



# **FY2010 Proposal for the Congressionally-Directed Augmentation**

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**SOUTH DAKOTA SPACE GRANT CONSORTIUM**

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**\*NOTE: Only the Augmentation Program Plan is included here. Other portions of the proposal required by, and submitted to, NASA are not included in this on-line version.**

## INTRODUCTION

The vision of the South Dakota Space Grant Consortium (SDSGC) is to expand opportunities for all South Dakotans through education, research, and public service in the fields of aerospace, earth science, and supporting STEM disciplines. We specifically seek to include women, Native Americans, and other underrepresented groups in all programs and activities supported by SDSGC. At both the higher education and precollege level, student participants in SDSGC programs are provided hands-on research and learning experiences that emphasize interdisciplinary problem-solving skills that are directly relevant to NASA mission challenges.

The projects described under this augmentation proposal complement and enhance the projects described under SDSGC's FY2010 "base" Program Plan dated January 29, 2010. This augmentation provides for innovative and creative programs that support current NASA Education priorities which include STEM workforce development, student-led collaborative/team projects, and intensive summer learning opportunities for middle school students and educators in STEM disciplines that are consistent with NASA Summer of Innovation principles. In regard to the latter, the augmentation programs that are focused on middle school students and teachers will improve STEM teaching and learning in partnership with federal agencies, academic and informal education organizations, nonprofits, and industry.

Consistent with SDSGC's base Program Plan for FY2010, SDSGC's augmentation programs described below will contribute to the state of South Dakota by leveraging educational investments to sustain its unique STEM education pipeline, spanning elementary through graduate levels. Despite its small population and limited research infrastructure, South Dakota institutions will continue to support NASA through science and engineering research programs and through the advancement of Native American students in STEM fields. The 2010 augmentation programs presented here will make significant contributions to NASA's PART measures in higher education and elementary/secondary education. Because SDSGC's January 29, 2010 base Program Plan described the various programmatic elements, the descriptions of proposed augmentation programs below will be limited to an explanation of how these programs will complement efforts described in the base grant.

It should be noted that SDSGC's January 29, 2010 submission of the FY2010 base budget (\$430,000) included zero-dollar line items reflecting augmentation programs that would be conducted if funding for those programs was later provided. On May 2, 2010, NASA provided feedback on SDSGC's base proposal which required a revised budget that removed the zero-dollar line items. The revised budget was submitted May 12, 2010, but the only required revision was to the budget itself; not to the metrics reported in the base proposal. Therefore, the metrics reported in the attached summary table of SMART goals and objectives and the attached PART Measures contributions include both base and augmentation metrics. Thus, the metrics apply to the comprehensive \$660,000 budget and no update of SDSGC's FY2010 PART Measures table is necessary.

Unlike other capability enhancement programs in the state such as NSF EPSCoR, Space Grant is in a unique position to have a comprehensive impact across all educational levels and across all sectors – public, private, tribal, and government. SDSGC uses this opportunity to advance two major themes across its programs: development of the state's STEM workforce, and improving educational and research opportunities for the state's Native American population. SDSGC will continue focusing on statewide development of robotics programs that link university faculty and students with precollege teachers, students, and community-based organizations

such as 4-H. These efforts have directly contributed to the first state robotics competition in January 2010 (30 teams) and to a new and unique M.S. program in Robotics and Intelligent Autonomous Systems.

#### **AUGMENTATION PROGRAMS AS IDENTIFIED IN BUDGET (IN ORDER OF FUNDING AMOUNT)**

##### Project Innovation Grants (\$81,688)

In order to identify and stimulate innovative educational and research capabilities in the state, SDSGC will make augmentation funding available through a statewide competition among the Consortium's 20 affiliates for successful "Project Innovation Grant" (PIG) projects in the programmatic areas of Higher Education, Precollege Education, and Research Infrastructure. The objective is to provide seed funding for meritorious projects that align with NASA and SDSGC goals and which show potential to develop into long-term, sustainable, innovative programs. Preference will be given to PIG proposals that include innovative and creative opportunities to support current NASA and SDSGC priorities including a) STEM workforce development, b) university level student-led flight or other types of student collaborative/team projects, c) intensive summer learning opportunities for middle school students and educators offered through affiliate organizations, d) research involved with the Deep Underground Science and Engineering Laboratory (DUSEL) and Sanford Lab at the former Homestake gold mine in Lead, SD, and e) opportunities to strengthen ties to NASA Centers. SDSGC's FY2010 PIG solicitation will specifically encourage NASA's Summer of Innovation program as a platform for increased synergy and collaboration with NASA Centers.

##### Fellowship/Scholarship (\$70,000)

Additional fellowship/scholarship funds will be provided to university students. The goal of the SDSGC Fellowship/Scholarship program is *"To administer a Fellowship/Scholarship program that offers educational and research opportunities to students from diverse backgrounds who are pursuing degrees in fields of STEM that align with NASA's mission and those of SDSGC members and affiliates."*

In South Dakota, students receiving \$1,000 or more in a single award are included in SDSGC's longitudinal tracking surveys and respective database. Based on the fact that 55 students were selected from among six Consortium universities in 2009 to receive significant fellowship/scholarship funding, it is projected that a similar number of STEM degree seeking students will be selected and longitudinally tracked in 2010 considering that this \$70,000 in additional fellowship funds will be combined with \$110,000 included in the base grant. About 20 of the total estimated 55 students will be funded by augmentation fellowship funds.

##### Intensive summer learning opportunities for middle school and minority students and educators

###### SDSM&T space, robotics, and other STEM precollege camps (\$20,000)

The goal of SDSGC's Precollege Education Program is *"To increase student awareness and access to educational and career opportunities in aerospace, earth science, and supporting STEM disciplines."* Augmentation funding will support intensive summer learning opportunities for an estimated 120 middle and high school students through scholarships to residential science and engineering camp experiences on the campus of SDSM&T during summer 2010 (Space Adventures Camps, Robotics Camps, and other

STEM precollege camps). Additionally, SDSGC will provide funding and staff to provide additional STEM programs and NASA content to the middle school component of the “South Dakota GEAR UP Honors Program” held on the campus of SDSM&T during summer 2010 and described in the base proposal in which 220 Native American students attend this six-week residential college-preparatory program. An objective of SD GEAR UP is increased enrollment in STEM disciplines and interest in STEM careers; tracking and evaluation tools are used to assess interest in STEM disciplines. Students must apply to SD GEAR UP as 8<sup>th</sup> graders to enter the program and are selected based on academic achievement and teacher recommendations. Student participants represent all nine tribes in South Dakota: Cheyenne River, Crow Creek, Flandreau-Santee, Lower Brule, Oglala, Rosebud, Sisseton-Wahpeton Oyate, Standing Rock, and Yankton. A middle school component of the FY2010 GEAR UP program will have 6<sup>th</sup>-8<sup>th</sup> graders and their parents visit for a few days to tour campus and learn about the programs available. Although the multi-state Summer of Innovation proposal that SDSGC was part of did not get funded this year, augmentation funding will allow 140 9<sup>th</sup> grade GEAR UP students to experience an inquiry-based, live presentation of *Journey through the Solar System* at the Uniview Planetarium at SDSGC affiliate the Journey Museum. The Journey Museum was successful in winning a 2009 NASA Office of Education Informal Education Program grant in the amount of \$485,575 through the 2009 Competitive Program for Science Museums and Planetariums (CP4SMP) solicitation, which provided funding for Uniview.

SDSGC was awarded a NASA INSPIRES Tier 2A grant in 2009 for a project titled “NASA SOLAR Institute (*Space Observation, Learning and Research*).” The grant will provide 50 high school students, largely Native American, with a two-week, college-preparatory experience in STEM fields during summers 2009 and 2010 at SDSM&T. FY2010 augmentation funds will be provided to enhance and complement the curriculum provided by the INSPIRES grant by adding additional programming for summer 2010 that includes: a) an inquiry-based experience in the Journey Museum’s Uniview Planetarium, and b) SDSGC staff presentations of various current and past NASA missions.

### South Dakota Space Days 2010

The goal of the SDSGC’s Informal Education Program is “*to enhance public scientific literacy in aerospace and earth science; to complement community efforts in STEM education; and to inspire citizens of diverse backgrounds through the excitement of scientific exploration and discovery.*” In keeping with the focus of a capability enhancement consortium, SDSGC allots less than 3% of its budget to informal education programs. \$18,000 in augmentation funds are provided for South Dakota Space Days 2010 to be held during the week of October 4, 2010 at Riggs High School in Pierre, SD. It is estimated that 1,500 middle and high school students and 75 teachers will participate in Space Days this year. Sponsored and organized annually by SDSGC, South Dakota Space Days is a highly successful public service program in which thousands of students and teachers from throughout the state participate in “hands-on” STEM educational activities. Students visit with experts in aerospace, aeronautics, earth science, engineering, computer science, physics, and other STEM fields about their careers. Guest speakers with nationally recognized credentials such as NASA astronauts, scientists, and

managers present programs and meet with the students. Numerous exhibits on space and earth science and technology are provided by SDSGC members and other organizations. At SD Space Days 2010, NASA educational materials will be provided to teachers who attend.

#### SDSM&T Robotics Team support (Higher Ed)

All of the university-level robotics teams supported by SDSGC were described in the base proposal. To enhance SDSGC's Higher Education program goal of building "*interdisciplinary programs related to NASA's Education Outcome 1 at the state's institutions of higher education and to support related programs that serve to strengthen STEM education in South Dakota*", \$6,000 in augmentation funding will be provided to SDSM&T's Robotics Team to support interdisciplinary and design competition experiences during FY2010. The team consists of 12 undergraduate students.

#### Precollege Teacher Awards

##### Robotics teacher award

In addition to SDSGC's continued support of teacher training workshops in NASA priority areas described in the base proposal with specific emphasis on two-day robotics training workshops targeted at the middle school level, \$5,000 in augmentation funding will be provided for a competitive award to a teacher to purchase robotics kits, supplies and curriculum. This will allow growth in the number of middle school team members of the "South Dakota Robotics Association" which will compete in the second South Dakota FIRST LEGO® League (SD FLL) Tournament to be held in Sioux Falls, SD in January 2011.

During seven weeks of summer 2010, SDSGC Associate Director Dr. Dan Swets of Augustana College is hosting middle school (ages 9-14) robotics camps and two weeks of elementary school (ages 5-8) camps on Augustana's campus to encourage additional participation in the SD Robotics Association and prepare the middle school students to compete in the 2010/11 SD FLL tournament season. The number of middle school students involved with the FLL activities in South Dakota has grown from 140 students in the 2008/09 season to 290 students in 2009/10, to an estimated 400 in the current 2010/11 season. Augustana College will likely apply for an FY2010 Project Innovation Grant described above to enhance middle school robotics in South Dakota.

##### Kelly Lane Earth and Space Science teacher grant

SDSCG will continue to sponsor a statewide competition for a precollege STEM teacher grant. The \$5,000 Kelly Lane Earth and Space Science grant is awarded annually to a select science or math teacher in South Dakota to recognize and support outstanding teachers and innovative educational programs at the precollege level.

#### Travel for additional affiliates to attend Space Grant meetings

The base grant allowed for only two members of SDSGC's Management Team to attend the regional and the biannual Space Grant Director's meetings. \$3,624 in augmentation funding allows for three affiliate representatives to attend these meetings during FY2010.

Professional Development Training for college and precollege Native American Students

\$1,665 in augmentation funds will allow Dr. Alfred Boysen of SDSM&T's Department of English to provide professional development training to 220 Native American Tribal school students attending the six-week residential South Dakota GEAR UP college-preparatory program on the campus of SDSM&T during summer 2010. This is the 18<sup>th</sup> consecutive year of the GEAR UP program. Diversity remains a cross-cutting theme with strategic objectives in all five SDSGC program areas as well as Management strategies that are designed to recruit and support underrepresented minorities and women. SDSGC's Strategic goal for Diversity is "*to model diversity in all Consortium programs and activities, with an emphasis on Native Americans, which make up the state's largest minority group.*" The SD GEAR UP program boasts impressive statistics. Of the students who graduate from the program, virtually 100% also graduate from high school and 85% attend college. The SDSGC-funded professional development component includes resume building and writing and speaking rubrics designed to improve presentation skills. It also includes financial assistance for teaching a freshman English class and a Speech Communication class at Tribal College affiliate Oglala Lakota College during summer 2010.

Other Direct and Indirect Costs

Augmentation funding is provided for materials and supplies (\$10,957), conference registration (\$1,500), and Indirect Costs (\$6,566).

## Summarized Table of Consortium Goals and SMART Objectives

<b>Major Programmatic Goals, Selected Objectives, and Annual Metrics<sup>1</sup> (from SDSGC Strategic Plan 2010)</b>
<p><b>B.1. Fellowship/Scholarship:</b> <i>Administer a Fellowship/Scholarship program that offers educational and research opportunities to students from diverse backgrounds who are pursuing degrees in fields of STEM that align with NASA's mission and those of SDSGC members and affiliates.</i></p>
<ul style="list-style-type: none"> <li>– Statewide competition offered at all 10 higher education affiliates including three Tribal Colleges; emphasis on internships with NASA, aerospace industry, DUSEL, and EROS. [About 20 of the 55 awards referenced in the FY2010 base proposal (\$1,000-\$12,000 each) will be funded by augmentation fellowship funds; all awardees enter longitudinal tracking system; at least 10% minority and 40% female; at least 3 NASA and 5 EROS interns]</li> </ul>
<p><b>B.2. Research Infrastructure:</b> <i>Promote the improvement of research programs and capabilities of members with an emphasis on the fields of aerospace, earth science, and supporting STEM disciplines.</i></p>
<ul style="list-style-type: none"> <li>– Statewide competition for Project Innovation Grants for research development offered at all 20 affiliates including three Tribal Colleges; emphasis on interdisciplinary research focused on NASA, DUSEL, or EROS priorities. [At least two awards for research (\$5,000-\$20,000)]</li> </ul>
<p><b>B.3. Higher Education:</b> <i>Build interdisciplinary programs related to NASA's Education Outcome 1 at the state's institutions of higher education and support related programs that serve to strengthen STEM education in SD.</i></p>
<ul style="list-style-type: none"> <li>– Statewide competition for Project Innovation Grants for course development offered at all 20 affiliates including three Tribal Colleges; emphasis on NASA disciplines. [At least one award for student-led collaborative/team projects (\$5,000-\$20,000)]</li> <li>– Support interdisciplinary student engineering design teams in NASA priority areas. [At least three engineering design teams such as robotics, aero-design, and unmanned aerial vehicle teams]</li> <li>– Support summer STEM programs for precollege students on college campuses with emphasis on Native American students. [At least four summer STEM precollege programs such as *space, *robotics, *engineering, *computer, and *science camps] (*Participant numbers and demographics collected for all student programs, and student surveys administered)</li> </ul>
<p><b>D.1. Precollege:</b> <i>Increase student awareness and access to educational and career opportunities in aerospace, earth science, and supporting STEM disciplines.</i></p>
<ul style="list-style-type: none"> <li>– Sponsor statewide competition for precollege STEM teacher grant. [One precollege teacher grant (\$5,000)]</li> <li>– Support teacher training workshops in NASA priority areas. [At least eight teacher workshops (200 teachers)]</li> <li>– Support summer STEM programs for precollege students on college campuses with emphasis on Native American students. [At least four summer STEM precollege programs (450 students)]</li> <li>– Support statewide precollege robotics programs, including resources, teacher training workshops, and state competition. [At least 30 teams participate in SD FLL robotics state competition (400 students)]</li> <li>– Share NASA educational resources (StarLabs, robotic kits, Uniview ExploraDome mobile planetarium, and telescopes). [At least 180 teachers and 250 students utilize NASA educational resources]</li> </ul>
<p><b>E.1. Informal Education:</b> <i>Enhance public scientific literacy in aerospace and earth science; complement community efforts in STEM education; and inspire citizens of diverse backgrounds through the excitement of scientific exploration and discovery.</i></p>
<ul style="list-style-type: none"> <li>– Partner with informal education affiliates to disseminate NASA content, share NASA educational resources, and host major NASA science education events. [15 informal education providers and 500 students share NASA resources; 150 teachers and 2,200 students participate in NASA science education events such as SD Space Days]</li> </ul>

<sup>1</sup> Note: The metrics above apply to the comprehensive \$660,000 proposal. There is no change in metrics to those reported in Table G.3 of the base proposal. SDSGC initially submitted a base budget with zero-dollar line items reflecting the augmentation programs if funding for them was later provided. NASA's review of SDSGC's base proposal required a revised budget that removed the zero-dollar line items, but the only required revision was to the budget itself. Note that the above student/teacher numbers do not total the full amount mentioned in the text of the base and augmentation proposals and comprehensive PART Measures table because this summary table includes only selected precollege metrics.