

Rocky Mountain (Utah) NASA Space Grant Consortium  
 University of Utah  
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 URL: <http://spacegrant.usu.edu>

### 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 fellowship and scholarship programs; interdisciplinary space-related research infrastructure, education, and public service programs; 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 Rocky Mountain (Utah) Space Grant Consortium is a Designated Consortium funded at a level of \$730,000 for fiscal year 2008.

### PROGRAM GOALS

1. Strengthen the future STEM Workforce of NASA and her aerospace contractors.
2. Recruit, retain and educate a diversity of students in STEM disciplines in NASA's missions.
3. Engage the public and community leaders.

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

#### **Outcome 1. Fellowships/Scholarships, higher education and research infrastructure**

- Five of seven University Student Launch Initiative awards went to the USU Chimaera Hybrid Rocket Team at Marshall Space Flight Center.
- Second place was awarded to Utah State University Open Source Autonomous Multiple Unmanned Aerial Vehicle team at St. Inigoes, Maryland.
- USU President Stan Albrecht & the USU team attended launch of STS-124 at the Kennedy Space Center by invitation from NASA.
- USU Fellowship student, Shannon Eilers, won first place in AIAA Hybrid Rocket student paper competition at Reno, Nevada.
- Space Grant Fellowship student Chris Hall won first place in IEEE paper competition at Pocatello and then second place at San Diego.
- Space Grant Affiliate USU student's SUSpECS surface degradation experiment panel was carried on STS-123 and then mounted on the ISS.
- Ten undergraduate Space Grant scholarships were awarded to Native American students.

**Outcome 2. Higher education and precollege**

- Pathway to Mars Precollege Teachers Workshop at Challis, ID – 6/9/08.
- Precollege Teachers Workshop at Davis School District – 6/2/08.
- Precollege Teachers Workshop at BYU – 6/23/08.

**Outcome 3. General public and external relations**

- The SDL/AIAA Small Satellite Conference held at Utah State University.
- Celebration of 50<sup>th</sup> Anniversary of NASA, 1 October 2008.
- Dr. David Long, of Space Grant Affiliate BYU, named IEEE Fellow.
- NASA Astronaut Mike Bloomfield named Vice President of ATK.
- Dr. Douglas Lemon named Director of Affiliate Space Dynamics Laboratory
- 60<sup>th</sup> Anniversary of the start of the Upper Air Research Project at the U of U.

**PROGRAM ACCOMPLISHMENTS****Outcome 1. Fellowships/Scholarships, higher education and research infrastructure**

For 2008, our Consortium awarded 23 fellowships, 21 scholarships, 7 higher education/research infrastructure student awards, and 6 internships. PhD Fellowship student performed research providing space flight patient safety during sedation. Seriously injured crew members may need intravenous medications. Small precordial stethoscope to automatically detect respiratory depression and obstructions developed. Device generates alarms to start rescue maneuvers. Electronic stethoscope and digital signal processing effective for monitoring respiratory rate and respiratory depression in recipients of propofol/remifentanyl. PhD Fellowship student developed pain management for surgical procedures. Intravenous medication can be given to block pain. Protocol developed for administering drugs during procedures. Doses identified for pain relief while minimizing the crew member breathing interruption. PhD student doing work in monitoring/displaying lung injury breathing patterns. Chest contusion projected to be the most likely life threatening injury during EVA. A device was developed to measure/display injured crew member breathing. Sensors for air and carbon dioxide exhaled drive an animated display.

**Outcome 2. Higher education and precollege**

Anecdotally, a major higher education accomplishment was faculty/student research outcomes using upper atmospheric measurements provided by NASA to globally monitor the radiation budget of the mesosphere. A Kriging interpolation algorithm was created to globally display solar-caused emissions. Cycles were identified for infrared emissions relating to climate change.

**Outcome 3. General public and external relations**

Due to space constraints, this is covered in Section 3.

**PROGRAM CONTRIBUTIONS TO PART MEASURES**

- **Longitudinal Tracking:** A longitudinal tracking system was developed to track students from the time of award until the present. These students include Fellowship/Scholarship, Higher Education, Research Infrastructure and Internship awards. Students are tracked via e-mail and via their mentor/major professor at each academic institution. We have included student summary data in Table B for students from FY 2006 through FY2008.

- **Course Development:** Course developments implemented: (1) Space Systems Engineering class with goal of meeting the Workforce needs initiated by participation of a Space Grant Fellowship student in the Systems Engineering Workshop conducted by Texas Consortium at JSC with workshop materials. (2) Infrared Electro-optics with STEM Workforce perspective for space applications of NIR radiometers.
- **Matching Funds:** The Rocky Mountain (Utah) Consortium provided matching funds in the amount of \$547,000 for the total \$730,000 funds awarded by NASA. The ratio of funds leveraged by NASA funding support is 3:4 (75%). The lead institution and the Affiliates provide matching funds through in-kind support, volunteer efforts, matching of fellowship/scholarship awards, and waived indirect cost.
- **Minority-Serving Institutions:** Our Consortium achieved functional and meaningful collaboration with a minority-serving institution of higher education, namely, Hampton University (HBCU), an Affiliate of the Virginia Space Grant Consortium. LaRC provided measurements data related to climate trends. Students and Mentors at HU and USU gained undergraduate/graduate level research experiences in computer-aided data processing and scientific analysis.

### IMPROVEMENTS MADE IN THE PAST YEAR

- Extensive collaborations with other Consortia, our Affiliates, and NASA Centers.
- Placing diverse student internships with Mentors in aerospace industrial firms.
- Focus of Outreach projects to the benefit of precollege teachers.
- Research infrastructures in aerospace-engineering/space-medicine.
- Maturation of a systems engineering academic program.
- Effective in adding qualified STEM Workforce graduates with careers in aerospace.
- Increased participation of women in Aerospace Engineering and Space Medicine.
- Increased feed-forward to and feedback from each Affiliate.
- Increased Precollege science teacher workshops and seminars for underrepresented.
- Hampton University/LaRC/USU collaboration.
- Increased Precollege teacher Outreach opportunities.
- SDL provided student fellowships and aerospace optical and infrared imaging.

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

19 Affiliates:

**Education and Research Universities:** (1) Utah State University, (2) University of Utah, (3) University of Denver, (4) Brigham Young University; **Industry:** (5) ATK Launch Systems; **Education Institutions:** (6) Weber State University, (7) Southern Utah University, (8) Snow College, (9) Dixie State College, (10) Utah College of Applied Technology, (11) Salt Lake Community College, (12) Westminster College; **Government Centers:** (13) Idaho National Laboratory, (14) Space Dynamics Laboratory; **Outreach Institutions:** (15) Clark Planetarium, (16) Aerospace Heritage Foundation of Utah/Hill Aerospace Museum, (17) North American Native Research & Education Foundation, (18) Utah Science Center, (19) Rocky Mountain NASA Fellows Association.