

Connecticut Space Grant College Consortium
University of Hartford, Lead Institution
Thomas Filburn, Ph.D., Director
Consortium Phone: (860) 768-4813
Consortium URL: www.ctspacegrant.org
Grant Number: NNX12AG64H

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 Connecticut Space Grant Consortium is a Capability Enhancement Consortium funded at a level of \$430,000 for activities in fiscal year 2012.

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 five major goals:

CTSG Goal 1: To establish and promote NASA-related research opportunities that draw on the collaborative strength of private, academic and government sectors.

Objectives:

- 1a.** Recruit at least two applicants per year for one or more of the following: NASA Summer Academy; Undergraduate Student Research Opportunity Project (USRP);
- 1b.** Place one student from each member institution at the CT Center for Advanced Technology (CCAT) and/or corporate institutions;
- 1c.** Centralize and disseminate NASA related research opportunities;
- 1d.** Increase the breadth of faculty response to Connecticut Space Grant opportunities;
and
- 1e.** Facilitate the formation of teams to pursue NASA related research opportunities.

CTSG Goal 2: To support education initiatives that will inspire students to pursue careers in science, technology, engineering and mathematics (STEM).

Objectives:

- 2a.** Identify and engage at least six partners to inspire K-12 students;
- 2b.** Identify STEM sites to be visited by K-12 students to promote interest in NASA-related fields of study;

- 2c. Commit each member institution to two high school outreach efforts per year;
- 2d. Increase by 30 the number of higher education students submitting research project proposals;
- 2e. Develop a web site for educational opportunities and resources; and
- 2f. Place students in industry in mentor/co-op/internship environments.

CTSG Goal 3: To raise the visibility of the Consortium.

Objectives:

- 3a. Create an outreach (marketing) plan by April '05, including the identification of stakeholder groups

CTSG Goal 4: To promote workforce development that recognizes the current and future needs of the Connecticut economy.

Objectives:

- 4a. Develop seminars around emerging technologies;
- 4b. Explore potential partnership with the Distance Learning Consortium;
- 4c. Work with local industry for career development in the workplace; and
- 4d. Develop courses/programs around workforce needs.

CTSG Goal 5: To develop sufficient resources for strong organizational growth consistent with the target of \$750,000 by 2010.

Objectives:

- 5a. Secure sufficient outside funding for a part-time/full-time dedicated staff person;
- 5b. Research best practices of top state consortiums; and
- 5c. Seek funding from industry, government and foundations.

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 12 member schools, we are clearly committed to support Outcome 1, development of a STEM workforce. As a means to meet our Consortium strategic goal of promoting NASA-related research opportunities (CTSG Goal 1) and workforce development that recognizes the needs of the CT economy (CTSG Goal 4), 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.
 - In the most recent reporting, 1 graduate fellowship (Yale) and 5 undergraduate fellowships (Bridgeport (2), UConn, Wesleyan, CCSU) were awarded and completed.
- Senior Capstone Project Grants, undergraduate project grants, travel grants, and an intensive week-long helicopter workshop.
 - 6 undergraduate project grants were awarded in Fall 2012 (UConn, Yale, Hartford, CCSU, Fairfield, Trinity).
 - Travel grants were awarded to both graduate (3) and undergraduate (6) students (UConn, CCSU, Hartford).

- An undergraduate student from CCSU traveled to Grapevine, TX to present two team papers (“*Senior Capstone Design Project for Aerospace Specialization and Student-Faculty Research on Propulsion*” and “*Hybrid Propellant Rocket Engine Test Fixture and Research on the Combustion of Non-Conventional Fuels*”) at the 51st AIAA Aerospace Meeting and Exhibit on January 7-10, 2013.
- Faculty research grants that provide important student research assistant opportunities, as well as expand the body of scientific knowledge within STEM.
 - Three types of faculty research grants are available, and in total, 5 were awarded (Bridgeport, Trinity, CCSU).
- Internships (summer full time, as well as academic year part-time positions) within numerous local aerospace companies (e.g. Pratt & Whitney, Sikorsky, United Technologies Aerospace Systems, etc.). In addition, our consortium supports internships at numerous smaller aerospace supply companies within our state’s borders (such as our industrial affiliates HABC0, Inc. or our non-academic affiliate Connecticut Center for Advanced Technology and Connecticut Corsair). These companies provide internship opportunities as well as varied projects for our students.
 - 2 Part-time academic year (Hartford, UNH) and 4 summer internships (UNH, Trinity, Hartford, UConn) were awarded. Students interned at the following companies: Proton On-Site, Connecticut Corsair, United Technologies Aerospace Systems (UTAS), Pratt & Whitney, and Sikorsky.
 - The industrial internship program is also open to students from the national Space Grant network.
- Research internships for students at Capitol Community College (the state’s lone MSI) are being set up, for the 2013-2014 Academic Year. These internships will allow students at CCC to participate in a research project in a science and/or engineering field at an established research institution in the Hartford area.
- Support for students to participate in NASA Academy programs for summer and academic year internship is on-going.
 - An undergraduate student from University of Hartford will be participating in a spring semester internship at NASA Ames Research Center.

Outcome 2 - The CTSG Consortium continues to work with elementary and secondary education groups, in addition to our collegiate affiliates 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. A number of the magnet 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 for our activities is to inspire students to pursue STEM in college. The projects/programs highlighted align with CTSG’s strategic Goal 2 – to support education initiatives that will inspire students to pursue careers in STEM.

- Higher education initiatives to *Educate and Engage*

- A new undergraduate scholarship was developed for students studying in fields of interest to NASA. One scholarship was awarded to each of the 11 undergraduate Academic Affiliate members of the Consortium.
- Smaller scholarships will be awarded to students from each participating community college to support students studying STEM fields, and for those with a desire to continue their education at a four-year college.
- CT Space Grant continues to support the Helicopter/UAS workshop. The workshop was successfully completed during Summer 2012, and Summer 2013. Changes were made to update the curriculum for this summer's program to further emphasize UAV topics. This program is open to college students in CTSG, and also college students from the national Space Grant network.
- K-12 initiatives to *Educate and Engage*
 - 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 reserved two seats within the summer helicopter training workshop for gifted 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. Two students were selected this year, both from the Hartford School District.
 - CTSG supported 6 student scholarships for middle school girls to participate in the 'Mad About Science' summer program, which was a STEM immersion summer camp.
 - Funds were used to support a second STEM summer program for girls – the Engineering Camp at University of New Haven.
 - CPEP (CT Pre-Engineering Program) is another summer program with which we continually support.
 - New this past year was support for participants from the East Lyme SSEP group to travel.
 - The FOCUS: Energy program was successfully administered during the Summer of 2012. This week-long program partners 15 middle and high school science teachers with college faculty, allowing them an opportunity to develop new curricular activities that meet state education standards, along with providing them materials and lesson plans to implement the activities.

Outcome 3 - The Consortium continues to maintain existing community links within the informal education field (e.g. museums and science centers) and seeks new partnerships in order to impact both NASA Education Outcome 3, promotion of STEM literacy, and CTSG Goal 2 (to support education initiatives that will inspire students to pursue careers in STEM) and CTSG Goal 3 (to raise the visibility of CTSG). Community-involvement partnerships include our longstanding affiliation with the New England Air Museum (NEAM), as well as working with the Connecticut Science Center, the Discovery Museum and Planetarium.

- CTSG sponsored our 2nd annual state-wide Space Day, where non-academic affiliate institutions held special NASA-related events. The 'festivities' this year were

expanded to include one campus planetarium at Eastern Connecticut State University in order to reach more diverse communities.

PROGRAM ACCOMPLISHMENTS

Outcome 1: Employ and Educate

The progress toward reaching our goals of Outcome 1 is evident in the Fellowships, Scholarships and Internships awarded in Fall 2012.

SMART Goals

- CCC lecture series – discontinued
- Target non-engineering fields – A biology/chemistry lecture was arranged for ECSU to initiate non-engineering undergraduate projects and research fellowships. Additionally, there is increased collaboration with Departments of Education at Academic Affiliates, working to involve pre-service teachers.
- Fellowship/Scholarship (awarded-to-date/completed) – Graduate Research Fellowship (3/1); Direct Undergraduate Scholarships (11/11); Community College Scholarships (0/0 – 12 awards proposed); Project Grants (6/7); Undergraduate Research Fellowship (9/5)
- Faculty Research Grants (awarded-to-date/completed) – Faculty Research (3/1); Faculty Seed Research (1/0); Faculty Collaboration (0/0 – two awarded proposed); Curriculum Development (1/1)
- Student and Faculty Travel – Travel grants were awarded to graduate (3) and undergraduate (6) students.
- NASA Academy support– 1 spring semester internship/2 summer internships
- Rock-On – CTSG supported 6 participants to attend the Rock-On workshop in summer 2013 (2 undergraduate, 2 graduate, and 2 informal educators).
- LSSL – Space Grant supported the latest Life Support & Sustainable Living (LSSL) program. The program that took place in January of 2013 reported 32 university and community college participants, of which 40% were female.
- Helicopter Workshop – The workshop held on June 16-21, 2013, was the most successful ever, with 29 attendees from 12 different consortia (CT, DE, FL, MA, NC, NE, NJ, NY, OR, PR, WA, WV).
- Industrial Internships awarded during Fall 2012 – Total awarded: 6 (Full-time summer: 4, Part-time academic year: 2)
- MSI Internships – No students have been awarded this internship yet, as the arrangements are still being made between the CTSG office and Capital Community College.

Outcome 2: Educate and Engage

Our goal to attract and retain students in STEM disciplines is achieved through a variety of opportunities for students, pre-service, and in-service teachers.

- Summer Teacher Academy – In partnerships with CCAT, the FOCUS: Energy program was successfully administered during the Summer of 2012. 15 in-service HS/MS teachers attended the workshop. 20 “student hands-on” activities were

supported, and approximately 1,300 students indirectly benefited from this program.

- K-12 Misc.– Through support of various events/opportunities, over 200 K-12 students were able to participate in STEM activities. The East Lyme SSEP team and CT Invention Convention both received support from CTSG. Additionally, two summer programs focused on middle school girls (Mad About Science, UNH Engineering Camp) were supported by these funds.
- K-12 Outreach – As a requirement of receiving CTSG funding, each student participant must perform some sort of outreach activity in which they will engage K-12 students. As the awards are just being dispersed, not outreach has been done at this point.
- SOAR – Due to funding limitations, we did not support the SOAR program in 2012.

Outcome 3: Engage and Inspire

The building of partnerships between formal and informal education, and promotion of STEM literacy and awareness of NASA's mission is primarily realized through museum support.

- Museum Support – The second annual CT Space Day was held on April 6, 2013. The 'festivities' were expanded from the three participating museums to include one additional event at Consortium Academic Affiliates ECSU. In total 4,500 participants were estimated for the events.
- CT Science Fair – Due to funding limitations, and growth in student sponsored projects, like NASA flight experiments, we did not support the CT Science Fair in 2012.
- CT Invention Convention – The CT Invention Convention was successfully held on May 4, 2013. Of the 8,000 students who participated at the 130 K-8 schools in CT, 697 finalists were selected to participate in the Invention Convention on May 4th. An estimated attendance of 5,000 parents, teachers, and judges attended the event.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION 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 in Academic Year 2012-2013 = 46; Fellowship/Scholarship = 30, Higher Education/Research Infrastructure = 16; 4 (8.7 %) of the total student awards recipients were underrepresented students; 8 (17.4%) of the total awards recipients were women. Of those most recently reported, 33 are still enrolled in their current

degree program. Longitudinal tracking for the past five years, 99 students are still enrolled, 6 are pursuing advanced degrees, 6 are seeking STEM employment, 15 are Employed STEM/Aerospace Contractor, 17 are Employed STEM/Non-aero contractor, 2 are employed in K-12 STEM Academia, 4 are employed in Other STEM Academia, and 8 are Non-STEM Next Step.

- **Minority Serving Institution Collaborations:** The CTSG office is working with Capital Community College, Connecticut's only officially recognized MSI, to organize this internship opportunity. Research partners have been identified (University of Connecticut Health Center, Mount Sinai Rehabilitation Hospital, and University of Hartford Physical Therapy). Internships will be awarded in the 2013-2014 Academic Year.
- **NASA Education Priorities:**
 - **Authentic, hands-on student experiences in science and engineering**
The following is a summary of the graduate and undergraduate fellowships awarded by CTSG:
 - Graduate Research Fellowship – Students engage in research related to space/aerospace science or engineering under the guidance of a faculty member or a mentor from industry.
 - Undergraduate Research Fellowship – Students engage in research related to space/aerospace science or engineering under the guidance of a faculty member or mentor from industry. Students may be preparing for senior design projects, honors research, or searching for an educational experience, which is consistent with the mission of NASA.
 - Student Projects Grants – This award allows students, or groups of students to purchase items needed for projects that are beyond the normal funds allocated by departments, colleges and universities. These awards may also be used in preparation for NASA sponsored design competitions.
 - Travel Grants – Students may apply for travel grants to visit NASA centers to use unique facilities, to present their NASA related work at professional meetings, to visit NASA researchers for collaboration purposes, and/or to participate in NASA sponsored competitions and events.
 - Industrial Internship – Students are matched with CT industry partners in space/aerospace science or engineering fields, under the guidance of a mentor from industry. Students may participate in Summer (full time, 10 week) or Academic Year (part-time, one semester) internships.
 - **Diversity of institutions, faculty, and student participants:**
Institutional Diversity: The affiliate distribution of these 46 awards was: CCSU 10 (21.7%), ECSU 1 (2.2%), Fairfield University 3 (6.7%), SCSU 1 (2.2%), Trinity College 3 (6.5%), University of Bridgeport 3 (6.5%), UCONN 11 (23.9%), UCONN Health Center 0, Univ. of Hartford 5 (10.9%), Univ. of New Haven 4 (8.7%), Wesleyan 2 (4.3%), Yale 3 (6.5%), COT (not awarded AY 2012-2013).

Faculty Diversity: Five (5) awards were granted in Fall 2012, however, at the time of reporting, only 2 have been completed. Both recipients were male, and 50% were underrepresented minority.

Student Diversity: The directly funded student participant diversity for awards for AY 2012 - 2013 reports 4 (8.7%) of the total student awards were awarded to underrepresented students; 8 (17.4%) of the total awards were awarded to women.

○ **Engagement of middle school teachers in curriculum enhancement**

In partnerships with CCAT, the FOCUS: Energy Teacher Workshop was successfully administered during the Summer of 2012. 15 in-service HS/MS teachers attended the workshop. 20 “student hands-on” activities were supported, and approximately 1,300 students indirectly benefited from this program.

○ **Summer opportunities for secondary students on college campuses**

- Mad About Science, University of Hartford, CTSG funded 6 scholarships for middle school girls to attend a two-week long summer camp where they spent the afternoon participating in hands on STEM activities.
- Engineering & Science Summer Experience, University of New Haven, CTSG funded 2 scholarships for high school participants to attend a week-long summer camp in which they discovered the excitement of working on engineering and science projects.
- Connecticut Pre-Engineering Program (CPEP) Summer Gaming Challenge, CTSG helped to support this program which runs all summer long, and enables middle school students to improve their math proficiencies by engaging in fun and challenging activities.

○ **Develop and sustain Community College relationships**

The CTSG is transitioning from a previous relationship with the Colleges of Technology, the CT State Community College System, to relationships with each individual college. Three relationships will be in place by Fall 2013, to begin Community College Programs. The number of Community College affiliate will grow to a minimum of 5 by the end of the 2013-2014 Academic Year.

○ **Aeronautics research directly related to NextGen (Next Generation Air Transportation System)**

The following research projects/programs were supported by CTSG:

- Helicopter/UAS Workshop, Central Connecticut State University
- “Testing Drag of ‘Anhydra’, a Superhydrophobic Surface”, T. Sullivan, Trinity College

○ **Environmental science and global climate change research**

The following project was supported by CTSG:

- “The Provenance Phylogenetic Diversity of Marine Archae: Implications for Paleoclimate Reconstructions and Early Life Research”, C. Warren, Yale University
- **Enhance support for innovative research activities by early career faculty**
CTSG ranks junior faculty research proposals at a higher level than senior faculty proposals in an effort to foster innovative research in early career faculty. Four (4) Faculty Research Grants were awarded in Fall 2012, none of which have been completed at the time of reporting.

IMPROVEMENTS MADE IN THE PAST YEAR

We have instituted a program that offers one undergraduate scholarship at each academic affiliate that offers a bachelor degree. This improvement guarantees that each academic affiliate will receive a direct, tangible benefit from its membership in the consortium each year.

A new system will be put into place to work directly with our Community College affiliate institutions, rather than working through the Colleges of Technology.

CTSG is working to obtain external funding from state government and industry by having both informal discussions/meeting and submitting formal requests.

The following updates/revisions have been made to our Consortium Strategic Goals:

CTSG Goal 1, Objective 1b. Place one student from each member institution at the CT Center for Advanced Technology (CCAT) by the end of 2006 and/or corporate institutions.

UPDATE: To date, CCAT has worked with several students on research fellowships, and as interns. These students have come from several university affiliates (including University of Hartford and UConn). Moving forward, CTSG will continue to work with CCAT, although the partnerships with students will fluctuate to reflect the needs of CCAT. Additionally, CCAT is an equal Industrial Affiliate, so students will be placed at any industry partner that best fits their educational/career needs.

REVISION: 1b. Place students from Academic Affiliate Institutions at Industrial Affiliates for student research, projects and industrial internships.

CTSG Goal 2, Objective 2b. Identify STEM sites to be visited by K-12 students to promote interest in NASA-related fields of study.

CTSG Goal 2, Objective 2c. Commit each member institution to two high school outreach efforts per year.

UPDATE: Outreach is a required part of student grant responsibilities. Students are encouraged to visit a community college, or K-12 classroom to share their knowledge and experience in STEM education and research. As a means to foster these outreach relationships, CTSG has added an Outreach page to our website (ctspacegrant.org/outreach). Due to the institutional diversity of our award recipients, the outreach efforts are spread across the state.

REVISION: (Combine 2b and 2c) 2b. Identify K-12 outreach sites, to foster diverse experiences for both student presenters and classroom participants. Require outreach of “significant” award recipients.

CTSG Goal 2, Objective 2d. Increase by 30 the number of higher education students submitting research project proposals.

REVISION: (Renumber) 2c. Increase the number of higher education students submitting research project proposals in all 4-year Academic Affiliate Institutions. Obtain a minimum of 5 student applications from all research focused Affiliates (UConn, Wesleyan, and Yale) each year, and encourage increased student participation from all other Affiliates.

CTSG Goal 2, Objective 2e. Develop a web site for educational opportunities and resources.

UPDATE: CTSG has developed and maintained a new website. With the help of a dedicated student worker, this website is updated on a daily basis.

REVISION: (Renumbered) 2d. Maintain an up-to-date website for dissemination of educational and grant opportunities, and other Space Grant and NASA related news and resources.

CTSG Goal 2, Objective 2f. Place students in industry in mentor/co-op/internship environments.

REVISION: (Renumbered) 2e. Place students in industry in mentor/co-op/internship environments.

CTSG Goal 3, Objective 3a. Create an outreach (marketing) plan by April '05, including the identification of stakeholder groups.

UPDATE: Visibility of CTSG has greatly improved with the reworking of the website, the hosting of CT Space Day, and with the growth of our partnerships with informal education affiliates throughout the state.

REVISION: Raise the profile of CTSG throughout the state by sharing information through the website, newsletter, and media events.

CTSG Goal 4, Objective 4b. Explore potential partnership with the Distance Learning Consortium.

UPDATE: This goal is no-longer appropriate.

REVISION: Deleted.

CTSG Goal 5: To develop sufficient resources for strong organizational growth consistent with the target of \$750,000 by 2010.

UPDATE: CTSG is working to grow the number and quality of the programs offered.

REVISION: Our new target is to reach the next level of funding by the end of our current grant cycle, 2015. In addition, we continue to explore potential state funding.

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) K-12 summer opportunities, 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, and GKN Aerospace Services*). 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 seven non-academic affiliates (*State of Connecticut, CT Science Museum, CT Corsair Project, New England Air Museum, Connecticut Center for Advanced Technology, the Discovery Museum 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)

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