

Hawaii Space Grant Consortium
University of Hawai`i at Mānoa
Dr. Luke Flynn
808-956-3138
<http://www.spacegrant.hawaii.edu>
Grant Number: NNX10AI93H

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 \$575,000 for fiscal year 2012.

PROGRAM GOALS

The Hawai`i Space Grant Consortium (HSGC) inspires, nurtures, and trains space scientists, space settlers, and aerospace engineers of the future. HSGC's 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 (Hawai`i Space Flight Laboratory (HSFL)), training pre-service and in-service teachers (Future Flight Hawai`i and Families Exploring Science Together (FESTival) Nights Programs), and educating the public about new NASA discoveries (Windward Community College Aerospace Lab, Planetary Science Research Discoveries), helping to strengthen the State economy (HSFL, supporting Hawai`i initiatives in robotics).

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

Alpha Centauri – Outcome 1: The Alpha Centauri (Kamailehope) sculpture by Hawaiian artist Rocky Jensen has been a two year project, a partnership of the Sciencenter, `Imiloa Astronomy Center, Cornell University (New York Space Grant Consortium), University of Hawai`i (Hawai`i Space Grant Consortium), and NASA. This new star station representing Alpha Centauri (Kamailehope, pronounced kah-my-lei-ho-pey), the star nearest to the Sun, is located on the Big Island at the `Imiloa Astronomy

Center of the University of Hawai'i. It is a prominent star known in Polynesian Astronomy and used in oceanic voyaging. This sculpture is an extension of the Sagan Planet Walk built in Ithaca, New York in 1997. The newly expanded Sagan Planet Walk measures 5,000 miles (8,000 kilometers) and was named in honor and memory of Cornell University astronomer, Carl Sagan, a respected space scientist, an inspired and tireless advocate for science. The Sagan Planet Walk and the Alpha Centauri is the largest exhibition in the world now that it expands from Ithaca to Hilo. HSGC's Art Kimura, Rene Kimura, and Linda Martel attended the unveiling of the Kamailehope sculpture in October 2012. Martel obtained `Imiloa stamps in a Passport to the Solar System booklet, making her the first Hawai'i resident to visit every station in the exhibit. Martel walked the Sagan Planet Walk in Ithaca in October, 2008 with Jeff Taylor (Space Grant Assoc. Director for Space Sciences) and his family when Taylor was the recipient of the 2008 Carl Sagan Medal for Excellence in Public Communication in Planetary Science awarded by the Division for Planetary Sciences of the American Astronomical Society at their 40th annual meeting, which was held at Cornell University.

Amber Imai – Outcome 2: A recent graduate from the UH Mānoa (UHM) Engineering College, Amber Imai has been an intern at NovaSol during the summer 2011 while working as a spectral imagery analysis engineer. She later pursued a Fellowship to enhance her skills with the development of satellite hardware components for the Hawai'i Space Flight Laboratory (HSFL) during the fall 2012 and continued her educational training with HSFL after her graduation this past December 2012. Amber is a well-rounded individual with the knowledge and experience of both volunteer and academic work. She is constantly involved in various extra-curricular activities and leadership roles in clubs at the university as well as a former participant of many of our HSGC programs through Future Flight Hawai'i, robotics programs (Botball, FIRST, etc) and our Internship program. Amber is one of our space grant model student who has gone through our HiSTEM Pipeline and is currently the first female student to have graduated from UHM and in the workforce under the HSFL organization.

Daniel Wukelic – Outcome 3: (*From the HSGC website*)

With support from Hawai'i Space Grant Consortium, current undergraduate UH Mānoa (UHM) Engineering student Daniel Wukelic worked as a 2012 NASA Ames Aeronautics Academy summer intern in Mountain View, California. His internship included a trip with his team members to Washington D.C. to present their project at NASA Headquarters, "*Designing Two Short-Haul Civil Tiltrotors.*" The audience included Dr. Jaiwon Shin, the Associate Administrator for the Aeronautics Research Mission Directorate. Even NASA Administrator Charles Bolden dropped in for some presentations. Daniel's group was later awarded a 2012 NASA Aeronautics Research Mission Directorate (ARMD) Associate Administrator Award under the category of "High Potentials – Group". Daniel reports that his time in the nation's capital also included memorable visits with the late Senator Daniel Inouye and with Teal Takayama, the assistant to Congresswoman Colleen Hanabusa.

PROGRAM ACCOMPLISHMENTS

Outcome 1: *Hawai'i Space Flight Lab (HSFL)* – The HSFL is an HSGC Research Infrastructure program that is leveraging State, Federal (including NASA), and corporate partners to provide student and workforce training opportunities to design, build, launch, and operate small spacecraft. The State of Hawai'i signed an agreement with NASA Ames to help with HawaiiSat-1. LEONIDAS is HSFL's two-launch demonstration project. HawaiiSat-1 has been redesigned to HiakaSat, which is a 55-kg microsatellite that has an infrared hyperspectral imager developed by University of Hawai'i faculty and will be launched to a 430-km orbit from Hawai'i in October, 2013 on the Operationally Responsive Space-4 Mission. *Honolulu Community College Trainees* – Honolulu CC is in the process of installing an X-band ground station that will be used to collect National Weather Service (NWS) data and also will be used to collect HSFL microsatellite data. While the X-band antenna is being funded by NWS, student training is being provided with NASA Space Grant traineeships. *Kaua'i Community College Trainees* – Kaua'i CC trainees are receiving training to communicate with satellites and will have UHF/VHF command and control of HiakaSat as well as an S-band data downlink on campus.

Outcome 2: *Science Professional Development Partnership* - HSGC have been fortunate to collaborate with two K-12 school complexes to receive science professional development partnership funds for the past six years to provide content workshops for elementary and middle school teachers to help develop contextually based curriculum to engage their students in addressing the new science standards. Coordinated by education specialists, Art and Rene Kimura, the sessions have included a NASA Digital Learning Network event from NASA Ames Research Center and Kennedy Space Center, and covered science content in geology, volcanology, oceanography, physics, chemistry, and astronomy provided by Space Grant affiliated scientists and instructors from the University of Hawai'i at Manoa's Hawai'i Institute of Geophysics and Planetology, the Honolulu Community College, the Windward Community College, and the Leeward Community College. Parent and child engagement programs in the evening, along with individual assistance to teachers and grade levels are provided by the HSGC.

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 HSFL missions. Windward CC's Dr. Jake Hudson is also helping with the Kaua'i CC rocketry program. *Astronaut Days of Discovery* – These days celebrate Hawai'i's astronauts and remain overwhelmingly popular. They showcase NASA and STEM presentations and hands-on activities. HSGC coordinates the events but Hawaiian Electric Company, the Chatlos Foundation and American Savings Bank are major sponsors that help to donate funds and volunteer to make the events successful.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:** Total Fellowship/Scholarship awards in FY2012 = 87; 44 of the total awards represents underrepresented minority F/S funding including 28 awards to women. The number to participants in the program this FY2012 year increased by 8 students from FY2011. There are 3 students that have graduated and have accepted STEM positions in an aerospace industry, while 4 more students have graduated and are working at the university as part of the Hawai'i Space Flight Laboratory. Of the total participants, 75 students are still currently in their degree program as undergraduates or graduates pursuing an advance degree, with 94% of these students pursuing STEM degrees. Improvements include the number of underrepresented students reached and an increase in students funded.
- **Minority-Serving Institution Collaborations:** 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, Kapi'olani, Kaua'i, and UH Maui College receive HSGC support for CanSat programs. Windward CC is also supported for the Aerospace Lab. Kauai CC has installed a UHF/VHF ground station for the HSFL and new research experiments. Honolulu CC has a new X-band receiving station that can be used for HSFL missions. Honolulu CC, Kaua'i CC, and Windward CC collaborated on a proposal to develop a first Hawai'i Community College CubeSat, which if funded, will be launched from Kaua'i in the future.
- **NASA Education Priorities:** The HSGC has partnered with the State of Hawai'i and others to host hands-on robotics programs (FIRST, Botball, MicroRobots) at the elementary and intermediate school levels. HSGC has a rich history of teacher training using hands-on NASA-related science content through Families Experiencing Science Together (FESTival Nights) that include a minimum of 8 science teachers and 100 student-parent teams in an evening hands-on workshop, Future Flight Hawai'i summer program that is a weekend long activity using related hands-on activities to replicate science missions to other planets, and the two Astronaut Days of Discovery where teachers help to run up to 20 hands-on activities for 600 students and parents during a day-long science fest. HSGC Community Colleges submitted a proposal to develop CubeSats on the Community College campuses. Honolulu and Kaua'i CC are working to convert their physical electronics labs to be able to build satellite circuit boards. This training is important for future development of a small sat industry in Hawai'i. HSGC encourages the career development of young faculty by providing mini-grants and travel awards as appropriate in order to further NASA research interests. HSFL's next satellite project is a Coral Reef Imaging Satellite that will assess the health of the world's coral reefs in the current era of sea level rise.

IMPROVEMENTS MADE IN THE PAST YEAR

Within the \$575,000 budget, HSGC has tried to maintain as many programs as possible. We have re-focused our efforts on the fellowship program and deleted visits to NASA Centers as we can reach more students in Hawai'i with fellowships.

HSFL – HSFL received full funding to participate in the ORS-4 Mission which will launch satellites to orbit from Kaua'i for the first time. The ORS-4 launch will take place in the fall of 2013. HSFL supports many of NASA's OCT goals including the development of a small spacecraft (HiakaSat), small launch vehicle (Super-Strypi, Sandia National Lab), and mission operations architecture for controlling small spacecraft (COSMOS). HiakaSat is being built by students partial supported on NASA fellowships and internships. Installation of an S-band ground station at Kaua'i CC has also been a focal point of the year.

Percentage of Underrepresented Students Served – HSGC maintained support for underrepresented students who received 51% of the 2012 awards, 52% of 2011 awards, and 46% of 2010 awards.

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 Ken Hon; 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.

UNIVERSITY OF HAWAII MAUI COLLEGE – 4-year university with graduate programs – Associate Director John Pye; undergraduate fellows and trainees have focused research in astronomy, optics, and STEM. The Akamai Internship Program gives students opportunities for internships through the Center for Adaptive Optics.

HAWAII COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Joseph Wilcox; undergraduate trainees 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. Honolulu CC assists with Astronaut Lacy Veach Day which is a festival of science activities held on Oahu in October.

KAPĪOLANI 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. Kapi'olani CC receives Federal funding to attract underrepresented students to STEM careers and HSGC programs.

KAUA'I COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Liaison/Industry Affiliate Stewart Burley (Strategic Theories

Unlimited, Inc.); undergraduate fellows, interns, and trainees have focused research on STEM including satellite telemetry with a new ground station, rocketry, CanSat, meteorology, and optics.

LEEWARD COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Roger Kwok; undergraduate fellows and trainees have focused research on astronomy. Leeward CC assists with Astronaut Lacy Veach Day which is a festival of science activities held on Oahu in October.

WINDWARD COMMUNITY COLLEGE – Associate degree granting community college – Associate Director Joseph Ciotti; Rocketry Coordinator/CanSat Liaison Jacob Hudson; undergraduate fellows and trainees have focused research in astronomy, CanSat design and competition, and rocketry. Windward CC hosts various outreach activities from the Hokulani Imaginarium and through 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 – Industry Affiliate Paul Fetherland and Dora Nakafuji; HECO supports Astronaut Lacy Veach Day and other HSGC programs both with funding and volunteers.

The National Space Grant Office requires two annual reports, this 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.