

FY10 Progress Report
California Space Grant Consortium (CaSGC)
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CaSGC 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 California Space Grant Consortium (CaSGC) is a Designated Consortium funded at a level of \$845,000 for fiscal year 2010.

CaSGC PROGRAM GOALS

- **To develop and maintain a network of institutions of higher education throughout California with interests and capabilities in aerospace science, engineering, and technology.**
- **To recruit and train aerospace professionals, especially women and underrepresented minorities, for careers in aerospace science and engineering. A primary focus of this effort is student-mentor projects.**
- **To promote a strong science, mathematics, and engineering education base from elementary through university levels that meets NASA's Education Enterprise established Education Program Operating Principles.**
- **To encourage interdisciplinary education and training, research, and public service programs related to aerospace.**
- **To encourage collaborative development programs among universities, industry, and federal, state, and local governments.**

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

NASA Education Outcome 1: "Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Employ and Educate)".

A. CaSGC FY 2010 Fellowship/Scholarship (F/S) Program

In FY 2010, the CaSGC Strategic Plan reflects SMART goals for participation of underrepresented groups to correspond to current California higher education demographics (includes all career fields – STEM and Non-STEM): 36% for minorities and 56% for females, based on the National Center for Education Statistics [NCES] data for California.

The results for the FY 2010 year show that the CaSGC awarded 184 fellowships and

scholarships. The CaSGC, providing awards primarily in STEM fields, was not able to achieve the SMART goals for minorities and women as stated in the CaSGC Strategic plan due to the low actual enrollment of minorities and women in STEM related fields. The 2010 awards were as follows:

- Awarding 31% of the 2010 awards to female students; and
- Awarding 21% of the 2010 awards to underrepresented minorities.

B. CaSGC FY 2010 Higher Education Program

The CaSGC has allocated **\$188,479 or 22% of the FY 2010 NASA Space Grant funds** to the Higher Education Program Element and when combined with other non-federal resources doubles the funds available to Higher Education programs.

CaSGC has worked toward NASA Objective 1.3: Student Involvement in Higher Education by providing funding for student-mentor projects & intern programs that provide hands-on student participation in STEM-related programs & research. In FY 2010, the CaSGC provided four competitive Higher Education opportunities (**Workforce Development Program, Statewide Undergraduate Research Opportunity Program, STEM Pipeline Opportunity, NASA Center Summer Intern Program**) that were available to all CaSGC affiliates.

The CaSGC Affiliate **Workforce Development Program** provides opportunities for CaSGC affiliate undergraduate and graduate students to be placed with NASA, university, and industry mentors while working on various NASA Mission Directorate programs. In FY2010, the CaSGC selected 14 affiliate projects for awards that were used to support the students' participation in these experiential projects. Each of these participating affiliate campuses has woven these hands-on student efforts with related interdisciplinary science and engineering curricular programs.

The FY 2010 Statewide **Undergraduate Research Opportunity Program (UROP)** was a continuation of the program initially implemented in FY2009. The CaSGC UROP provided opportunities to undergraduate students (29 student proposals selected in FY2010) attending CaSGC affiliate institutions (competitively reviewed and selected) for projects that not only engage undergraduate students in world-class aerospace-related research projects but also provide an effective shared resources environment for Space Grant STEM education throughout California.

The FY 2010 SMART goals for Workforce and UROP opportunities were as follows: 1. Engage all active CaSGC affiliates in these higher education Human Capital Programs; 2. Reach the goals for involvement of underrepresented students in these STEM-related projects; 3. Increase the involvement of MSI affiliate institutions in every aspect of these programs; and 4. Lead institution management will provide coordination resources in forming partnerships between CaSGC affiliates, industry, and NASA Centers. Most of these goals were achieved in FY2010 for these higher education opportunities except for the goals relating to underrepresented student participation.

In addition, the CaSGC has worked toward NASA Objective 1.4: Course Development (STEM disciplines) by developing an effective aerospace learning environment that has both curricular excellence as well as hands-on skill development. Each of the CaSGC affiliates contributes to

both areas throughout California. The CaSGC Strategic Plan, recognizing the breath and depth of existing aerospace-related science and engineering curricular programs on the affiliate campuses, had set and implemented the following SMART goals for FY 2010: 1. Provide funding that creates partnerships between the CaSGC and the affiliate campuses to encourage aerospace-related engineering and science curricular development and dissemination; 2. Provide the facilitation, coordination, and networking management resources for these curricular efforts while continuing to define the aerospace-related university-level educational needs of California and NASA; 3. Emphasize the involvement of MSI affiliates in curricular development and sharing efforts. The CaSGC has met these goals in its FY2010 program

In FY 2010, the CaSGC initiated the **STEM Pipeline Opportunity** Program that addresses some of the "Human Capital" pipeline issues within NASA and the Nation. These pipeline issues include educational (Higher Education, Precollege, and Public Outreach), research, and hands-on training that will positively impact the aerospace workforce pipeline. Highest priority is given to the higher education level of the pipeline. The CaSGC **STEM Pipeline Opportunity** Program provides funds to CaSGC affiliates (competitively reviewed and selected) that propose projects that not only foster world-class aerospace-related research but also provides an effective shared resources environment for Space Grant STEM education, outreach, and workforce development. The STEM Pipeline Opportunity funds were allocated to various CaSGC Program Elements in the following way: 30% for Higher Education Projects, 30% for Research Infrastructure Projects, 30% for Precollege Projects, and 10% for Outreach and Informal Education Projects. The STEM Pipeline announcement to the affiliates emphasized the importance of:

- Building partnerships that include multiple CaSGC affiliates;
 - Seeking partnerships with the California Community College System;
 - Actively pursuing the participation of science and engineering students from underrepresented ethnic or gender groups on each participating campus);
- Actively engaging Minority Serving Institutions (MSIs) in proposed projects
- Promoting interdisciplinary (science and engineering) teaming;
- Obtaining matching resources from industry, state agencies, educational institutions, and community workforce organizations;
- Demonstrating the ties to NASA Centers or Mission Directorates and alignment with NASA Vision and Mission as it relates to the national goal of an increased science, technology, engineering, and math (STEM) talent pool;

As part of the **FY 2010 STEM Pipeline Opportunity**, **15 affiliate proposals** were selected for CaSGC awards. Each of the funded STEM Pipeline proposals met the announcement guidelines. A number of the affiliate proposals had tasks that were specifically focused on Higher Education student – mentor projects and course development and dissemination. From its formation in 1989, the CaSGC has emphasized undergraduate education as the area to achieve greatest impact by Space Grant. Although the initial founding members of the CaSGC (UCSD, UCLA, and UCB) have taken the lead in creating interdisciplinary undergraduate learning environments that include both engineering and science curricular programs and experiential learning student-mentor projects, many of the CaSGC affiliates now integrate their experiential science and engineering projects with their curricular efforts.

As part of the **FY 2010 NASA Center Summer Intern Program**, the CaSGC competitively selected and supported one student at NASA Marshall and NASA Langley, two students at

NASA Glenn, and six students at Boeing/NASA JSC. The students were funded for the summer internships using Space Grant funds, ESMD funds, and industry funds.

C. CaSGC FY 2010 Research Infrastructure Program

The aerospace-related research infrastructure in California is immense (many projects funded by sources other than Space Grant), therefore in FY2010; CaSGC focused its resources (**\$35,000 or 4.1% of Space Grant budget vs. \$358,000 non-federal funds**) by forming partnerships with affiliates on coordinating a part of the educational & "Human Capital" aspects of that large & diverse infrastructure.

With this in mind, CaSGC worked toward the FY 2010 **SMART** goals in the following way: 1. Provided Space Grant funded research Fellowships/Scholarships in partnership with CaSGC affiliates in support of selected research projects; 2. Partnered with the University of California (UC) System on aerospace-related Centers of Excellence; 3. Applied CaSGC management time toward arranging teaming between CaSGC affiliates on NASA Mission Directorate-related research programs; 4. Applied CaSGC management time in arranging research project teaming between CaSGC affiliates and NASA Centers (NASA ARC, DFRC, JSC, JPL) and industry; 5. Coordinated and managed student/mentor and faculty research experience programs at NASA Centers.

The CaSGC has determined that the above coordination & management partnership activities are a productive way to engage CaSGC affiliate institutions, faculty, and students into California's aerospace-related research infrastructure with a relatively small CaSGC budget allocated for this Program Element.

NASA Education Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty (Educate and Engage)

CaSGC FY 2010 Precollege Education Programs:

Throughout California the CaSGC provided management support and small funding assistance (**\$50,000 or 5.9% of Space Grant funds**) to affiliate campus Teacher Education & Training and K-12 Programs. The K-12 education and outreach programs within the three large California higher education systems (University of California, California State University, and California Community College Systems) are immense programs serving large K-12 pre-service and in-service teacher populations. State and National Standards for science and math curriculum guide each of these programs and each participates in annual evaluations and assessments. In addition, each of these institutions is carrying out numerous programs that focus on encouraging underrepresented pre-college students (minorities and women) to select STEM careers.

In FY2010, the CaSGC allocated support (both management and a small amount of CaSGC funds) to a number of precollege projects throughout California. Proposal tasks for precollege projects were accepted from CaSGC affiliates within the Workforce Development and STEM Pipeline Affiliate Programs. The CaSGC has set a path for a small precollege involvement (from a NASA Space Grant funding perspective) that has the Consortium playing an aerospace STEM-related coordination and facilitation role (management time) to the organizations on the affiliate campuses that have primary responsibility for precollege curriculum development, teacher education, outreach, and assessment.

The CaSGC has established the following definitive set of program objectives for the FY2010 Pre-College Program Element: 1. Provide an active interface between the affiliate institution's pre-service & in-service professional development programs and NASA education and research resources – Starting in FY2009 and continuing in FY2010, the CaSGC is taking the lead to coordinate and facilitate the statewide involvement of California in the *Summer of Innovation* opportunity; 2. Actively partner with affiliate campus programs that focus on encouraging underrepresented pre-college students (minorities and women) to select STEM careers; 3. Partner with and participate in the STEM State and National Standards activities to provide an interface to NASA programs and educational content; 4. Encourage and engage CaSGC Scholarship/Fellowship recipients to partner with K-12 educators in their local communities to entice students to pursue STEM careers; 5. Utilize Pre-college Program metrics that document the number of active programmatic interfaces with affiliate campus programs described in the four areas above. The CaSGC has successfully achieve the above goals in its FY 2010 Precollege objectives.

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

The CaSGC has allocated a small but directed budget (**\$10,000 or 1.2 % of Space Grant funds**) to affiliates for Outcome 3. In FY2010 (under Workforce Development and STEM Pipeline Programs), the CaSGC accepted affiliate Informal Education proposals and provided Space Grant funds. These directed affiliate efforts focused on a definitive set of objectives:

- Objective 1: Being a key conduit for Informal Education information between NASA's Research Programs-Missions-Education Offices and the California informal education community to increase learning, educate students, educators and the general public on aerospace-specific STEM content areas, and to expand the nation's future STEM workforce,
- Objective 2: To provide aerospace-related content expertise to formal & informal STEM educational environments through Space Grant's network of affiliates.

A primary vehicle utilized by the CaSGC to provide NASA STEM-related content for informal education is through current and engaging NASA and Space Grant websites. Although the websites have been useful they do not replace the hands-on events (student – mentor projects) and the community face-to-face interactions at the science centers, museums, and community science events. The CaSGC has successfully achieve the above goals in its FY 2010 Informal Education objectives.

CaSGC FY 2010 PROGRAM ACCOMPLISHMENTS

The CaSGC FY 2010 Program accomplishments have been aligned closely with the timing of the baseline budget (\$575,000) and the augmentation budget (\$270,000). For the past four years the CaSGC Fiscal Year was from 1 April to 31 March. For FY 2010, the CaSGC fiscal year has a shifted start date of 26 August leaving a five-month gap in program element funding. This funding deficit has forced changes in the proposed budget allocations and subsequent accomplishments for several of the CaSGC program elements.

NASA Education Outcome 1 Impacts/Results: Scholarships/Fellowships; Higher Education; and Research Infrastructure

Scholarships/Fellowships

The results for the FY2010 period indicate that the CaSGC awarded 184 fellowships and scholarships. The CaSGC, in emphasizing student awards primarily in STEM fields, was not able to achieve the stretch SMART goals for the general population minorities and women as stated in the CaSGC Strategic plan (**includes all career fields – STEM and Non-STEM**): **36% for minorities and 56% for females, based on the National Center for Education Statistics [NCES] data for California**). The 2010 awards (both Space Grant and non-federal match) were as follows:

- Awarding 31% of the 2010 awards to female students;
- Awarding 21% of the 2010 awards to underrepresented minorities; and
- Awarding 82% to undergraduate students

Funding for the F/S Program Element was derived from multiple sources including NASA Space Grant (Proposed FY 2010 (\$320,000) and FY 2010 non-federal match F/S allocations were \$100,000. As a result of the five month start date slip, the CaSGC management made the decision to reduce the Undergraduate Research Opportunity Program (UROP) allocation by approximately \$60,000. This reduction resulted in a **Space Grant FY 2010 allocated F/S amount of \$260,000** (exceeding the required FY 2010 Solicitation Minimum Fellowship/Scholarship (F/S) amount of \$235,000). The non-federal match funds (\$100,000) were provided by the University of California Office of Research to stimulate research, education, & training programs that involve UC undergraduate and graduate students in aerospace-related research projects.

CaSGC FY 2010 Higher Education Program

CaSGC has worked toward NASA Objective 1.3: Student Involvement in Higher Education by providing funding for student-mentor projects & intern programs that provide hands-on student participation in STEM-related programs & research. In FY 2010, the CaSGC provided four higher education competitive opportunities that are available to all CaSGC affiliates.

The **first** opportunity is the **CaSGC Affiliate Workforce Development Program – (CaSGC initially proposed a FY 2010 baseline budget of \$83,479 and an Augmentation budget of \$90,000 for a total of \$173,479)** where CaSGC affiliate undergraduate and graduate students are placed with NASA, affiliate research, and industry mentors working on various NASA Mission Directorate programs. **Fourteen** CaSGC affiliate projects were competitively selected. These fourteen selected workforce projects not only support the students' participation in these experiential efforts but also weave the hands-on student efforts with related interdisciplinary science and engineering curricular programs.

The funded FY 2010 affiliate proposals established student – mentor projects that span the following areas:

- **Rocket and launch vehicle technology (CalPoly Pomona, CalPoly SLO, USC, San Diego State, CSU Long Beach, CSU Fresno, UC San Diego);**
- **Uninhabited Aerial Vehicles (UAV) (CalPoly Pomona, CSU Sacramento, CSU Los Angeles, CSU Fresno, UC San Diego);**

- **Nano- and micro-satellites (USC, UC Santa Barbara, Santa Clara, CalPoly SLO, UC Irvine, CalPoly Pomona);**
- **Space and Earth Science (UC Santa Barbara, UC Riverside, UC Los Angeles, UC Berkeley, Azusa Pacific);**
- **Community outreach (CSU Sacramento, CSU Los Angeles, CSU Fresno, UC San Diego, Azusa Pacific, UC Berkeley).**

Counting both Space Grant funded students, as well as, students funded from other sources, **180 students were actively engaged** in these affiliate workforce programs.

The **second** Higher Education opportunity involved the **FY2010 Statewide Undergraduate Research Opportunity Program (UROP - CaSGC proposed allocation = \$100,000 but reduced to \$40,000 by five month start date slip)** provided exceptional opportunities to undergraduate students (**29 student proposals from affiliates across California were selected for funding**) for projects that not only engage undergraduate students in world-class aerospace-related research projects but also provide an effective shared resources environment for Space Grant STEM education throughout California. In many of the higher education institutions, the science and engineering schools are emphasizing the academic and career selection importance of providing research experience opportunities at the undergraduate level. The UROP provides a significant contribution to encouraging students to enter and remain in STEM career paths.

The UROP student proposals were submitted, and competitively reviewed and selected by the CaSGC. Students that won awards under this program were required to prepare a summary report for sharing on the CaSGC website and have the opportunity to present their results at conferences and at an annual CaSGC-sponsored symposium. The difference between this and other CaSGC scholarship programs is the projects are student-driven; the students conceptualize the projects, find a mentor and apply directly to CaSGC headquarters for funding.

The SMART goals for Workforce Development and UROP have been met in engaging many of the CaSGC affiliates, for increasing the involvement of our five CaSGC MSI institutions, and providing CaSGC management coordination resources in forming partnerships between CaSGC affiliates and NASA Centers, industry, and universities. The CaSGC failed to reach the goals for involvement of underrepresented students (36% for minorities and 56% for females, based on NCES data for CA) in these STEM-related projects. The enrollment of science and engineering underrepresented students for STEM-related career paths at the CaSGC affiliate institutions remains far below the “stretch” goals indicated above.

The **third** Higher Education opportunity is part of the **STEM Pipeline Opportunity Program**. The overall **STEM Pipeline Opportunity Program** funded 15 proposed projects. A number of the funded proposals addressed Higher Education areas relating to professional development of pre-college teachers (CalPoly Pomona, UC Berkeley, UC Santa Barbara, UC Riverside, CSU Fresno, CSU Long Beach, Astronomical Society of Pacific, UC San Diego) and undergraduate curriculum development for four-year universities and community colleges (CalPoly Pomona, UC Davis, UC Los Angeles, UC Santa Cruz, CSU Sacramento).

One of the important strengths of the CaSGC Higher Education Program is that with a relatively small budget but with a strong partnership management role, significant impacts/results are

achieved in support of NASA's Objective 1.4: Course Development (STEM Disciplines). Each of the CaSGC curricular programs was developed and certified under standards imposed by the California University Systems and national evaluation and certification organizations. The engineering and science departments on the affiliate campuses annually review all curricular programs.

The **fourth** Higher Education opportunity is the NASA Center intern programs. In FY 2010, the CaSGC competitively selected and supported one student at NASA Marshall and NASA Langley, two students at NASA Glenn, and six students at Boeing/NASA JSC. The students were funded for the summer internships using Space Grant funds, ESMD funds, and industry funds.

Research Infrastructure: For FY 2010, the qualitative SMART goal for Research Infrastructure was to expand the opportunities for research Fellowship/Scholarships, provide viable interface paths for non-UC affiliates to the UC Centers of Excellence program, and provide management resources in forming research partnerships between the NASA Mission Directorates and California NASA Centers.

The interdisciplinary, aerospace-related partnership programs, facilitated and coordinated by the CaSGC, involving the NASA Centers, industry and the affiliate research universities have continued to be slowed by the economic conditions nationally and in California. The CaSGC Strategic Plan stresses that a combination of a small amount of Space Grant funding and considerably more management time for partnerships is the most effective means to impact the large existing aerospace-related research infrastructure. The CaSGC, through its Research Infrastructure partnerships, has coordinated a unique array of successful aerospace-related programs including:

- **Space Grant/University of California Centers of Excellence (UC Davis – Remote Sensing and Earth Resources; UC Berkeley – Space Physics and Space Operations; UC Santa Barbara – Environmental remote sensing and astrophysics; UC Los Angeles – Planetary and Space Physics; UC Santa Cruz – Adaptive Optics and astronomy/astrophysics; UC San Diego – Climate Change Research (science and engineering), aeronautics and rocket research, and Space Physics;**
- **CaSGC's Cooperative Research Programs at NASA Centers;**
 - **NASA ARC Space Portal research partnership – Commercial Space transportation Partnerships, International Space Station National Laboratory;**
 - **NASA Dryden Flight Research Center – UAV research, Suborbital Remote Sensing research involving MSI affiliates (CSU Los Angeles, CSU Fresno), UC affiliates (UC San Diego, UC Los Angeles, UC Davis), UAV industry in southern California, Los Alamos National Lab, and Department of Defense sponsors.**
- **Rocket Research at CSU Long Beach, San Diego State, University of Southern California, UC San Diego with the aerospace industry (Garvey Space, Flometrics, and SpaceX);**
- **Biotechnology Space Research Alliance (BSRA – <http://BSRAportal.org>) Private – public partnership for biotech research on the International Space Station National Lab. Partnered with MIT and MA Space Grant on a proposal to NASA to form the ISS Institute;**
- **Facilitated and coordinated the JPL and UC Irvine partnership for the Steckler**

Phase I research program and Phase II proposal.

NASA Education Outcome 2 Impacts/Results: Precollege

The FY 2010 impact of the CaSGC Precollege Education Program is indicated by the quantitative growth (**above 5%**) both in the demand for CaSGC affiliate participation in university and informal education programs and the increase in budget from sources outside Space Grant. The main strength of the program is the extensive network of partnerships the CaSGC has forged with the K-12-related organizations within our affiliate universities, connection to the California Science & Mathematics Projects, and with the California-based NASA Centers. A weakness is that the CaSGC contribution is so small that we have difficulty influencing any of the critical decisions made on professional development of teachers and STEM curriculum. The metrics used to determine the impact of the CaSGC precollege program consists of documenting the number of precollege programs; workshops, partnerships, and participants in which the CaSGC affiliates make a significant contribution. A significant contribution is defined as funding support, management support, and/or providing key NASA content and interfaces.

In FY 2010, the CaSGC has given support (both management and a small amount of CaSGC funds through its Workforce Development and STEM Pipeline Programs) to a number of CaSGC affiliate precollege projects. The CaSGC has set a path for a small precollege involvement (from a NASA Space Grant funding perspective) that has the Consortium playing an aerospace STEM-related coordination role (management time) to the organizations on each of the affiliate campuses that have primary responsibility for precollege curriculum development, teacher education, outreach, and assessment. The CaSGC has a definitive set of program objectives for the Pre-College area: 1. Provide an active interface between the affiliate institution's pre-service & in-service professional development programs and NASA education and research resources – The CaSGC is continuing to take the lead to coordinate and facilitate the statewide involvement of California in the NASA *Summer of Innovation* Program – The CaSGC has also taken a leadership role in facilitating statewide involvement in the **Innovations in Global Climate Change Education (IGCCE)** Program; 2. Actively partner with affiliate campus programs that focus on encouraging underrepresented pre-college students (minorities and women) to select STEM careers; 3. Partner with and participate in the STEM State and National Standards activities to provide an interface to NASA programs and educational content; 4. Encourage and engage CaSGC Scholarship/Fellowship recipients to partner with K-12 educators in their local communities to entice students to pursue STEM careers; 5. Document active programmatic interfaces in the CaSGC Pre-college Program Element.

Examples of FY2010 CaSGC supported Precollege efforts are as follows: 1. UC San Diego students engaged precollege teachers and students (two San Diego high schools with large minority student populations) with high altitude ballooning program; 2. San Diego Supercomputer Center (SDSC) offers a number of CaSGC-funded intensive one-week TeacherTECH workshops for middle and high school educators focused on astronomy and space science; 3. UC Santa Cruz provided Tesla Science workshops for precollege teachers and students; 4. Azusa Pacific STEM Project provided NASA content for middle school teacher professional development and to stimulate student STEM careers (high minority student demographic); 5. Astronomical Society of the Pacific provided K-12 Professional Development workshops on astronomy, 6. Sonoma State provided professional

development space science workshops for K-12 teachers, 7. CSU Long Beach provided workshops for young women in Engineering.

NASA Education Outcome 3 Impacts/Results: General Public and External Relations Programs Public Service & External Relations: The CaSGC has taken the position that the Public Service Element would be best served by funding this program area with small amounts of NASA CaSGC funds along with providing considerably more people resources (faculty, students, and research staff). In FY2010 Public Service tasks (Informal Education) was accepted as part of proposed projects under the CaSGC Scholarship/Fellowship, Affiliate Workforce Development, State-wide Undergraduate Research Opportunity Program, and STEM Pipeline Affiliate Projects. The CaSGC Public Service Programs have provided an effective means of promoting an understanding of science, technology, engineering, and mathematics (STEM) disciplines as well as current environmental issues from a scientific perspective.

Examples of FY2010 CaSGC Informal Education projects include: 1. UC Berkeley's "Living with a Star" program at the San Francisco Exploratorium and Lawrence Hall of Science; 2. UC Davis's CalView web project providing Earth science information on climate change and environmental issues; 3. CaSGC's participation in the Southeastern San Diego's Center for Community Well-Being (CCW) that supports community education, health, and economic growth for minority populations in SE San Diego; 4. UC Santa Barbara's astrophysics outreach program with the Santa Barbara Planetarium; 5. CSU Fresno's Girl's Summer Engineering experience (GIRLS SEE); 6. Sonoma State's Summer High School Intern Program; and 7. CaSGC's website for public information and links on NASA content and mission programs.

The CaSGC Public Service Programs have provided an effective means of promoting an understanding of science, technology, engineering, and mathematics (STEM) disciplines. The metrics used to determine success in the state are as follows: 1. Visits to websites; 2. Increases in the number of General Public and student participants; 3. Number of articles and features in the media; and 4. Attendance at community projects.

PROGRAM CONTRIBUTIONS TO PART MEASURES

Student data and Longitudinal Tracking: The FY 2010 CaSGC Student data and Longitudinal Tracking indicates that 184 awards were given for all Program Elements. Of the 184 CaSGC awards, 57 (31%) were given to female students, 38 (21%) to minority students, 151 (82%) to undergraduate students, and 33 (18%) to graduate students.

In FY 2010, a total of 26 students received significant awards or reached the longitudinal tracking threshold. Of these 26 students, 5 (19.2%) were female students and 4 (15.4%) were students from underrepresented backgrounds. Of these 26 FY2010 tracked students, 24 are in the same degree program, 1 student graduated and is pursuing an advanced STEM degree and 1 student graduated and is seeking STEM employment.

The CaSGC initiated full Longitudinal Tracking in FY 2007. Since only four years (FY 2007, FY 2008, 2009 and FY 2010) have been tracked for significant student awards, the majority of students are continuing BS, MS, or PhD degrees in STEM fields. It is anticipated that in the next

several years we will see a number of PhD students entering the workforce in industry, at academic institutions, and at NASA.

Course Development: In FY 2010, the CaSGC continues a curricular effort involving affiliates (Minority Serving Institutions) from the California State University System (CSU Los Angeles and CSU Fresno, CalPoly Pomona), the University of California System (UC San Diego), and the Community College System (Pasadena City College and East LA College). The programs' major emphasis is on STEM curricula and student – mentor projects (Uninhabited Aerial Vehicles – UAVs) that would target and engage underrepresented minorities in STEM-related education and careers. The UAV-related team will share facilities, curricula over e-learning networks, and personnel. Example CaSGC course developments include:

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| 1. UC Davis | Earth Resources & Remote Sensing (revised)
The Geography of Bliss (revised – understanding ecology data) |
| 2. UC Santa Barbara | Senior Design for optical systems (revised) |
| 3. CalPoly Pomona | ARO 461 & 462 (revised – Senior design of aerospace systems) |
| 4. CSU Sacramento | ME 296J (revised – Space Systems Engineering) |
| 5. UC Berkeley | Astronomy 10 (revised – Fundamentals of Astronomy) |
| 6. UC Los Angeles | Intro. to Space Science & Engineering (new) |
| 7. UC San Diego | MAE 155B (revised Space Engineering) |
| 8. UC Santa Cruz | Science Communications (revised – Art & Astrophysics) |

Matching Funds: The FY 2010 CaSGC program was structured to respond to a funding profile that has Space Grant funding at \$845,000 with total matching funding at \$1,500,000 (ratio of 1 to 1.8). The NASA required match for FY 2010 was \$610,000 (fully documented in FY 2010 proposal). Additional match of \$890,000 was derived from partnerships with the California affiliate universities, California Agencies (Workforce Development, Water Resources), aerospace industry, and other Federal Government agencies (NSF, NASA, Department of Agriculture).

Minority Serving Institutions: The CaSGC presently has five affiliate institutions that are designated as Minority Serving Institutions (MSI – Specifically Hispanic Serving Institutions – HSI) – California State University, Los Angeles, California State University, Long Beach, California State University, Fresno, California State University, San Bernardino, CalPoly Pomona). The CaSGC, in FY 2010, continued with its Strategic Plan for involving Minority Serving Institutions (MSI) as follows:

- Reviewing the CaSGC strategies for the recruitment and retention of underrepresented groups (both minorities and women) in STEM careers and updating the CaSGC Strategic Plan.
- Aggressively advertising Space Grant fellowship/scholarship, workforce, and STEM Pipeline opportunities on each affiliate campus and promoting such opportunities to underrepresented science and engineering organizations;
- Promoting partnerships with programs at MSI affiliate campuses that provide resources for underrepresented groups pursuing STEM career paths;
- Assisting in setting up partnerships with NASA Center and industry programs that promote STEM career assistance to underrepresented groups;
- Reviewing and updating the CaSGC Diversity Plan to reflect the evolving California demographic information and its impacts on MSIs.

The MSI Working Group (presently chaired by Dr. Helen Boussalis, who herself is the Director of a Minority University Research Center at CalState LA) annually reviews the CaSGC Diversity Plan and examines the most current demographic data on ethnic and gender participation in California STEM-related higher education and Precollege programs. This management structure allows for continuous engagement of key California MSIs in the management, direction, goal setting, and implementation of underrepresented (women and minorities) involvement in CaSGC Program Elements. Also the MSI Working Group has been addressing the appropriate involvement of MSI designated community colleges in the CaSGC Program Elements.

The CaSGC has continued an aerospace-related program that engages CaSGC affiliate MSI institutions (CSU Los Angeles, CSU Long Beach, and CSU Fresno), several MSI community colleges (largest Hispanic Serving Community Colleges in Los Angeles, Pasadena City College and East LA College), and UC San Diego involving UAV research and shared curricula. The economic downturn in California and NASA has curtailed some of the project activities but the program is still progressing. It has significant promise in influencing the higher education pipeline for underrepresented students. It is hoped that this pilot activity will establish a model that can be propagated throughout California and the nation.

A second continuing project is a joint effort between the Maine Space Grant Consortium and the CaSGC affiliate, CSU Long Beach, that involves minority students from Maine and California working on the development of high performance rocket designs and science payloads. This multi-consortia partnership has impacted a number of minority students from Maine and California.

A new third program involves UC Santa Cruz and Hartnell Community College in the agricultural Salinas Valley (large Hispanic student population). Dr. Enrico Ramirez-Ruiz (CaSGC campus director at UC Santa Cruz) has established a successful transfer program for Hispanic students from Hartnell to the astrophysics program at UC Santa Cruz.

IMPROVEMENTS MADE IN THE PAST YEAR

In FY 2010, the CaSGC has reviewed its Strategic Plan, including its diversity strategies and organizational management structure. This management structure has been successful in stimulating active and continuous involvement of all of the CaSGC affiliates. The lead institution management has been able to focus on forming strategic partnerships with other private-public institutions, to develop other funding sources, maintain a strong focus on the national Space Grant goals and objectives, and make sure the CaSGC impacts are aligned with the needs of NASA and California.

The timing on the initiation of the new five-year grant has created a need to make considerable programmatic adjustment. In previous years the CaSGC fiscal year went from 1 April to 31 March. For FY 2010, the fiscal year was delayed until late August (five-month slip). This five-month slip (no Space Grant funding) effectively caused a seventeen-month 2010 CaSGC fiscal year. Several of the proposed Program Element programs suffered budget cuts (STEM Pipeline, Workforce Development, and NASA Center Internships) because of this five-month slip. An additional problem was that the full FY 2010 funding did not arrive on the UCSD lead campus until October. This meant that announcements of the various CaSGC programs could not be

made until well into the first semester of the academic year. Competitive selections and awards could not be made until the second semester. These delays negatively impacted the CaSGC program.

In FY 2010, the CaSGC continued its effort to actively engage as many CaSGC affiliates as possible, particularly those institutions that are designated as Minority Serving Institutions (MSIs), in the STEM workforce and Pipeline projects. In regard to affiliate management, we reviewed each of the affiliates in terms of participation and made changes in campus directors/coordinators where it was determined that improvement was needed.

The CaSGC instituted the new **STEM Pipeline Opportunity Program** that addresses some of the "Human Capital" pipeline issues within NASA and the Nation. These pipeline issues include educational (Higher Ed, Precollege, and Public Outreach), research, and hands-on training that will positively impact the aerospace workforce pipeline. Fifteen CaSGC STEM Pipeline awards (competitively reviewed and selected) were given. This program resulted in:

- Partnerships that include multiple CaSGC affiliates;
 - Partnerships with the California Community College System;
 - Participation of science and engineering students from underrepresented ethnic or gender groups on each participating campus;
- Actively engaging Minority Serving Institutions (MSIs);
- Obtaining matching resources from industry, state agencies, educational institutions, and community workforce organizations;
- Demonstrating the ties to NASA Centers or Mission Directorates and alignment with NASA Vision and Mission as it relates to the national goal of an increased science, technology, engineering, and math (STEM) talent pool;

The CaSGC Statewide Undergraduate Research Opportunity Program provided research experience opportunities to 29 undergraduate students attending CaSGC affiliate institutions. The number of students served has decreased from its FY 2009 program due to the timing of the start of the CaSGC fiscal year.

The second year of the **NASA Summer of Innovation** program and the initiation of the **Innovations in Global Climate Change Education (IGCCE)** program has helped the CaSGC to be recognized as a leader in facilitating participation of California academic and informal education entities in these opportunities.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

CaSGC Affiliate	Institution Type	Key Characteristics
UC San Diego	Lead CaSGC University	Research University offering BS, MS, PhD
UC Los Angeles	CaSGC University	Research University offering BS, MS, PhD
UC Berkeley	CaSGC University	Research University offering BS, MS, PhD
UC Davis	CaSGC University	Research University offering BS, MS, PhD
UC Santa Cruz	CaSGC University	Research University offering BS, MS, PhD
UC Santa Barbara	CaSGC University	Research University offering BS, MS, PhD
UC Irvine	CaSGC University	Research University offering BS, MS, PhD
UC Riverside	CaSGC University	Research University offering BS, MS, PhD
Stanford University	CaSGC University	Research University offering BS, MS, PhD
Santa Clara University	CaSGC University	Research University offering BS, MS, PhD
Univ. Southern Calif.	CaSGC University	Research University offering BS, MS, PhD
Sonoma State Univ.	CaSGC University	4-year University offering BS, MS
CSU Long Beach	CaSGC MSI University	4-year University offering BS, MS
Univ. of San Diego	CaSGC University	Research University offering BS, MS, PhD
CSU Los Angeles	CaSGC MSI University	4-year University offering BS, MS
CSU Sacramento	CaSGC University	4-year University offering BS, MS
CSU San Bernardino	CaSGC MSI University	4-year University offering BS, MS
CalPoly SLO	CaSGC University	4-year University offering BS, MS
CalPoly Pomona	CaSGC MSI University	4-year University offering BS, MS
San Jose State	CaSGC University	4-year University offering BS, MS
San Diego State Univ.	CaSGC University	4-year University offering BS, MS
Pomona College	CaSGC University	4-year University offering BS, MS
CSU Fresno	CaSGC MSI University	4-year University offering BS, MS
Azusa Pacific Univ.	CaSGC University	4-year University offering BS
San Diego CCD	CaSGC Community C.	2-year Community College
SD Supercomp. Ctr.	CaSGC affiliate	Research Center at UCSD funded by NSF
Astro Soc. Of Pacific	CaSGC affiliate	Astronomy Research & Education Resource

In addition to the CaSGC Affiliates and their contributions to all of the CaSGC Program Elements, a number of other private and public institutions have played significant roles in the execution of the following CaSGC projects:

CaSGC Project Name	CaSGC Partner	Role in Project Execution
1. Boeing/JSC Interns	Boeing	Industry mentors & funds
2. CA Affiliate UAV Project	Gen. Atomics	Industry mentors & funds
	Northrop Grumman	Industry mentors & funds
	NASA Ames & JPL	Mentors & funds
3. Cal SOI Projects	Pasadena City College	Manages minority students
	East LA College	Manages minority students
	JPL	Mentors and services
	NSGF	Management services
4. IGCCE Project	Scripps Inst. of Oceanography	Mentors and services
	JPL	Mentors and services
	Calif. Science Centers	Mentors & funds
	Calif. informal Ed. Org.	Mentors
5. COTS Program	SpaceX	Mentors, management, & funds
	NASA Ames	Mentor
6. Balloon Projects	Global Western	Mentors
	SEASAND	Teachers & services
7. Biotech & ISSNL	Aurora Flight Sciences	Mentors and services
	BioCom Industry	Mentors & funds
	NASA Ames	Mentors
	Boston Museum of Science	mentors & services
	NASA JSC & Boeing	Mentors & resources
8. Rocket Projects	Garvey Space	Mentors & funds
	Flometrics, Inc.	Mentors & funds
	NASA MSFC	Mentors
	JPL	Mentors & funds
	Boeing	Mentors & funds
	Northrop Grumman	Mentors & funds
9. STEM Pipeline Projects	SD Science Alliance	Mentors & funds
	BioCom Institute	Mentors & funds
	Calif. MESA Programs	Mentors & services
	WestEd	Evaluation services
	Aerospace Industry	Mentors & funds
	True Vision Systems	Equipment
	Calif. NASA Centers	Mentors and services
10. Remote Sensing Project	UC Office of Research	Funds & Management
	UC Davis	Facilities & mentors
	Water Resources Agency	Mentors & resources
11. Nano- & Micro-Satellites	ULA	Mentors & resources
	Boeing	Mentors & resources
	Northrop Grumman	Mentors & resources
	Lockheed	Mentors & resources
	Calif. NASA Centers	Mentors & Facilities