

Hawaii Space Grant Consortium  
University of Hawaii at Manoa  
Dr. Luke Flynn  
808-956-3138  
<http://www.spacegrant.hawaii.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 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 Hawai'i Space Grant Consortium is a Designated Consortium funded at a level of \$730,000 for fiscal year 2008.

### PROGRAM GOALS

The Hawai'i Space Grant Consortium (HSGC) inspires, nurtures, and trains the space scientists, space settlers, and aerospace engineers of the future. HSGC strategy and programs are dynamic and reviewed annually to reflect State as well as NASA program needs and include development and maintenance of the HiSTEM Pipelines of activities (undergraduate/graduate opportunities supported by pre-college activities in the areas of space science, engineering, and remote sensing), enhancing undergraduate education through research (fellowships, traineeships, and internships that **must** have a NASA focus) and course curricula, improving research infrastructure (Hawaii Space Flight Laboratory (HSFL) and NASA Lunar Science Institute), training pre-service and in-service teachers (Future Flight Hawaii Programs), educating the public about new NASA discoveries (Windward Community College Aerospace Lab, Planetary Science Research Discoveries), helping to strengthen local space-related industries (Internship Program and HSFL), and helping to strengthen the State economy (HSFL, supporting Hawaii Governor's Innovation Initiative in robotics).

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

**Mr. Zachary Lee-Ho - Outcome 1** - Zachary Lee-Ho, a Hawaiian engineering student, was a linebacker on the UH football team. Zach was an average student when he became the student project manager for the LEONIDAS small satellite design team of eight Hawaiian students. Zach has helped with presentations at the State legislature and, along with Matthew Patterson also Hawaiian, has proposed the Kukui Aerospace Program to encourage Hawaiian students to pursue aerospace careers. Zach is a true leader, has

improved greatly as a student, and is now applying for his Master's degree in Mechanical Engineering while working on the Attitude Control System for the UH LEO-1 spacecraft. **Community College CanSat – Outcome 1** – Windward CC and Honolulu CC continue to field excellent CanSat student teams. Both CC's participated in Mainland competitions and a majority of their team members have gone on to study engineering and other STEM disciplines at 4-year universities.

**Astronaut Lacy Veach Day of Discovery – Outcome 2 & 3** - HSGC has partnered with Hawaiian Electric Company to annually sponsor Lacy Veach Day, a series of hands-on workshops and presentations that generate interest in STEM and NASA science. Online registration for 650 student-parent pairs was fully reserved in less than 24 hours after the site opened!

## PROGRAM ACCOMPLISHMENTS

**Outcome 1: Hawaii Space Flight Lab (HSFL)** – The HSFL is an HSGC Research Infrastructure program that is leveraging State and Federal assets in Hawaii to provide a student training and workforce development opportunity for students to design, build, launch, and operate small spacecraft in low-Earth orbit. The first HSFL project is a two-launch demonstration project called LEONIDAS, which has received \$12.01M in funding from FY 07-09. *Kumu A'o CubeSat* – Kumu A'o is the first CubeSat designed by Hawaiian engineering students and is partially funded by HSGC and UH College of Engineering. *Internships at Pacific Missile Range Facility (PMRF)* – HSGC sponsored two Kauai undergraduate students to work on summer internships at PMRF on projects related to HSFL. PMRF Technical Director John Benzie pledged the use of Navy internship funds to fund additional HSGC/HSFL students for subsequent summers.

**Outcome 2: Hi-STEM** – HSGC maintains pipelines of activities from K-12 through graduate school that are collectively called Hawaii Science Technology Engineering and Math or Hi-STEM. Hi-STEM allows HSGC to channel students, especially underrepresented students, towards NASA and STEM careers. Hi-STEM has three primary pathways (space science, engineering, and remote sensing) with evolving subject matter and activities that allow HSGC to adjust to NASA priorities and discoveries.

**Outcome 3: Windward Aerospace Lab** – Windward CC is constantly expanding the offerings of its Aerospace Lab that includes flight simulators, a planetarium, radio telescopes, and soon, the HSFL education and public outreach center to track progress of HSFL missions. Windward CC is also helping Kauai development through its rocketry coordinator Dr. Jake Hudson. *HSGC Assistance to Imiloa Center* – HSGC has been assisting the Imiloa Center on the Big Island with public outreach strategies and hands-on learning materials that have NASA and STEM objectives. *Astronaut Lacy Veach and Ellison Onizuka Days* – These days, celebrating Hawaii's astronauts, remain overwhelmingly popular and showcase NASA and STEM presentations and hands-on activities. HSGC coordinates the events but Hawaiian Electric Company and American Savings Bank donate funds and volunteers to make the events successes.

## PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: Total Fellowship/Scholarship awards in 2008 = 60; 32 of the total awards represents underrepresented minority F/S funding including 18 awards to

women. 35 students are pursuing advanced STEM degrees, 18 of which are underrepresented, while 5 students (3 underrepresented) have accepted STEM positions in an aerospace industry.

- Course Development: HSGC has developed 12 courses in Geology (305: Geological Field Methods, 460: Remote Sensing, 466: Planetary Geology, 593: Mission to the Red Planet, 611: Accelerated Intro to Geology, 673C: Petrologic Evolution of the Moon and Mars, 711(Seminar): Terrestrial and Space Energy Resources, 711(Seminar): Applied Field Methods Merging GPS and GIS Techniques), Geographic Information Systems (Windward 150: Intro to GIS), Electrical Engineering (199: Design Project, 496: Senior Capstone Project, 499: Senior Design Project), and Mechanical Engineering (419: Astronautics).
- Matching Funds: HSGC maintains a 1 to 1 match of non-Federal support for the HSGC to non-Fellowship NASA Space Grant support; however, counting Federal support through other grants and contracts the ratio is above 8 to 1.
- Minority-Serving Institutions: UH-Hilo as well as all of the UH System Community Colleges are minority serving institutions. The HSGC maintains strong ties with its affiliates through dedicated associate directors. Windward, Honolulu, Kapiolani, and now Maui CC receive HSGC support for CanSat programs. Windward CC is also partially supported for the Aerospace Lab and for providing education and public outreach for the HSFL. Leeward CC has installed a UHF/VHF ground station, and soon an S-band ground station for the HSFL.

## IMPROVEMENTS MADE IN THE PAST YEAR

- HSGC presence on Kauai is flourishing. HSGC has sponsored interns at PMRF, summer trainees at the Kauai CC Optics Lab, and high school rocketry teams including a launch day at PMRF on February 13, 2009. HSGC, with Kauai CC Chancellor support, plans to expand its offerings to include a rocketry club with the goal of competing in Alabama, greater fellowship opportunities, and course development in areas of interest to NASA and PMRF.
- HSFL development (Research Infrastructure, Higher Education) The HSFL is a truly cooperative program that includes Federal (PMRF – Navy launch range), State (Hawaii government – support for HSFL faculty positions; UH – support for infrastructure development; UH campuses – support for HSFL activities), and private (NovaSol – instruments for second spacecraft; NorthStar Communications – environmental testing support) organizations.
- Governor’s Initiative on Robotics - Governor Lingle has chosen HSGC-supported robotics activities (FIRST Robotics, Botball, VEX, and HURC [Hawaii Underwater Research Challenge]) as models for a State-wide program to increase STEM education. HSGC Future Flight Hawaii Director Art Kimura heads this program which has received over \$1 million in Federal and State support for after school robotics programs. In March 2008, Hawaii held its first FIRST regional in which over 25 Hawaii teams participated thanks to the support of the Governor.
- NASA Lunar Science Institute - Associate Director Jeff Taylor is P.I. on a large, interdisciplinary proposal to participate in the new NASA Lunar Science Institute (NLSI). The proposal focuses on the bulk composition and geologic evolution of the Moon, in order to understand lunar origin and differentiation.

## PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

UNIVERSITY OF HAWAII AT MANOA – 4-year university with graduate programs – Director Luke Flynn; Program Coordinator Marcia Rei Sistroso; Headquarters of HSGC and HSFL; majority of graduate and undergraduate fellows, interns, and trainees perform research in CubeSat and small satellite design, astronomy, planetary science, geology, engineering, marine science, remote sensing, and computer science.

UNIVERSITY OF HAWAII AT HILO – 4-year university with graduate programs – Associate Director Sun Park; undergraduate fellows and trainees have focused research on the strong astronomy, geology, and remote sensing programs. UH-Hilo along with American Savings Bank hosts the Astronaut Ellison Onizuka Day public science program annually in January.

HAWAII COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Bernhard Laurich; undergraduate focus on STEM and astronomy.

HONOLULU COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Gregory Witteman; undergraduate fellows and trainees have focused research on CanSat design and competitions. HCC assists with Astronaut Lacy Veach Day which is a festival of science activities held on Oahu in October.

KAPIOLANI COMMUNITY COLLEGE – Associate degree granting community college – Associate Director John Rand; undergraduate fellows and trainees have focused research on CanSat design and competitions and engineering. KCC receives Federal funding to attract underrepresented students to STEM careers and HSGC programs.

KAUAI COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Stewart Burley (Strategic Theories Unlimited, Inc.); undergraduate fellows, interns, and trainees have focused research on STEM including rocketry, meteorology, and optics.

LEEWARD COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Roger Kwok; undergraduate fellows and trainees have focused research on astronomy and soon telemetry through the LCC-HSFL ground stations. LCC assists with Astronaut Lacy Veach Day which is a festival of science activities held on Oahu in October.

MAUI COMMUNITY COLLEGE – Associate degree granting community college – Associate Director John Pye; undergraduate fellows and trainees have focused research in astronomy and STEM. Akamai Internship Program gives students opportunities for internships through the Center for Adaptive Optics.

WINDWARD COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Joseph Ciotti; undergraduate fellows and trainees have focused research in astronomy, CanSat design and competition, and rocketry. WCC hosts the Aerospace Lab, serves as outreach for HSFL, and offers an aerospace certificate.

UNIVERSITY OF GUAM – 4-year university with graduate programs – Associate Director Mark Lander; undergraduate focus on STEM.

HAWAIIAN ELECTRIC COMPANY – industrial affiliate – Associate Director Paul Fetherland; HECO supports Astronaut Lacy Veach Day and other HSGC programs both with funding and volunteers.