

Wisconsin Space Grant Consortium  
WI Lead Institution: Carthage College  
Director: Kevin Crosby  
Telephone Number: 262-551-5855  
Consortium URL: [spacegrant.carthage.edu](http://spacegrant.carthage.edu)  
Grant Number: NNX15AJ12H

Lines of Business (LOBs): NASA Internships, Fellowships, and Scholarships;  
Stem Engagement; Institutional Engagement; Educator Professional Development

#### A. 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 \$760,000 for fiscal year 2017.

#### B. PROGRAM GOALS

The mission of the WSGC is to use the excitement and vision of space and aerospace science to equip the citizens of Wisconsin with the math, science and technology tools they need to thrive in the 21st century. The overarching goal of the WSGC is to improve Wisconsin's future development and eminence in aerospace.

**Objectives:** All WSGC activities are designed to advance the long-range research and educational agendas of NASA, the National Space Grant and Fellowship Program, NASA's Education Framework, and National and State Educational Standards. WSGC SMART targets/metrics are listed in Section D. Our objectives defined by the Consortium's Advisory Council are summarized below:

1. **Employ and Educate** a STEM workforce in disciplines needed to achieve NASA's strategic goals, through a portfolio of investments by 1) efficiently administering competitive and highly visible fellowship and scholarship opportunities for college and university students in STEM disciplines through direct marketing, outreach, and effective communication; 2) increasing the impact of internship programs on career placement within the aerospace industry in Wisconsin by identifying STEM engagement and workforce development opportunities; 3) expanding

opportunities for students to secure NASA Center Internships and Co-Ops by cultivating new partnerships within the commercial aerospace industry; 4) providing highly visible and impactful team-based research and space technology experiences for undergraduates by pursuing external funding to support expansion and growth of the Student Satellite Program; 5) improving STEM education in institutions of higher education through the introduction of research-based pedagogies and learner-centric curricula by developing web resources highlighting best practices and communicating successful curriculum program implementation; and 6) efficiently administering a competitive and highly visible program of research awards to faculty engaged in promising research related to NASA mission and goals by encouraging, initiating, and expanding programs, collaborative networks, and student-centered research collaborations. **NASA Outcome Objective Addressed:** 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3.

2. **Educate and engage** our network by attracting and retaining students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty by facilitating the development of K-12 instructional materials, outreach activities and informal faculty in STEM fields related to NASA mission and goals by continuing to fund successful outreach efforts. **NASA Outcome Objective Addressed:** 1.4, 2.1, 2.2, 2.3, 2.4, 3.2, 3.3.

3. **Engage and inspire** community by building strategic linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission by incentivizing the awareness and participation of underrepresented groups in NASA's mission through community-based programming. We utilize our programs to fund projects and programs that target historically underrepresented groups, increase formal linkages between statewide K-12 institutions with underrepresented communities and space-focused informal education opportunities, and devote 10% of our K-12 funding programs to engage, inspire and educate individuals with special needs. **NASA Outcome Objective Addressed:** 1.5, 2.4, 3.1, 3.2.

### C. PROGRAM/PROJECT BENEFITS TO PROGRAM AREAS

1. **Employ and Educate.** The Wisconsin Space Grant Consortium partnered with the Wisconsin Economic Development Corporation and the Milwaukee Bucks to host the first annual Aerospace Jam. The event hosted over 400 STEM students and dozens of state aerospace employers at the Bradley Center, home of the NBA Milwaukee Bucks. The students met with employers, learned from experts about the Wisconsin aerospace industry, and networked with each other over the course of the half-day event. Participants were provided food vouchers and tickets to the evening's Bucks game. The event was extremely successful and will grow in scale next year as more companies have committed to attending. Aerospace business partners are now part of our Industry Internship Program, offering students unique internship opportunities and expanding the number of students receiving job offers as a direct result of this event. Next year, we will create a resume archive for students to upload their resumes prior to the event so that companies can review candidates prior to meeting them in person. The Milwaukee Bucks hope to expand this program to other NBA teams and state space grant consortia. Illinois Space Grant Consortium and Florida professional teams are interested in using the WSGC and Milwaukee Bucks model.
2. **Educate and engage.** Notable projects this year include the WSGC's efforts to incentivize space sciences curriculum development with a focus on project-based

programs. Two program highlights in this area have been particularly successful. We have renewed a partnership with University of Wisconsin Sheboygan, one of the state's two-year colleges. Due to UW-S's involvement with RockSat C, UW-S Alumni Ryan Kisiolek, launched a partnership between UW-S and UW-Milwaukee to form a joint effort within the RockSat-C program between the two institutions. This partnership allows him to mentor students on the two-year campus and broaden the reach of WSGC programs. Kisiolek is a prime example of WSGC's efforts to engage two-year campus students in STEM and help them matriculate to a four-year campus. A second significant development this year toward the Educate and Engage Goal is the WSGC's support of Enterprise in Space. EIS hosts teacher development workshops to promote the infusion of space science topics in K-12 curriculum. With WSGC sponsorship, EIS hosted two workshops on the Carthage College campus, attracting Wisconsin teachers from across the state who spent a day learning to implement microgravity science curriculum components into their existing curriculum.

3. **Engage and Inspire.** Charee Peters, a Ph.D. candidate in Astronomy at the University of Wisconsin has developed a unique and effective way to engage underrepresented students across the state in STEM activities. Peters, with funding from the WSGC has developed an outreach program that leverages her love of roller derby and her passion for astronomy to teach students the basic physics of momentum conservation, collision dynamics, angular momentum, and other topics that are fundamental to both roller derby and galactic evolution. The entertaining presentation has been delivered to several schools across the state to rave reviews from students. Peters presents these workshops with fellow professional roller derby athletes, physics professors from UW-Platteville, and Lawrence University. As a Native American woman in science, Peters is an important role model for our students, and her message and unique delivery is powerful and effective.

#### D. PROGRAM ACCOMPLISHMENTS

- NASA Internships, Fellowships, and Scholarships (NIFS): WSGC represents 28 academic affiliates throughout the state of Wisconsin; 60% of the campuses have students applying to the NIFS programs this year. WSGC is still accepting applications for our Elijah Balloon program. In addition, the consortium is still in the process of competitively awarding the student awards and we are on track to meet annual program goals. **Program Goals vs. Actual** (E) Exceed; (M) Meet; (N) Not Met; (NA) Not Awarded: *Undergraduate Scholarship* (Budget: \$36,000): (NA) Applicants-20/23 (E); Females – 8/7 (N); Underrepresented-13%/26.0% (E); *Undergraduate Research* (Budget: \$40,000); (NA) Applications-15/13 (N); Female Applicants-6/4 (N); Underrepresented-2/1 (N); Schools Represented 8/6 - 25% increase over LY (N). *Graduate Fellowship* (Budget: \$35,000): (NA) Applicants-30/5 (N); Underrepresented 3/1 (N). *Collegiate Rocket Launch*: Teams 12/10 (N); New School 1/1 (M); Returning Teams 3/11 (E). *Elijah Balloon*: (NA) Two-year Student Applicant Payload 1/TBD; Launch 1/TBD. 4 Other Student Programs Supporting student participation in NASA RockSat-C, Robotic Mining, and Senior Design projects.

- Higher Education Incentives Program: Total award allocation is \$54,000. WSGC is still in the process of competitively making the HEI awards. Program goals for the HEI awards include two major awards at \$10,000, one minor award at \$5,000, and one multi-institution award at \$20,000. We also fund our RockSat team awards through HEI. To date, the Consortium has funded one multi-institution award (meets goal). We released a second solicitation of opportunity in order to fully meet our goals. The proposal review for the second solicitation will be complete in late-March with awards announced in early April. Additionally, RockSat, Robotic Mining, and Senior Design participation is fully funded (meets goal).

- Research Infrastructure Program: Total program allocation is \$55,000. WSGC is still in the process of competitively making the Research Infrastructure awards. Program goals for the RIP program include 3 major awards at \$10,000, two minor awards at \$5,000, and one multi-institution award at \$20,000. To date, the Consortium has made two major awards and two minor awards. No multi-institution awards have been made.

- Precollege projects: Total program allocation is \$25,000. Program goals for the current year include five awards of \$5,000 each. WSGC has made nine competitive awards across the Aerospace Outreach and Special Initiatives programs that support precollege projects. The total award amount across all precollege projects is \$51,825. Though the expenditures exceed the budget in the current year, the overall program budget across the current and previous year is balanced.

- Informal Education projects: Total program allocation is \$25,000. Program goals for the current year include five awards of \$5,000 each. Awards are still being made for this program with two projects totaling \$6500 awarded.

#### E. PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE GOALS

*Include summary data for the bulleted list below:*

- **Diversity:** The Consortium continues to meet its diversity targets with 13.86% of student awards going to underrepresented minority student awardees. 39.60% of student awardees identify as female. Women continue to represent 33% of WSGC Affiliate Member Institutional Representation. The WSGC Executive Board includes 37.5% females, a 3.5% increase from 2015. The lead institution administrative staff is 100% female. Of the 40 Affiliates, two are MSIs, five are 2-year academic, 23 4-year academic, two government, four industry, and six non-profit organizations.
- **Minority Serving Institution Collaborations:** Wisconsin has two tribal colleges and one primarily-female college. Of these institutions, two are members of the WSGC. College of Menominee Nations participates in our Scholarship program and First Nations Launch. Alverno College is a primarily-female college. They assist with our Collegiate Rocket Launch program.

- **Office of Education Annual Performance Indicators:**
  - API 2.4.1: ED-17-1     15 URM, 27F Applicants (Undergraduate Scholarship, Undergraduate Research, Graduate & Professional Research Fellowships, Student Satellite Initiative awards decided/issued in March)
  - API 2.4.2: ED-17-2     140
  - API 2.4.4: ED-17-4     65 (Enterprise in Space, Yerkes Observatory, Simpson Street Free Press, Eagle’s Nest Project, BTC Institute, Milwaukee Bucks Aerospace Jam, Milwaukee Maker Faire, KoJo Productions, Rollin Dolls Professional Roller Derby, University of Wisconsin -LaCrosse)
  - API 2.4.5: ED-17-5     1426

**F. IMPROVEMENTS MADE IN THE PAST YEAR**

In FY 2017, the Consortium undertook several changes to program delivery. These changes were in response to ‘continuous improvement’ conversations with our Advisory Committee and Executive Board. In response to a Consortium goal of encouraging multi-institution collaborative research and curriculum efforts, the WSGC offered one new award in each of its faculty programs. These awards invite two or more institutions to collaborate on either a curriculum project or a research project involving undergraduate students. At \$20,000/award, these grants have the potential to be transformative on some of our campuses. The Consortium’s Associate Director for the Higher Education Incentives program developed the parameters and evaluation rubric for the awards.

Additionally, the Consortium undertook a new project that bridges efforts in Higher Education and Aerospace Outreach. In partnership with the ZERO G Corporation and with additional funding from the American Physical Society, the WSGC has embarked on a project to fund a STEM teacher from a Wisconsin Title I school to participate in a parabolic flight. The *Embedded Teacher* program supports a teacher’s flight on a ZERO G research flight. The Consortium selects the teacher, provides curriculum guidance to introduce microgravity sciences into the teacher’s classroom(s) and guides the development of small demonstration experiments that the teacher will ultimately perform while on a parabolic flight. The program, modeled after the Northrup Grumman-funded *Education Flights of Discovery*, will fly its first teacher as part of a research flight in March 2018. The Consortium Director is working with the teacher’s classes both before and after the flights to build excitement, generate predictions about the fluid physics experiments to be performed, and to analyze the flight video to compare with student predictions. The WSGC is supporting the filming of a documentary of the experience for the teacher to use in her classroom. NBC Nightly News is also flying along with the teacher to cover this unique and impactful educational experience.

In response to input from our Technical Advisory Panel members, the rubrics for applicant evaluation have been significantly improved this year. The improvements are

designed to better align the evaluation rubrics with award goals and criteria. Another procedural improvement within the Consortium has been the development and refinement of templates for our student authors who submit final project reports in the form of articles for our *Proceedings of the Wisconsin Space Conference*. This annual publication is an important vehicle for our student authors to garner publication credits and to disseminate their WSGC-funded work. We have added a LaTeX template for authors and refined the content of other templates to improve the consistence and quality of our publication.

The Associate Director for Higher Education Incentives initiated a “Space Grant Speakers Bureau” to provide opportunities for our faculty to share talks across campuses in Wisconsin. The WSGC facilitates these talks and provides 50% support for speaker travel between campuses. As of February 2018, 17 talk abstracts have been posted on the WSGC Speakers Bureau web page.

#### G. CURRENT AND PROJECTED CHALLENGES

Diversity Recruiting. The Consortium continues to struggle to attract a diverse applicant pool for many of its awards. While we consistently meet our diversity and inclusion targets, we have internal goals of exceeding these published objectives. Despite several Consortium-wide efforts, these internal goals remain elusive. In response to this challenge, the WSGC is now working with Dr. Chad Starks of BCS Consultants, who has advised several Space Grant consortia on diversity recruiting. Dr. Starks gave a well-attended (30+) workshop at our annual state conference in August of 2017. Follow-up conversations with Affiliate Representatives suggested that the framework he presented for recruiting was accessible and translatable to their home campuses. We intend to follow up with these Affiliates to ensure that the lessons learned during the workshop are being implemented.

Sub-awards. Given the large number of active affiliates, the WSGC continues to struggle to adapt the Consortium’s culture and traditions of wide engagement across the state with the 2014 revision of OMB guidance to federal grant holders. Given the competitive nature of all WSGC awards, it is difficult to assign sub-awards to each of the 40 Affiliates. Each Affiliate may receive several faculty awards and student scholarships. Writing a single subaward to each Affiliate at the beginning of the grant year is not feasible. The Consortium continues to work with the grants offices at each of its academic affiliates to ensure reasonable and comprehensive award agreements that meet compliance criteria.

Commercial Internships. The WSGC has aggressive goals related to developing cost-shared internships with our commercial affiliates. We need to expand and diversify the Wisconsin aerospace companies with which we can partner to place our students for summer and semester-long internships. Working with larger partners in the state has continued to present difficulties. Many of these companies prefer to recruit nationally and are not in need of the cost-share support that we can offer. In an effort to develop relationships with hiring managers in these companies, we continue to pursue job fairs and informal opportunities to meet and promote the importance and potential of the Space Grant program within the state.

## **H. PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION**

*All WSGC Affiliate members have equal status and equal representation on our Advisory Board regardless of their size. All WSGC programs are openly competed within the Consortium and no programs are “housed” at individual campuses. As noted below, some institutions serve different recurring roles within the Consortium, but all Affiliates contribute Advisory Council representation to the WSGC.*

### **Two-year Academic Partners**

- College of Menominee Nation, Tribal; *participates in S/F, First Nations Launch.*
- University of Wisconsin-Fox Valley, Com/Jr; *participates in S/F, Collegiate Rocket Launch.*
- University of Wisconsin-Sheboygan, Com/Jr; *served as host of 2010 annual summer conference; participates in S/F, Collegiate Rocket Launch, RockSat.*
- University of Wisconsin-Washington County, Com/Jr; *participates in Collegiate Rocket Launch.*
- Western Technical College, Com/Jr; *Institutional Representative serves as Chair of Advisory Council; participates in S/F.*

### **Four-year Academic Partners**

- Alverno College, bac; *Served as host of 2015 annual spring meeting; provides support services for Collegiate Rocket Launch activities.*
- Carroll University, bac; *participates in S/F, Collegiate Rocket Launch.*
- Carthage College, bac/Grad; *Lead Institution; participates in S/F, Collegiate Rocket Launch, Cube Satellite, regular user of WIYN Consortium opportunities; hosts microgravity, RockSat teams.*
- Concordia University- Wisconsin, bac; *participates in S/F Collegiate Rocket Launch, Student Satellite Initiatives.*
- Lawrence University, bac; *participates in S/F, Student Satellite Initiatives.*
- Milwaukee School of Engineering, bac/Grad; *home of the Student Satellite Initiative programs in high altitude ballooning and Collegiate Rocket Launch activities; provides AD for Student Satellite Initiatives; participates in S/F, Collegiate and Regional Rocket Launch, Student Satellite Initiatives, MATE ROV, Robotic Mining Competition, Senior Design, and Cube Satellite.*
- Ripon College, bac; *Served as host of 2014 annual spring meeting; participates in S/F, Collegiate Rocket Launch, Student Satellite Initiatives.*
- St Norbert College, bac; *participates in S/F, Collegiate Rocket Launch.*
- University of Wisconsin-Green Bay, bac/Grad; *Former Lead Institution; participates in S/F, Collegiate Rocket Launch, Student Satellite Initiatives.*
- University of Wisconsin-La Crosse, bac/Grad; *participates in S/F; provides AD for Undergraduate Research and Research Infrastructure programs; hosted the 2011 and 2017 annual summer conference.*
- University of Wisconsin-Oshkosh, bac; *participates in S/F, Collegiate Rocket Launch; assists with planning and housing support for 2015 WSGC annual conference; host of 2018 Spring Advisory Council meeting.*
- University of Wisconsin-Parkside, bac/Grad; *participates in S/F, Collegiate Rocket Launch.*
- University of Wisconsin-Platteville, bac/Grad; *participates in S/F, Collegiate and Regional Rocket Launch, Student Satellite Initiatives.*

- University of Wisconsin-River Falls, bac; *participates in S/F, Collegiate and Regional Rocket Launch.*
- University of Wisconsin-Stevens Point, bac/Grad; *participates in S/F, Collegiate Rocket Launch.*
- University of Wisconsin-Stout, bac/Grad; *participates in S/F.*
- University of Wisconsin-Superior, bac/Grad; *host of 2009 and 2016 annual summer conference, participates in S/F.*
- University of Wisconsin-Whitewater, bac/Grad; *host of 2012 annual summer conference; participates in S/F, provides AD for Special Initiatives program.*
- Wisconsin Lutheran College, bac; *participates in S/F.*

### **Graduate & Professional Academic Partners**

- Marquette University, PhD; *Served as host of 2013 annual summer conference; provides AD for Higher Education Initiatives program; participates in S/F, Collegiate and Regional Rocket Launch.*
- Medical College of Wisconsin, Medical; *participates in S/F.*
- University of Wisconsin-Madison, PhD; *participates in S/F, Collegiate and Regional Rocket Launch, Robotic Mining Competition, Cube Satellite.*
- University of Wisconsin-Milwaukee, PhD; *provides AD for Scholarships and Fellowships; participates in S/F, Collegiate and Regional Rocket Launch.*

### **Industry Partners**

- Aerogel Technologies, LLC, Aerospace.
- Astronautics Corporation of America, Aerospace; *participates in internships; coordinates network for aerospace/cybersecurity cluster.*
- Orbital Technologies Corporation, Aerospace; *provides AD for Industry Programs; provide support services for Collegiate Rocket Launch; participates in internships.*
- Space Explorers, Inc., K-12 Ed.; *participates in internships.*

### **Not-for-Profit Partners**

- AIAA – Wisconsin Section, Not-for-Profit Student Eng.; *provides judges, logistical support for student rocket competitions.*
- BioPharmaceutical Technology Center Institute, Not-for-Profit Informal Ed.; *served as host of 2014 annual summer conference; provides AD for Aerospace Outreach; participates in application reviews.*
- Experimental Aircraft Association (EAA), Not-for-Profit Aviation Ed.; *served as host of 2015 annual summer conference; provides workshop facilities and logistical support for Collegiate and Midwest Rocket Launches, participates in application reviews.*
- Great Lakes Spaceport Education Foundation, Inc., Not-for-Profit K-12 Ed.; *participates in Collegiate Rocket Launch.*
- Kickapoo Valley Reserve, Government State; *served as host of 2016 Spring Advisory Council Meeting; runs Space Camp program featured in PBS/NOVA blog.*
- Spaceport Sheboygan, Not-for-profit Space Ed.; *hosts meetings and provides judges and logistical support for collegiate rocket launch programs; serves as host of 2017 Annual Spring Advisory Council Meeting.*



**Government State Partners**

- Wisconsin Department of Public Instruction; *participates in application reviews.*
- Wisconsin Department of Transportation; *participates in application reviews.*