

Wisconsin Space Grant Consortium  
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## PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Wisconsin Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2013.

## PROGRAM GOALS

### **Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Educate and Engage)**

Minor differences between these goals and objectives and those from the original proposal are due to changes being made as we incorporate lessons learned and NASA priorities change. These changes are noted in italics.

**Goal 1.** Enhance Wisconsin growth in aerospace while supporting the NASA workforce pipeline by (1) supporting workforce development initiatives and (2) testing methods of recruiting students early in their career and retaining top students throughout their schooling.

#### **Objectives**

1.1 Use our primary Workforce Development initiative, the Student Satellite Program, to broaden workforce opportunities for science majors, *especially at smaller four-year and two-year schools*, by supporting curriculum development and hands-on research in high-altitude ballooning activities.

1.2 Maintain our ability to recruit students from a wide range of Affiliate Member institutions by supporting and refining our Balloon and Rocket Programs.

1.3 Continue to budget specific money in the Other Student Awards Program to help support at least two students (more if selected) to NASA Academy, at least two students (more if applicable) to NASA Internships and at least one team involved in NASA's Reduced Gravity Program.

- 1.4 Increase retention of our best and brightest aerospace students by increasing Fellowship awards for our most highly-ranked graduate students (the top 10%) from \$5000 to \$8,000 and investigating raising the ceiling on our Undergraduate awards.
- 1.5 Provide opportunities for our funded students, faculty and other experts to present their research at our annual Wisconsin Space Conference.
- 1.6 Support and strengthen the national Space Grant program through the Director's elected leadership roles in the national organization.
- 1.7 Continue to press our Affiliate Members to build relationships with the Minority Advancement offices at their campuses, and nurture growing relationships.
- 1.8 Support the aerospace programs associated with our minority-serving institution, the College of Menominee Nation (CMN), by investing in *First Nations rocket launch activities*. (Note that this new wording includes but broadens the original goal of supporting a Tribal College Rocket Consortium)
- 1.9 Continue to recruit Affiliate Members to diversify our reach.

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

**Goal 2.** Utilize the limited resources of the Consortium and the success of the current Special Initiatives Program to create a new suite of cohesive, progressive programs that recruit and better retain minority and female students from middle school through high school to our current higher education offerings.

**Objectives**

- 2.1. Successfully run our Special Initiatives and Aerospace Outreach Programs.
- 2.2. Partner with the College of Menominee Nation (CMN) in supporting aerospace-centered research and student activities under a special funding initiative that targets Native American students served by CMN.
- 2.3. Create a High School Rockets program as a partnership with USLI and Rockets 4 Schools, one that injects standards-based STEM curriculum into the already-successful Rockets 4 Schools spring rocket launch and closes the pipeline gap between students served by Rockets 4 Schools and those served by our University Rocket Competition.
- 2.4. Continue to nurture our strong relationships with our two minority-serving Affiliate Members, the College of Menominee Nation and Alverno College (a women's college with a large African-American student population).

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

**Goal 3.** Seek out more effective ways to encourage Wisconsin precollege educators to learn and utilize space-related content in the classroom, and find new, innovative methods of funding those efforts.

**Objectives**

- 3.1 Continue the current Aerospace Outreach Program, with increased emphasis on reaching out to educators directly.

3.2 Create new and expand existing High School-related programs (High School Rockets Competition; High School Partners) to (1) close the gap in our pipeline between K-12 and Higher Education students, and (2) provide direct support to NASA's current Education Priorities.

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

#### **Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals (Educate and Engage)**

- Rocket activities for Native American students (First Nations Rocket Launch): This program comprises opportunities at a range of skills levels for native students to build and launch rockets in a collegial, culturally-relevant environment. We use WSGC Base Grant money primarily to fund our student mentors and staff, and to fund local native teams in this far-reaching program. One beneficiary of this is a "non-traditional" student at the College of Menominee Nation, Dean Davis. Mr. Davis launched a rocket for the first time last year. This year he has taken a leadership role, advising two and possibly three teams. He is also employed at CMN. Mr. Davis hopes to launch five rockets in April.

- We continue to see applications and proposals from students and faculty at a wide range of affiliate member schools. We believe this is a result of our policy to invest in small, focused types of experiences that can enrich an undergraduate's experience at crucial points in their education, keeping them engaged, rather than funding programs focused at a single school. This flexible, non-centralized approach allows individual students, no matter how large or small, well- or poorly equipped their campus, to plug in to our programs from a distance and take advantage of them. One student who personifies the benefits of this approach is Trent Cybela, a student at University of Wisconsin-Platteville. Trent attended a Rockets 4 Schools launch and was hooked; he embraced the opportunity our Collegiate Rocket Competition gave him to not only launch rockets but recruit his fellow students to join him in rocket design, construction and flight. This year, 47% of our directly-funded students were from one of our non-research institutions; if only undergraduate awards are counted, that rises to 65%.

- Our decentralized approach allows us to promote vigorously all statewide and national programs consortium-wide; additionally, most funded students, no matter their school, attend our annual "So You Want To Work For NASA" workshop. This has meant that students from institutions from all over the state have secured coveted NASA program spots, such as internships. For example, Justin Nelson, a student at UW-Stout located in rural Menomonie, WI, is the recipient of not one but two NASA internships: one at Langley last summer, and at Ames this summer as part of the Robotics Academy.

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

- Based on a strong state need for more students choosing to enter NASA-related fields, our primary goal at the WSGC is *recruitment* of students into these fields. Once in, we have an extremely high *retention* rate. This is because, while each of our programs is a standalone program funding separate projects, through careful design of these programs we have created a full pipeline of opportunities that a student can take advantage of at

any point or level of experience in her or his education from middle school through graduate school. We shepherd students through this pipeline through directed workshops and one-on-one student contact at common transition points. Thus, a student like Trent whose interest in rockets was sparked by Rockets 4 Schools has found greater challenges in our Collegiate Rocket Competition. Jane Christenson, a student at UW-Stevens Point recruited through our Undergraduate Scholarship program was introduced to the Undergraduate Research program, in which she was funded for a research project of her own design. Joseph Krueger, a promising physics and mathematics student, found challenges in both our Collegiate Rocket Competition, and then our Undergraduate Research Program. In this way, we turn recruitment into retention and ultimately into a steady stream of high-caliber Wisconsinites entering the NASA and aerospace workforce.

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

- Our Aerospace Outreach Program specializes in partnerships, in which NASA-related curriculum is the inspiration for long-term STEM activities between schools and other institutions. An example from this past year is *Star Stories*, a teacher workshop on astronomy. For this activity, the focus was on integrating history and myth with current research and results, thereby creating ties between STEM educators and state content experts. The National Research Council’s Science Education Standards were addressed throughout the workshop.

**PROGRAM ACCOMPLISHMENTS**

**Outcome 1 associated goals and objectives**

**Goal 1**

Objective 1.1 accomplishments. In response to the 2012 NASA CAN, we began forming partnerships with several two-year colleges, including affiliates and non-affiliates, to create a high-altitude balloon pilot program. We planned to utilize WSGC and partner experience and resources to train students and faculty at partner schools to design, build, fly and analyze data from science payloads launched on tethered balloons. The connections made through the effort were sustained and we plan to pursue this idea when another such opportunity arises.

Objective 1.2 accomplishments. We supported 86 students in 15 teams from 10 affiliates in the Collegiate Rocket Competition, an increase in representation from last year; 3 teams represented the first or second time a team was fielded from that institution. Our top three teams were advanced to the Regional Collegiate Rocket Competition, which we administer for the Great Midwestern State Space Grants. We also funded 6 students from 3 affiliates in the Elijah High-Altitude Balloon teams.

Objective 1.3 accomplishments. In FY13 with our base grant we funded 3 NASA Academy or Center interns and 2 NASA Reduced Gravity teams (14 students).

Objective 1.4 accomplishments. As in FY 12, we are unable to raise the ceiling on our Undergraduate Awards based on the limits of our current base grant.

Objective 1.5 accomplishments. The 23<sup>rd</sup> Annual Space Conference, hosted by Marquette University, had 74 registered attendees from all over the state.

Objective 1.6 accomplishments. Director R. Aileen Yingst is currently serving as an active member of the Space Grant Directors' Executive Committee.

Objective 1.7 accomplishments. Based on an assessment of every academic member's self-reported demographics, we have made connections with diversity-focused organizations, offices or departments at UW-Madison, Medical College of Wisconsin, MSOE and UW-Colleges (comprising all two-year public institutions).

Objective 1.8 accomplishments. We currently have 10 teams from 8 institutions nationwide participating in our First Nations Launch activities. This year we funded two native students from the College of Menominee Nation out of base funds; we anticipate funding six by year's end. Additional WSGC budgetary contributions to this objective includes funding for students and staff to provide non-technical support to the program.

Objective 1.9 accomplishments. Our current membership now stands at 41 institutions. We have gained at least 1-2 new members per year for the past six years. Our newest member is UW-Stevens Point, a 4-year university in central Wisconsin.

### ***Other Progress and Accomplishments under Outcome 1***

**WSGC Scholarships, Undergraduate Research Awards, and Fellowships:** In FY 13 we made awards to 28 students within these three programs using NASA base funding (there was 1 student that received a scholarship and research award). Of those awards, 9 went to Undergraduate Scholars, 9 to Undergraduate Researchers, and 11 to Graduate Fellows, including the winner of the Dr. Laurel Salton Clark Award. Member institutions typically leverage our support to an average of three additional undergraduate students per year with internal funding; the exact number for this year will not be known until later in the school year. Students will present their findings at this summer's Wisconsin Space Conference to be held at BTCI (partnering with ORBITEC) in August.

**Research Infrastructure Program:** Two Research Infrastructure grants were awarded to provide relatively new faculty or staff the opportunity to establish a space-related research project, or more experienced faculty or staff the opportunity to begin new space-related research programs. Also included here is support of the WIYN Astronomy Consortium, which provides 1-3 observing nights per year to faculty and students.

**Higher Education Incentive Grants:** One award was made to college or university faculty or academic staff interested in developing a new course, minor, major, or curricular area related to any NASA-related discipline.

**Industry Awards:** We have partnered with our Industry members to fund five student interns at member businesses, and have funded one award for Industry training activities and one research award to Industry/Academic teams, to foster partnerships in research between academia and industry.

### **Outcome 2 associated goals and objectives**

#### **Goal 2**

Objective 2.1: We funded 5 Special Initiatives awards this year, directed at increasing diversity in student participation in NASA-related and other STEM fields. We also funded 7 awards in Aerospace Outreach, to funding K-12 initiatives, particularly in teacher training.

Objective 2.2: We funded 2 Native American students through our Base Grant this year; again, we anticipate funding six by fiscal year end.

Objective 2.3: The WSGC is funding an innovative program called RockSim. The purpose is to give students the tools to make the transition between secondary programs like Rockets 4 Schools, and college level programs like the Collegiate Rocket Competition. We intend to award funding for the RockSim workshop before the end of the fiscal year.

Objective 2.4: We have discussed our native programs earlier.

### ***Other Progress and Accomplishments under Outcome 2***

**Special Initiatives program:** Five awards were made to faculty, educators or other individuals or groups to develop and conduct innovative programs that target groups traditionally underserved in aerospace.

### **Outcome 3 associated goals and objectives**

#### **Goal 3**

Objective 3.1: Our Aerospace Outreach Program is designed to fund innovative planning grants and supplemental grants for projects that increase interest, recruitment, experience and training of pre-college students in the pursuit of space- or aerospace-related science, design, or technology, or encourage K-12 students in space-related pursuits. We have funded 7 projects under this program.

Objective 3.2: We support this goal through funding other than our Base Grant.

## **PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES**

**Student Data and Longitudinal Tracking:** Total awards= 44, 5 students received awards in more than one project; Fellowship/Scholarship= 29, 1 student received awards in more than one project; two of the total awards are self-reported underrepresented minorities and 20 were women. We expect to have more students in the Scholarship/Fellowship, Higher Education, and Research Infrastructure programs that cannot yet be reported on because the reporting period is not complete; we currently expect that at least 6 of these students will be underrepresented minorities. During the FY13 program year, of the 77 students moving on to the next step, 15 students are NASA contractors, 25 students have accepted STEM positions in industry, 16 have graduated and are pursuing advanced STEM degrees; and 9 others are in STEM, non-aerospace positions.

**Minority-Serving Institution Collaborations:** Wisconsin has two tribal colleges and one primarily female college. Of these three institutions, two are members of the WSGC: Alverno College and the College of Menominee Nation (CMN). Both are active members. Paul Smith, a professor at Alverno College, is a key mentor in our Collegiate Rocket program. Our primary interaction with CMN is the First Nations Launch activities described above, which often includes hosting the associated workshops.

**NASA Education Priorities:** Our focus this year was on the NASA Education Priorities of authentic experiences, diversity, community colleges and research infrastructure.

- **Authentic, hands-on student experiences:** To meet this priority, nearly *every student* funded directly by the WSGC (except for some of our scholars where funds are meant to pay tuition) is required to be engaged in an active, authentic, hands-on, problem-solving experience. This includes all students funded through our Undergraduate Research and Graduate Fellowship programs; all NASA Academy, Intern and special programs students; all Industry Interns; all students funded by faculty under our Research Infrastructure program, and all Student Satellite Initiative team members and interns.
- **Diversity:** First Nations Launch activities reported here significantly supported increasing the diversity of institutions, faculty and student participants both in Wisconsin (among our native students) and nationally (through recruitment of tribal schools and student teams across the country). For FY 13, we supported 10 teams from 8 schools in this endeavor, thereby encouraging native students from 7 states across the country in hands-on, authentic STEM-related and NASA-related activities; these numbers may increase by the end of the fiscal year.
- **Community Colleges:** The WSGC has four members that are two-year or technical colleges (15% of academic members). All WSGC members are equal members of the Consortium and have an equal representation on our Advisory Council. Additionally, we have begun discussions with UW-Colleges (the two-year college equivalent of our UW-System for four-year colleges) to determine if membership of the entire two-year college system is feasible and desirable.
- **Research Infrastructure:** In Wisconsin, one of our highest state priorities is recruitment of students and faculty in NASA-related research. We have, for this reason, steadily increased the amount available for Research Infrastructure grants to early career faculty to pursue NASA-related research.

### IMPROVEMENTS MADE IN THE PAST YEAR

• **Managerial:** After fourteen years in the position, the Director of the WSGC has chosen to resign, in order to pursue her research and mission work. In light of this resignation, the University of Wisconsin-Green Bay, the current lead institution, has chosen to allow another institution to assume responsibility for the WSGC. Accordingly, the Director held a meeting with the University Administration and the Chair of the Advisory Council, to map out a plan that will allow for a smooth transition. The Advisory Council Chair will take the lead in this effort. Following the guidelines set out by NASA and the WSGC Charter, the Advisory Council will approve a process that will allow member institutions to compete for Lead Institution status, including naming a potential director. The Advisory Council will then forward to NASA their consensus recommendation for these positions, along with the vita of the new director. The current director is committed to overseeing a smooth transition, and assisting post-transition with important milestones such as the next 5-year review.

### PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Wisconsin Space Grant Consortium Members

|                    |          |         |
|--------------------|----------|---------|
| Alverno College    | Academic | 4yr bac |
| Carroll University | Academic | 4yr bac |

|   |                |              |
|---|----------------|--------------|
| Concordia University- Wisconsin               | Academic       | 4yr bac      |
| Lawrence University                           | Academic       | 4yr bac      |
| Ripon College                                 | Academic       | 4yr bac      |
| St Norbert College                            | Academic       | 4yr bac      |
| University of Wisconsin-Oshkosh               | Academic       | 4yr bac      |
| University of Wisconsin-River Falls           | Academic       | 4yr bac      |
| Wisconsin Lutheran College                    | Academic       | 4yr bac      |
| Carthage College                              | Academic       | 4yr bac/Grad |
| University of Wisconsin-Green Bay             | Academic       | 4yr bac/Grad |
| University of Wisconsin-La Crosse             | Academic       | 4yr bac/Grad |
| University of Wisconsin-Parkside              | Academic       | 4yr bac/Grad |
| University of Wisconsin-Platteville           | Academic       | 4yr bac/Grad |
| University of Wisconsin-Stevens Point         | Academic       | 4yr bac/Grad |
| University of Wisconsin-Stout                 | Academic       | 4yr bac/Grad |
| University of Wisconsin-Superior              | Academic       | 4yr bac/Grad |
| University of Wisconsin-Whitewater            | Academic       | 4yr bac/Grad |
| Milwaukee School of Engineering               | Academic       | Bac/Master   |
| College of the Menominee Nation               | Academic       | Tribal       |
| University of Wisconsin-Fox Valley            | Academic       | Com/Jr       |
| University of Wisconsin-Sheboygan             | Academic       | Com/Jr       |
| Western Technical College                     | Academic       | Com/Jr       |
| Marquette University                          | Academic       | PhD          |
| University of Wisconsin-Madison               | Academic       | PhD          |
| University of Wisconsin-Milwaukee             | Academic       | PhD          |
| Medical College of Wisconsin                  | Academic       | Medical      |
| Aerogel Technologies, LLC                     | Industry       | Aerospace    |
| Astronautics Corporation of America           | Industry       | Aerospace    |
| Orbital Technologies Corporation              | Industry       | Aerospace    |
| Space Explorers, Inc.                         | Industry       | K-12 Ed.     |
| Spaceflight Fundamentals, LLC                 | Industry       | Informal Ed. |
| Crossroads at Big Creek                       | Not-for-Profit | Informal Ed  |
| Experimental Aircraft Association (EAA)       | Not-for-Profit | Aviation Ed. |
| AIAA – Wisconsin Section                      | Not-for-Profit | Student Eng. |
| BioPharmaceutical Technology Center Institute | Not-for-Profit | Informal Ed. |
| Great Lakes Spaceport Education Fnd, Inc.     | Not-for-Profit | K-12 Ed.     |
| Spaceport Sheboygan                           | Not-for-profit | Space Ed.    |
| Wisconsin Aerospace Authority                 | Government     | State        |
| Wisconsin Department of Public Instruction    | Government     | State        |
| Wisconsin Department of Transportation        | Government     | State        |

All WSGC members have equal status and equal representation on our Advisory Board regardless of their size.

**The National Space Grant Office requires two annual reports, the 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.**