

Alaska Space Grant Program  
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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 Alaska Space Grant Program is a Program Grant/Capability Enhancement Consortium funded at a level of \$534,983 for fiscal year 2008.

## PROGRAM GOALS

The Alaska Space Grant Program has the mission to "promote Earth and Space Science and Technology related teaching, research, and public service throughout Alaska, with special emphasis on culturally responsive programs to engage native, minority, and non-traditional communities." The program goals outlined in the FY2008 proposal are as follows:

- Implement a 10 days aerospace module for the Alaska Summer Research Academy (ASRA) targeted at bringing native / rural high school students of Alaska to gain research experience.
- Capacity building to continue existing student rocket program and to expand it to a new small satellite program with additional funding from NASA EPSCoR and potentially other competitive federal funding.
- Support BalloonSat program and the University's Unmanned Aerial Vehicle (UAV) based research, involving statewide undergraduate and graduate students.
- Continue supporting geospatial (remote sensing, GIS, GPS) workforce development program with emphasis on post-secondary education.
- Assist graduate students with fellowships and ancillary support to carry out geospatial research projects that tie in directly with the needs of Alaska's state industries.
- Steer affiliate programs to develop more in the direction of enquiry-based learning and supporting higher education and research.

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

**Student Rocket and Small Satellite Programs:** The Student Rocket Project successfully launched its 5<sup>th</sup> major payload from the Poker Flat Research Range on January 10, 2009 at 2:17pm. The rocket reached an apogee of 98.5 km. The SPR5 Ionospheric Sounding and Inertial Sensing (ISIS) payload was designed and built by UAF students with collaboration with two Japanese universities. All systems functioned well throughout the flight including the UAF student built telemetry unit (built to IRIG standard 106-05 to be compatible with NSROC telemetry equipment), plasma probe, radio receivers, UV sensors, magnetometers, and GPS. All students that have participated in the student rocket program and have graduated have acquired employment in STEM related fields (Outcome 1: *Employ and Educate*). Our latest graduate (this year) is working for a NASA contractor working with Goddard, while a second that will graduate this May already has accepted employment with a Johnson Space Center contractor. Frequently students attend UAF specifically so that they can participate in the student rocket program (Outcome 2: *Educate and Engage*).

In 2008 engineering students participated in NASA's Microgravity University with a proposal titled "Investigation of Small Satellite Attitude Control Systems" that focused on the design of a small satellite attitude control system and the measurement of pointing accuracy and stability. (see <http://www.uaf.edu/asgp/microgravity> for details.) Although, the experiment itself was a marginal success the educational benefit to the team and the subsequent enthusiasm that they brought back to Alaska was priceless (Outcome 2: *Educate and Engage*). In fact the team has expanded this year and has submitted another successful proposal.

**Balloon Experimentation and Research (BEAR):** During this past year ASGP has partnered with the Arctic Amateur Radio Club (AARC) to develop high-altitude balloon infrastructure that can subsequently be used to engage high school and rural students in STEM fields (Outcome 2: *Educate and Engage*). The partnership with the AARC has increased public awareness of the goals of Alaska Space Grant (Outcome 3: *Engage and Inspire*). The 1st BEAR flight (May 10, 2008) was a resounding success reaching a maximum altitude of 95,327 feet. BEAR 2 was launched July 29, 2008 and was unfortunately lost 30 minutes into the flight due to equipment malfunction. On Sunday September 28, a big game hunter was guiding a hunting party in the remote area of the West Fork of the Little Delta River when he spotted something blue and yellow on top of a nearby peak. Being curious, he hiked up to the location and noted the BEAR 2 parachute and payload capsules. Fortunately, all the capsules had ownership and phone numbers written on the outside and so the payload and balloon remnants were returned. (See <http://www.bear.437am.com/> for more details.)

## PROGRAM ACCOMPLISHMENTS

- **Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals:**

**Undergraduate Research Design Studio:** Although not part of the FY08 proposal, Dr. Thorsen has been working on expanding the educational “pipeline” to facilitate the flow of students into programs like the student rocket project. Dr. Thorsen teaches the freshman EE102 which introduces students to the design cycle and environmental monitoring through the development of a balloon payload. The development of the Undergraduate Research Design Studio extends the “pipeline” to the senior year with a systems engineering elective. We are currently in the pilot phase of the course and hope to make it an official course in this coming year.

**Alaska Infrastructure Development Support:** In summer of 2008, DGGS provided all field logistical support to the project. ASGP PhD student Santosh Panda stayed in the field for 3 weeks this summer. The DGGS part of the support for us ended in 2008 and they have been very happy with this partnership. They hope to continue partnering with ASGP in the future and potentially providing match support for similar partnerships that promote graduate education and training. Santosh received “Best Student Poster Award” from the Permafrost Young Research Network.

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

**Alaska Summer Research Academy:** ASRA Earth and Space Science Module was successfully conducted as planned. In 2008 the instructors were Peter Webley; John Bailey; and Anupma Prakash. About 8 students (grades 8-12) participated. Neal Brown expanded the balloon photography part in the module. Instead of working with two small balloons, we went with 5 balloons and so could lift a much heavier camera set up.

Additionally, this educational paradigm was disseminated to a broader community through two posters - one at the Geological Society of America meeting and one at AGU meeting.

**Geospatial Workforce Development Program:** This work has been going smoothly and strongly. We have been able to consistently offer solid remote sensing, GIS, GPS courses at UAF and spreading them beyond post secondary level to k-12 levels too. The GIS and GPS class enrollments nearly doubled this year.

Graduate (MSc) student Sudipta Sarkar was nominally funded by ASGP to help Bill Witte maintain the instruments and mobile lab. He was a big support to answer several user questions, including those coming from our teachers spread now in various school districts. Large parts of the equipment are currently in Nome with elementary school teachers who are working with their students on introducing geospatial science in grade 4 (this is the youngest grade we have ever attempted).

The EDGE program run by Anupma Prakash and UAS affiliate Cathy Connor, is related to this effort and has made a genuinely positive impact in the state. See [www.edge.alaska.edu](http://www.edge.alaska.edu) for highlights and impacts on the state.

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

**Alaska Microgravity Team:** The team of undergraduate engineering students that make up the Alaska Microgravity Team have taken their enthusiasm for space, engineering, and NASA to the public schools throughout Alaska. In addition to classroom visits the team has produced videos of their experiences which have been disseminated to the Challenger Learning Center to be shown to an even broader range of students. These videos have also been disseminated on UTube and through the local UAF dorm channel. This year the students are working with the Museum of the North to produce a more professional video and displays that can be used by the Museum in their educational outreach program.

## PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: Fellowship/Scholarship = 31; 48.4% female, 51.6% male; 16.1% underrepresented. 3 students are employed in non-aerospace STEM fields, 2 in aerospace related STEM positions and 1 has graduated and is pursuing an advanced degree.
- Course Development: Currently piloting an undergraduate systems engineering curriculum as “Undergraduate Research Design Studio”.
- Matching Funds: FY2008 grant requested \$534,983 (\$135,000 Fellowships) with a match of \$399,988. These gives an overall 1:1 match for the non-fellowship funds.
- Minority-Serving Institutions: None

## IMPROVEMENTS MADE IN THE PAST YEAR

Dr. Thorsen commenced her role in the leadership of the Alaska Space Grant Program on September 8, 2008. Throughout the fall (2008) Dr. Thorsen visited each of the ASGP affiliates to discuss accomplishments, successful practices and frustrations in the management of ASGP. As a result of these meetings we have started developing new processes for fellowship/scholarship awards, applications for projects in the yearly grant cycle, and project reporting requirements. For bureaucratic simplicity in tracking we have decided to manage the fellowship/scholarship application process through the main ASGP office.

## PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

### **University of Alaska Fairbanks (UAF)**

The University of Alaska Fairbanks is the lead institution for the Alaska Space Grant Program, and the research center for the statewide university system. Facilities at UAF include the Poker Flat Research Range, which is the only university-operated sounding

rocket range in the world, and the Alaska SAR Facility which provides downlink and data processing facilities for an international fleet of Synthetic Aperture Radar (SAR) satellites. UAF offers the only degree programs in electrical and mechanical engineering within a 1400-mile radius (a civil engineering program also exists at UAA).

### **University of Alaska Anchorage (UAA)**

The University of Alaska Anchorage is an urban university serving the population center of Alaska (42% of the people in Alaska live in Anchorage). We are currently working to engage UAA more fully into Space Grant activities.

### **University of Alaska Southeast (UAS)**

Space Grant activities at UAS focus on supporting undergraduate research in: glaciology and remote sensing on the Juneau Icefield, sensor web construction and geochemical, hydrological, and ice motion data collection in local glaciated watersheds, and in physical science instruction to statewide middle school and high school teachers and their students to improve their use of technology, instruction of Earth System Science, and student directed research projects in Alaska's secondary schools.

### **Alaska Pacific University (APU)**

APU offers an excellent teacher education program that helps teachers throughout Alaska to develop and enhance curriculum to address national and state standards. APU is also home to the Alaska Science Center and the NASA Regional Education Resource Center (ERC) for Alaska, which disseminates NASA curriculum enhancement materials to teachers throughout Alaska.

### **The Imaginarium Science Discovery Center**

The Imaginarium Science Discovery Center is a non-profit educational institution in Anchorage dedicated to promoting the creative exploration of science concepts through discovery based models that reach out and involve all facets of Alaska's diverse population. Space Grant activities at the Imaginarium have focused on the development of new hands-on exhibits and inquiry-based programs in Space and Earth Science and Aerospace technology.

### **Challenger Learning Center**

The Challenger Learning Center of Alaska (CLCA) is a non-profit corporation that opened in April 2000. Space Grant activities focus on providing student scholarships in rural communities with a high concentration of underserved minorities to visit the Challenger Learning Center to fly simulated space missions augmenting in class curriculum.

### **The Museum of the North**

The University of Alaska, Museum of the North is the only research and teaching museum in Alaska. Space Grant has supported the upgrade of Alaskan and global system science programs for the visiting public.