposals that demonstrate collaborations with NASA. Also, our Consortium partners with CCAT to connect faculty researchers with start-up aerospace and NextGen manufacturers in CT.
- **Environmental Science and Global Climate Change** – This is an area of expanding student and faculty interest. CT actively reaches out to faculty within environmental studies areas to encourage their submission of grant proposals, as well as to encourage their students' submission. However, we presently do not have a program designed specifically to engage/award to this academic discipline.
- **Diversity of institutions, faculty and student participants.** – All of CT's leaders actively work on their affiliate campus to reach out to students and faculty who are traditionally underrepresented in STEM, and strongly encourage those who are US Citizens to apply for grants. We have found this to be effective. CT's state enrollment rate for students underrepresented in STEM is 20.1% and for women this figure is 53.5%. Those numbers differ greatly in the STEM major subsets. Also, CT has a large resident alien population within its colleges, many of whom make up the enrollment statistics mentioned above. CT has one officially recognized MSI, but the resident alien makeup of the groups of students we seek to reach are even more heavily concentrated within the community colleges. Therefore, CT's strategy is to continue to pursue diligence in its outreach at the affiliate level (campus directors partnering with offices, ie. women's studies, diversity affairs, disability services, student professional associations, etc.) to reach those traditionally underrepresented in STEM.
- **Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.** – CT has instituted a preference in its awarding of faculty grants to non-tenured faculty. Also, our Consortium's selection committee provides in-depth feedback within all of its grant notification letters (awards and declines), explaining that the Consortium's goal is to seed research that leads to continued funding from other sources. That feedback is essential to junior faculty's grant writing development, which is essential to their success as researchers in the long run. We use the grant proposal process to train (students and faculty) on how to be successful grant writers.

PROGRAM CONTRIBUTIONS TO PART MEASURES

Following are Connecticut's success in contributing to the NASA PART measures at this half-way point in our programmatic cycle.

- Student Data and Longitudinal Tracking: *Total awards granted to students = 26; Fellowship/Scholarship = 8, Higher Education/Research Infrastructure = 18; 4 (15.3%) of the total awards represents underrepresented minority funding; 10 (38.5%) of these awards were granted to women. 8 of the total awards were received by graduate students, while 18 (69.2%) were granted to undergraduates. All 26 students are currently enrolled in their degree program at this time. The affiliate distribution of these 26 awards was: CCSU 4 (15.3%), ECSU 0, Fairfield University 4 (15.3%), SCSU 1 (3.8%), Trinity College 1 (3.8%), University of Bridgeport 0, UCONN 1 (3.8%), UCONN Health Center 0, UHart 5 (19.2%), UNH 1 (3.8%), Wesleyan 3 (11.5%), Yale 6 (23%), CCC-COT (awarding takes place in spring 2011).*
- Course Development: 2 awards have been granted this year that will create new or revised courses targeted at the STEM skills needed by NASA. Both of these course development grants will improve existing college-level courses.
- Matching Funds: While our funding cycle is only at its midpoint at this time, Connecticut anticipates that it will leverage an additional 74.6 cents of non-federal funds for every NASA dollar spent this year for Connecticut Consortium-related programming (ratio of .746:1).
- Minority-Serving Institutions: This year Connecticut developed a new initiative to provide increased scholarship dollars for students within Capitol Community College, Connecticut's only officially recognized MSI. Prior efforts (a speaker series of events to expose CCC students to 4-year affiliates nearby) to better engage and inspire students within this affiliate did not produce the reportable outcomes desired. These scholarships are awarded in late spring 2011, and analysis of its success will be reported later in the year. Also, Connecticut is collaborating with the DC Space Grant Consortium and our industrial affiliates to place at least two students from MSIs (Howard University and possibly North Carolina A&T) within summer aerospace internships in Connecticut during summer 2011.

IMPROVEMENTS MADE IN THE PAST YEAR

- Engagement of Minority-Serving Institutions: Connecticut has one officially-recognized MSI. Past initiatives to engage students within this MSI have not met with the level of outcome success desired. Therefore, increased funding has been planned for scholarship awarding this year to students of this college who plan to pursue STEM majors at a 4-year CT affiliate. Awarding is planned for late spring 2011; analysis of its success will be reported later in the year.
- Administration– Consortium by-laws are now in place. Campus directors terms of service are now limited, allowing the Consortium to engage even greater numbers of faculty across the affiliate base. Two Campus Directors have just rotated out of their assignments, recommending their replacements to the Consortium. Also, roles for Consortium leadership are now clearly defined and have been put into writing. The Consortium Office has added an Assistant Director to ensure more fluid transitions of leadership staff in the future, and to develop relationships within K-12.
- Reporting – Benchmarking with other state consortia has led to Connecticut revising its longitudinal reporting strategy. Hard copy and online evaluation forms have been created to allow the Consortium Office to collect critical reporting data directly from

the award recipients to help us better capture responses from these important participants, rather than relying on the Campus Directors to provide updates.

- Outreach to K-12 Students – While CT is not funded to directly support K-12, we believe it would be beneficial to both students in K-12 as well as Consortium participants to create a mentoring program between these groups. This also allows our Consortium to contribute to NASA Part Measures within the K-12 constituency as well as improve our efforts related to Outcome 3. We have developed a voluntary mentoring/speaker program in which starting this year we ask all program participants to consider either mentoring or giving a STEM-related presentation or hands-on workshop within one of Connecticut's inner city K-12 classrooms. The Consortium's new Assistant Director is working to develop a list of willing K-12 teachers to facilitate this programming. Through benchmarking with our national Space Grant peers, we have developed evaluation forms to capture PART Measure information related to this new outreach initiative.
- Engagement of Affiliates/Affiliate Satisfaction – We have added one a new Consortium program (the Capitol Community College STEM Scholarship Program) that was conceptualized and will be run by one of our academic affiliates. This increases the number of affiliate run programs to three. Our affiliates have expressed their enthusiasm for such opportunities. Also, instituting by-laws and developing leadership role position descriptions has led to our affiliate leaders feeling more involved and engaged in their roles within the Consortium leadership.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Academic Affiliates: CT has thirteen academic affiliates *(Central Connecticut State University, Connecticut Colleges of Technology (which includes CT's only MSI – Capitol Community College), Eastern Connecticut State University, Fairfield University, Southern Connecticut State University, Trinity College, University of Bridgeport, University of Connecticut, University of Connecticut Health Center, University of Hartford (Lead Institution), University of New Haven, Wesleyan University, and Yale University).* These affiliates play an active role in A) project development and implementation; increasingly taking the lead on conceptualization and implementation of Consortium-funded new initiatives; such as 1) the Community College scholarship program, 2) the Life Support & Sustainable Living program, 3) the helicopter workshop and 4) the new summer bridge program, and B) providing a Campus Director to continually expand campus engagement, providing leadership and membership on the grant selection committee, and serving as a conduit for faculty and students to connect with NASA centers and other STEM researchers. (Outcomes 1, 2 and 3)

Industrial Affiliates: CT has seven industrial affiliates *(Pratt & Whitney Aircraft, Hamilton Sundstrand, UTC Research, Sikorsky Aircraft, UTC Power, Kaman Aerospace, GKN Aerospace Services, and HABCO, Inc.)*. These affiliates provide important internship and research opportunities for CT's students and faculty. They also provide leadership guidance on and external advisory board, helping to ensure that the Consortium remains aware of industry trends and future hiring need projections related to STEM careers. (Outcomes 1 and 2)

Non-Academic Affiliates: CT presently has six non-academic affiliates *(State of Connecticut, CT Science Museum, CT Corsair Project, New England Air Museum, Connecticut Center for Advanced Technology, and Connecticut Pre-Engineering Program)*. The role of these affiliates is to help us promote STEM literacy throughout the state and to provide important internship and faculty research opportunities for affiliates within our state. (Outcomes 2 and 3)