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 Minnesota Space Grant Consortium is a Designated Consortium funded at a level of $785,000 for fiscal year 2009.

PROGRAM GOALS
Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA’s strategic goals.

Goal 1.1: Enhance diversity in the STEM workforce by providing research opportunities to women students and students from underrepresented groups at least at a minimum percentage equal to Minnesota demographics for enrollment in higher education (Native American 1.2%, African American 6.8%, and Hispanic 2.3%, for a total of 10.3% and 50% for females).

Goal 1.2: Contribute to the STEM workforce by providing research opportunities to high-performing undergraduate and graduate students attending MnSGC institutions.

Goal 1.3: Enhance diversity in the STEM workforce by providing scholarship and fellowship support to women students and students from underrepresented groups (at the same level as Goal 1.1).

Goal 1.4: Contribute to the STEM workforce by providing scholarship and fellowship support to high-performing undergraduate and graduate students attending MnSGC institutions, including support for students from all accredited higher education institutions in Minnesota to participate in NASA Center internships.

Goal 1.5: Enhance diversity in the STEM workforce by enhancing higher education opportunities for women students and students from underrepresented groups (at the same level as Goal 1.1).

Goal 1.6: Contribute to the STEM workforce by enhancing higher education opportunities for high-performing undergraduate and graduate students attending MnSGC institutions through aerospace design projects and student aerospace hardware projects.
Goal 1.6: Contribute to the STEM workforce by promoting higher education course development in areas of interest to NASA at MnSGC institutions.

Goal 1.7: Enhance diversity in the STEM workforce by promoting research and higher education programming at the tribal college affiliate within the MnSGC.

Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.

Goal 2.1: Enhance the teaching of STEM topics, especially in schools with high underrepresented populations, by supporting pre-college teachers, especially those that serve primarily underrepresented students, through a variety of aerospace-related professional-development opportunities.

Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA’s mission.

Goal 3.1: Promote familiarity with, and interest in, aerospace and space-related STEM fields and career opportunities by offering a variety of informal education activities around the state.

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

Outcome 1:
- High-altitude ballooning payload building expanding to 1 additional affiliate, in addition to 3 schools previously involved
- Funded 8 student interns at NASA Centers
- Build 2 suborbital payloads that were flown from NASA Wallops Flight Facility, 1 of which was a cooperative effort between the lead institution and 1 affiliate
- High-powered rocketry program initiated at our tribal college affiliate
- Aerospace, physics/astronomy, and geology research conducted at lead institution and multiple affiliates

Outcome 2:
- Freshman seminar on high-altitude ballooning at the lead institution; ballooning now being incorporated into classes at 2 other affiliates
- Supported 2 new courses at affiliates, one on Climate Change, another on Computer Programming
- Summer aerospace workshop for teachers conducted by MnDOT, our state government affiliate
- Planetarium/astronomy sessions at Science and Nature Teacher Conference
- Aerospace curriculum session and exhibit/demonstrations at the “E4” (Excellence in Elementary Engineering Education) teacher conference

Outcome 3:
- Day-long exhibit about the MnSGC at the MN State Fair, staffed mostly by college students
- Continuing Education class on high-altitude ballooning offered at the lead institution
- Formed a new partnership with the MN Planetarium Society that provides mobile planetarium activities statewide
- Regular astronomy/telescope evening events at 2 affiliates
PROGRAM ACCOMPLISHMENTS

Goal 1.1: Enhance diversity in the STEM workforce by providing research opportunities to women students and students from underrepresented groups.

Objective 1.1.A: Involve underrepresented groups in research programs to at least a minimum percentage equal to Minnesota demographics for enrollment in higher education (Native American 1.2%, African American 6.8%, and Hispanic 2.3%, for a total of 10.3%) and 50% for females.

Results: We planned on having a minimum of 4 students from underrepresented groups and 20 female students participate in research in 2009-2010. We had 4 students from underrepresented groups and 19 female directly-supported student research participants.

Goal 1.2: Contribute to the STEM workforce by providing research opportunities to high-performing undergraduate and graduate students attending MnSGC institutions.

Objective 1.2.A: Offer opportunities for high-quality undergraduate research experiences.

Results: We planned on providing research opportunities for at least 40 undergraduate students in 2009-2010. We were able to provide directly-supported research experiences for 40 students.

Objective 1.2.B: Support high-quality graduate research in aerospace science, engineering, and related fields.

Results: We planned on supporting at least 5 graduate students in these areas in 2009-2010. We supported 9 graduate students doing research, 7 of them through our fellowship program.

Goal 1.3: Enhance diversity in the STEM workforce by providing scholarship and fellowship support to women students and students from underrepresented groups.

Objective 1.3.A: Provide scholarships for underrepresented students to at least a minimum percentage equal to the most recent Minnesota demographics for enrollment in higher education (see Objective 1.1 A) and award 50% of our scholarships to women in 2009-2010.

Results: We planned to provide at least 45 scholarships and fellowships, with the targets above for underrepresented and women students. We provided a total 99 scholarships and fellowships, 32 of them (32.3%) to underrepresented students and 46 of them (46.5%) to women.

Goal 1.4: Contribute to the STEM workforce by providing scholarship and fellowship support to high-performing undergraduate and graduate students attending MnSGC institutions, including support for students to participate in NASA Center internships.

Objective 1.4.A: Offer opportunities for all qualified students at our affiliates to participate in the MnSGC Fellowship and Scholarship Program.

Results: We planned on providing (a) at least 5 Consortium-wide scholarships and (b) at least 40 institution-specific scholarships. We provided 10 Consortium-wide scholarships and 89 institution-specific scholarships.

Objective 1.4.B: Provide scholarship support for at students to participate in NASA summer internships and other activities at NASA Centers in 2009-2010.

Results: We planned to support at least 8 students at NASA Centers. We supported 8 students at NASA Centers in the summer of 2009.
Goal 1.5: Enhance diversity in the STEM workforce by enhancing higher education opportunities for women students and students from underrepresented groups.

Objective 1.5.A: Involve underrepresented groups in higher education programs to at least a minimum percentage equal to Minnesota demographics for enrollment in higher education for participation in higher education (see Objective 1.1 A) and at least 50% female in 2009-2010.

Results: We planned to provide direct support to at least 10 students working on Higher Education projects, with the targets above for underrepresented and women students. We directly supported 13 students in higher education projects, but had an additional 100 unpaid direct student participants in this area. Of the 13 directly-funded students, 4 were supported through scholarships, 1 student (7.7%) was an underrepresented student and 4 of the students (30.8%) were women.

Goal 1.6: Contribute to the STEM workforce by enhancing higher education opportunities for high-performing undergraduate and graduate students attending MnSGC institutions through aerospace design projects and student satellite projects.

Objective 1.6.A: Support the aerospace design program at the UMTC.

Results: We planned on providing at least 5 aerospace design projects sponsored by industry or government. We provided 12 projects sponsored by of which 11 were sponsored by industry – Boeing, Lockheed Martin, ATK, Cirrus Design, BAE Systems, and Veratech.

Objective 1.6.B: Participate in the National Space Grant Student Satellite Program.

Results: We planned on providing activities in at least two different types of student satellite projects. We supported ballooning activities at 4 schools, 2 rounds of a suborbital rocket payload building, and the start of high-power rocketry at 2 affiliates.

Goal 1.6: Contribute to the STEM workforce by promoting higher education course development in areas of interest to NASA at MnSGC institutions.

Objective 1.6.A: Support undergraduate Higher Education activities at MnSGC affiliates.

Results: We planned on providing support for at least 3 new or ongoing courses/programs in 2009-2010. We supported new courses on Climate Change and Computer Programming as well as revisions to courses on Spacecraft Attitude Dynamics and Control, Techniques for Experimental Physics, Planetary Science, and Astronomy (for education majors).

Goal 1.7: Enhance diversity in the STEM workforce by promoting research and higher education programming at tribal college affiliates within the MnSGC.

Objective 1.7.A: Enhance STEM educational opportunities at the 2 tribal college affiliates (although classified as Tribal College at the start of the grant period one of our Tribal College Affiliates, Fond du Lac Tribal and Community College is currently no longer officially classified as a Tribal College)

Results: We planned on helping facilitate at least 1 research or higher education program at each of these affiliates in 2009-2010. We sponsored 1 course at each affiliate, on robotics and computer programming respectively, as well as the start of high-powered rocketry activities at both affiliates. We also supported the expansion of tree-ring climate-change research at Leech Lake Tribal College.
**Goal 2.1:** Enhance the teaching of STEM topics, especially in schools with high underrepresented populations, by supporting pre-college teachers through a variety of aerospace-related professional-development opportunities.

**Objective 2.1.A:** Improve the formal and informal teaching of science and mathematics at the pre-college level.

**Results:** We planned on offering at least 2 formal short-duration professional teacher development activities in 2009-2010 in which at least 50% of the participants subsequently use the materials/activities in their own teaching. We offered 1 short-duration program involving planetarium use by teachers, 2 long-duration workshops (one on robotics and the other on general aerospace curricula), plus several 1-time presentations to teacher groups on NASA-related topics.

**Objective 2.1.B:** Promote the teaching of mathematics, science, and pre-engineering by working with teachers

**Results:** We planned to work with at least 3 schools that serve primarily underrepresented students, to familiarize them with aerospace curricula in 2009-2010. We worked with teachers in 10 schools during this time period, more than 4 of which have high underrepresented populations.

**Goal 3.1:** Promote familiarity with, and interest in, aerospace and space-related STEM fields and career opportunities by offering a variety of informal education activities around the state.

**Objective 3.1.A:** Promote aerospace and space related sciences through informal education activities around the state in 2009-2010. Survey a representative sample of participants and expect that at least 75% of respondents agree that the informal education activities were valuable to them (or to their groups, if they are a group leader).

**Results:** We offered informal education opportunities at 4 different affiliates in which at least 75% of the participant agreed that the activities were useful to them as well as informal education activities at an additional 3 affiliates which were well-received but were delivered in contexts where it was difficult to formally survey participants.

**PROGRAM CONTRIBUTIONS TO PART MEASURES**

- Longitudinal Tracking:
  
  Student Data and Longitudinal Tracking: Total awards = 52; Fellowship/Scholarship = 19, Higher Education/Research Infrastructure = 33; of the total awards, 2 Fellowship/Scholarship awards and 3 Higher Education/Research Infrastructure were to underrepresented students. During the FY09 program year 11 students graduated and are pursuing advanced STEM degrees, 3 accepted STEM positions at NASA contractors, 6 accepted STEM positions with (non-aerospace) industry, 4 accepted STEM positions in academia, and 1 went into a non-STEM field.
  
  For all students that were significantly supported in the period spanning FY06-FY09, 18 graduated and are pursuing advanced STEM degrees, 7 accepted STEM positions at NASA contractors, 15 accepted STEM positions with industry, 1 accepted a position at NASA, 4 accepted STEM positions in academia, and 1
went into a non-STEM field. The remaining students have not yet received the degree that they were pursuing while they received their Space Grant award.

- **Course Development:**
  Higher education courses in areas of interest to NASA and using NASA content have been developed with Space Grant funding at multiple institutions in the MnSGC. Recent new courses include a climate change course at St. Catherine University and a computer programming course at Leech Lake Tribal College. Recently-revised courses include Spacecraft Attitude Dynamics and Control at the University of Minnesota – Twin Cities, Techniques for Experimental Physics at Concordia College, Planetary Science at Bemidji State University, and Astronomy (for education majors) at the University of St. Thomas.

- **Matching Funds:**
  Non-scholarship Space Grant funding is matched 1 to 1 by in-kind and new-money contributions by the institutions offering programming. Match dollars are used to complement and expand upon Space-Grant-funded programming.

- **Minority-Serving Institutions:**
  Leech Lake Tribal College is an active participant in the MnSGC. In addition to providing scholarships for their students, Space Grant support helped them start a high-powered rocketry program, develop and offer a computer programming class, and expand their tree-ring research activities to study the effects of climate change.

**IMPROVEMENTS MADE IN THE PAST YEAR**

- **Improved review/feedback of affiliate proposals**
  This year we improved the process by which evaluate proposals for MnSGC funding, requiring explicit Goals and Objectives (in SMART format) in all proposals and implementing the use of a (rotating-membership) panel of internal affiliate directors, plus one external reviewer, to rank proposals using specific rubrics and give feedback to the Director and Associate Director.

- **Increased support of graduate research**
  This year the MnSGC expanded the amount of funding going to graduate student research at the University of Minnesota – Twin Cities, and brought faculty from the UMTC’s School of Physics and Astronomy, for whom some of those graduate students work, into a more-active role in the consortium.

- **Expanded student aerospace hardware opportunities**
  The MnSGC expanded aerospace hardware opportunities for students (student satellite projects) around the consortium. This year several affiliates began new projects in high-altitude ballooning, suborbital rocketry payload building, and high-powered rocketry.

- **Preparation for expansion of pre-college involvement in ballooning**
  In-line with the new emphasis on engaging more middle school teachers and students, the MnSGC laid the groundwork for expanding high-altitude ballooning activities to engage local middle schools through ballooning workshops, to be held in the summer of 2010.
## PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

<table>
<thead>
<tr>
<th>Affiliate</th>
<th>Institutional Type</th>
<th>Primary Role</th>
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<tbody>
<tr>
<td>Augsburg College</td>
<td>MS granting private</td>
<td>Undergrad. Research/Informal Education</td>
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<tr>
<td>Bemidji State University</td>
<td>MS granting public</td>
<td>Undergrad. Research/Pre-College/Higher Education</td>
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<td>Carleton College</td>
<td>4 year private</td>
<td>Undergrad. Research/Informal Education</td>
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<td>Bethel University</td>
<td>MS granting private</td>
<td>Undergrad. Research/Pre-College</td>
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<td>St. Catherine University</td>
<td>MS granting private (women only)</td>
<td>Undergrad. Research/Higher Education</td>
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<td>Concordia College</td>
<td>4 year private</td>
<td>Undergrad. Research/Higher Education</td>
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<td>Fond du Lac Tribal and Community College</td>
<td>2 year public community college (formerly a tribal college)</td>
<td>Higher Education</td>
</tr>
<tr>
<td>Leech Lake Tribal College</td>
<td>2 year tribal community college</td>
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<td>4 year private</td>
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<td>State Agency</td>
<td>Pre-College</td>
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<td>Undergrad. and Grad. Research/Higher Education/Pre-College/Informal Education</td>
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