GOV. MSG. NO. 663

Luke Flynn - CV

PERSONAL INFORMATION

Full Name: Luke Paul Flynn

Address: Hawai'i Institute of Geophysics and Planetology, School of Ocean and Earth Science and Technology, University of Hawai'i at Mānoa

Citizenship: United States

PROFESSIONAL DUTIES

07/01/02 – present	Director, Hawai'i Space Grant Consortium
10/30/05 – present	Director, Hawai'i NASA EPSCoR Program
05/15/07 – present	Director, Hawai'i Space Flight Laboratory

EMPLOYMENT HISTORY

08/01/08 – present	Specialist (Tenured), HIGP/SOEST, University of Hawai'i at Mānoa
02/16/06 – 07/31/08	Associate Specialist, HIGP/SOEST, University of Hawai'i at Mānoa
03/15/05 – 02/15/06	Associate Researcher (Tenure-track), HIGP/SOEST, University of Hawai'i at Mānoa
07/01/00 – 03/14/05	Associate Researcher, HIGP/SOEST, University of Hawai'i at Mānoa
12/04/99 – 07/01/02	Associate Director, Earth Science Education, Hawai'i Space Grant Consortium
04/01/95 – 06/30/00	Assistant Researcher, Hawai'i Institute of Geophysics and Planetology, University of Hawai'i at Mānoa.
06/92 – 03/31/95	Research Associate, Planetary Geosciences, University of Hawai'i at Mānoa

EDUCATION

PhD in Geology and Geophysics
Planetary Geosciences Division, University of Hawai'i at Mānoa, Honolulu, HI
(Dissertation subject: Radiative Temperature Measurements of the Puu O'o – Kupaianaha Eruption with Implications for Satellite Remote Sensing)
B.A. in Physics with Astronomy concentration
Cornell University, Ithaca, NY

SCIENCE TEAM MEMBERSHIPS AND OTHER EVENTS:

07/01/18 – present	Vice Chair of Executive Committee, National Space Grant Program
07/01/16 – present	PISCES Board of Directors, State of Hawaii Governor's Appointee

07/01/15 – present	UH – USPACOM Strategic Partnership – UH Liaison for Space
07/01/11 – present	Member, Executive Committee, National Space Grant Program
06/14/07 – 06/30/16	Principal Investigator, LEONIDAS – Low-Earth Orbit, Nanosatellite-Integrated Defense Autonomous System
05/15/07 – present	Director, Hawai'i Space Flight Laboratory
10/30/05 – present	Director, Hawai'i NASA ESPCoR Program
01/01/04 – 12/31/10	Member, Board of Directors, National Space Grant Alliance
07/01/02 – present	Director, Hawai'i Space Grant Consortium
10/18/99 – 12/31/02	Principal Investigator and Team Member, Earth Observing – 1 Instrument Team.
10/13/99 – present	Appointed to the Graduate Faculty in the Department of Geology and Geophysics.
04/01/98 – present	GOES Thermal Alert Team Leader
06/12/96 – 12/31/02	Principal Investigator and Team Member, Landsat 7 Instrument Team.
08/22/95 – 12/31/98	Team Member, Hyperspectral Imager Instrument Team.
07/18/95 – 12/31/98	Co-Investigator and Team Member, EOS Volcanology ID Science Team.
09/94 – 10/94	Mission Scientist for SCAR-C Wildfire monitoring campaign.

AWARDS

2017	University of Hawaii System Nominee for State Employee of the Year.
2016	University of Hawaii at Manoa Chancellor's Award for Outstanding Service to the University.
2007	**NASA *Group Achievement Award* to the *Earth Observing One Sensorweb Team.*** "For outstanding achievement in the development of an operational 24/7 autonomous Earth Observing Sensorweb, integrating multiple space and ground sensors". Awarded 2007.
2007	**Journal of Volcanology and Geothermal Research *Most Cited Author 2003–2007.*** Awarded for the paper Wright, R., L. Flynn, H. Garbeil, A. Harris, and E. Pilger, MODVOLC: Near-real-time thermal monitoring of global volcanism, special issue *J. Volcanol. Geotherm. Res.*, M. Ramsey and L. Flynn (eds.), **135**, 29-49, 2004. Awarded 2007.

PROFESSIONAL INTERESTS

05/15/07 – present	Hawai'i Space Flight Lab – Establishing capability to build, launch, and maintain small spacecraft in Earth orbit or for small pathfinder planetary missions. Providing access to space for HIGP and UH faculty research programs to enhance research opportunities.
07/01/02 – present	Hawai'i Space Grant – Increasing opportunities for Hawai'i residents to pursue space-related research careers and expanding Hawai'i's technical workforce in this area.
08/01/86 – present	Thermal Remote Sensing – Participating in remote sensing research to monitor active fires and volcanoes worldwide.

0. SUMMARY OF SPECIALIST ACTIVITIES:

As part of my Specialist duties, I am Director of the Hawaii Space Grant Consortium, the Hawaii NASA EPSCoR Program, and the Hawaii Space Flight Laboratory (HSFL). In the last five years, I have managed $14M in research grants and contracts. The two main emphases in my Specialist job description are space education and workforce development. HSFL is a very large and ambitious workforce development program that had its first orbital launch attempt on November 3, 2015. HSFL can be a driving force behind new economic possibilities for the State.

1. INSTRUCTION:

a. – f. No courses taught during 5 year period.

g. Students supervised: Graduate and post-graduate students: 3 (Miguel Nunes, Isaac Rodrigues, Amber Imai-Hong); Undergraduate students working on HiakaSat and New Mexico project: average of 140 over 3 years until 2015. Average of 55 in 2016 and 2017.

h. Students supported: 2013 – 2015 PhD graduate student: Miguel Nunes [ME]; 2013 Undergraduates total 143 (83 Space Grant and 60 HSFL); 2014 Undergraduates total 135 (80 Space Grant and 55 HSFL); 2015 Undergraduates total 130 (75 Space Grant and 55 HSFL); 2016 Undergraduates total 142 (87 Space Grant and 55 HSFL); 2017 Undergraduates total 143 (88 Space Grant and 55 HSFL). Total undergraduates supported in 5-year period: 693. In terms of demographics, HSGC/HSFL supports 55% underrepresented students (well above the 23.2% UH average) and ~30% women (which is below the 55% female population at UH).

i. I served on one PhD Committee (Miguel Nunes, Mechanical Engineering).

j. I served on one PhD Exam Committee (Miguel Nunes, Mechanical Engineering).

k. Evidence of Teaching Innovation (Short Narrative): The Hawaii Space Grant Consortium (HSGC) maintains the HiSTEM pipelines of courses and activities that cover K-12 education through workforce development. HiSTEM is frequently referenced by NASA Education HQ as a method to effectively integrate course offerings to encourage students to pursue STEM careers. Here is the HiSTEM list of activities that HSGC supports:

HiSTEM: Hawai'i Science, Technology, Engineering, and Mathematics

Level	**Engineering**	**Remote Sensing**	**Space Science**
K-12 including Teacher Training	Future Flight Hawai'i FESTival Night Astronaut Discovery Days *Robotics Programs:* Botball, FIRST,HURC, VEX-IQ	Future Flight Hawai'i FESTival Night Astronaut Discovery Days	Future Flight Hawai'i FESTival Night Astronaut Discovery Days
Community College	SG Traineeships SG Internships CanSat Akamai Internship Program (Maui)	SG Traineeships SG Internships GIS 100 (Ciotti) CanSat, Rocketry	SG Traineeships SG Internships GG 108
Undergrad	SG Fellowships SG Traineeships SG Internships	SG Fellowships SG Traineeships SG Internships	SG Fellowships GG 108 GG 168

	CubeSat EE 199 ME 419 EE 499 NASA Academy HI Space Flight Lab LEONIDAS	GG 460 GEOG 480 (Hon) NSCI 494 GG 671: GIS/GPS NASA Academy HI Space Flight Lab	NSCI 494 Astrobiology NASA Academy HI Space Flight Lab
Graduate	Master's Apprenticeship Post-Graduate Fellowship HI Space Flight Lab	Master's Apprenticeship HI Space Flight Lab	GG 673: Moon, Mars GG seminars in advanced topics HI Space Flight Lab

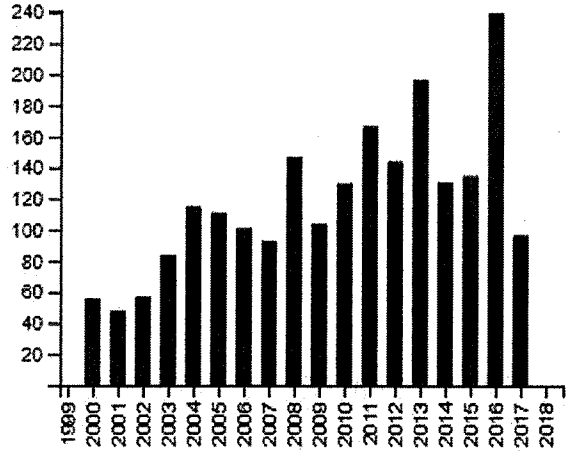
3 Key Highlights: The State of Hawaii now supports ~300 VEX-IQ robotics teams through HSGC – this is the 5th highest total in the country independent of population size. The Community Colleges maintain very vibrant research and technology programs that include the IMUA project to launch suborbital research payloads (3 years of flights so far). The CC's requested a record $125K in Space Grant project funding in Spring-Summer 2017 in order to participate in national programs like CanSat, Rock-On (CanSat building workshop at NASA Wallops), and ARLISS (rocket design and flight competition in Nevada desert). Finally, HSGC/HSFL engage over 100 students per year in unique experiential learning projects which is the equivalent number of students in 4 courses!

2. RESEARCH:

a. – c. Articles Published (2013 – 2017): 1

Misra, AK, Acosta-Maeda, TE, Sharma, SK, McKay, CP, Gasda, PJ, Taylor, GJ, Lucey, PG, Flynn, L, Abedin, MN, Clegg, SM, and R Wiens, "Standoff Biofinder" for Fast, Noncontact, Nondestructive, Large-Area Detection of Biological Materials for Planetary Exploration, *Astrobiology*, **16**, 715-729, 2016.

d. Number of Citations: 197 in 2013, 131 in 2014, 135 in 2015, 240 in 2016, and 97 in 2017.



The graph above shows the total number of citations from the year 2000 to 2017. The top 9 cited references are given in the table below. The first two highly-cited references were aerosol studies authored by Dr. Yoram Kaufman who was at NASA Goddard and the University of Maryland.

Web of Science statistics list 1441 articles citing the 32 papers (of 41) reported with an average of 69.91 citations per article and an *h*-index of 23.

Use the checkboxes to remove individual items from this Citation Report or restrict to items published between 1980 and 2018 Go	2014 ◄	2015	2016	2017	2018 ►	Total	Average Citations per Year
	131	135	240	97	0	2237	72.16
1. **The MODIS 2.1-mu m channel - Correlation with visible reflectance for use in remote sensing of aerosol** By: Kaufman, YJ; Wald, AE; Remer, LA; et al IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING Volume: 35 Issue: 5 Pages: 1286-1298 Published: SEP 1997	33	38	39	28	0	473	22.52
2. **Potential global fire monitoring from EOS-MODIS** By: Kaufman, YJ; Justice, CO; Flynn, LP; et al JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES Volume: 103 Issue: D24 Pages: 32215-32238 Published: DEC 27 1998	26	19	20	13	0	289	14.45
3. **MODVOLC: near-real-time thermal monitoring of global volcanism** By: Wright, R; Flynn, LP; Garbeil, H; et al JOURNAL OF VOLCANOLOGY AND GEOTHERMAL RESEARCH Volume: 135 Issue: 1-2 Pages: 29-49 Published: JUL 15 2004	14	9	25	5	0	146	10.43
4. **Automated volcanic eruption detection using MODIS** By: Wright, R; Flynn, L; Garbeil, H; et al REMOTE SENSING OF ENVIRONMENT Volume: 82 Issue: 1 Pages: 135-155 Article Number: Pii S0034-4257(02)00030-5 Published: SEP 2002	8	10	24	8	0	132	8.25
5. **Effusion rate trends at Etna and Krafla and their implications for eruptive mechanisms** By: Harris, AJL; Murray, JB; Aries, SE; et al JOURNAL OF VOLCANOLOGY AND GEOTHERMAL RESEARCH Volume: 102 Issue: 3-4 Pages: 237-270 Published: NOV 2000	5	8	14	9	0	126	7.00
6. **Calculation of lava effusion rates from Landsat TM data** By: Harris, AJL; Flynn, LP; Keszthelyi, L; et al BULLETIN OF VOLCANOLOGY Volume: 60 Issue: 1 Pages: 52-71 Published: AUG 1998	7	4	15	5	0	123	6.15
7. **Mass flux measurements at active lava lakes: implications for magma recycling** By: Harris, AJL; Flynn, LP; Rothery, DA; et al JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH Volume: 104 Issue: B4 Pages: 7117-7136 Published: APR 10 1999	4	3	14	3	0	116	6.11
8. **Temporal trends in lava dome extrusion at Santiaguito 1922-2000** By: Harris, AJL; Rose, WI; Flynn, LP BULLETIN OF VOLCANOLOGY Volume: 65 Issue: 2-3 Pages: 77-89 Published: MAR 2003	6	7	9	3	0	78	5.20
9. **DISTRIBUTION OF THERMAL AREAS ON AN ACTIVE LAVA FLOW-FIELD - LANDSAT OBSERVATIONS OF KILAUEA, HAWAII, JULY 1991** By: FLYNN, LP; MOUGINISMARK, PJ; HORTON, KA BULLETIN OF VOLCANOLOGY Volume: 56 Issue: 4 Pages: 284-296 Published: OCT 1994	2	2	5	1	0	68	2.83

e. Funded Grants and Contracts: **Total as PI from 2013 – 2017 = $14,010,458.25**

As the Director of the Space Grant and EPSCoR Programs, I am listed as the PI on numerous projects that I do not claim credit for here. I will note that Project IMUA was funded by NASA in 2014 and brought in an additional $499,967 to the UH Community Colleges, and also that 3 EPSCoR CAN proposals were funded to HIGP investigators (Misra [$721,376], Hermalyn [$737,805], Mouginis-Mark [$749,694], and Azimov [$680,154.21]) for an additional $2.89M. Finally, most of the $29M LEONIDAS contract was spent in the final two years of the contract even though awards were made in 2011 and 2012, especially for rocket parts and fabrication.

04/12 – 04/15 Principal Investigator "The Hawaii Space Grant Consortium", NASA's Office of Education, Office of Strategic Communications, **4-year total - $1,725,000.** FY 13 - $575,000, FY 14 - $575,000, FY 15 - $575,000.

09/12 – 09/15 Principal Investigator "The Hawaii NASA EPSCoR Project", NASA's Office of Education, Office of Strategic Communications, **3-year total - $400,000.**

FY 13 – $125,000, FY 14 - $125,000, FY 15 - $150,000.

06/07 – 06/16 Principal Investigator "LEONIDAS: Low-Earth Orbit, Nanosat-Integrated Defense Autonomous System", **9-year total: $29,039,570.67.** **FY 13 – 17** – Operationally Responsive Space - **$7,983,318.25.**

04/15 – 04/18 Principal Investigator "The Hawaii Space Grant Consortium", NASA's Office of Education, **3-year total - $1,375,000**. FY 15 - $575,000, FY 16 - $400,000, FY 15 - $400,000.

09/15 – 09/18 Principal Investigator "The Hawaii NASA EPSCoR Research Infrastructure Development Program", NASA's Office of Education, **3-year total - $450,000**. FY 15 - $150,000, FY 16 - $150,000, FY 17 - $150,000.

10/13 – 10/16 Principal Investigator "Developing a Pipeline of Payloads to Grow Student Capability in Minority-Majority States of New Mexico & Hawaii in the Suborbital Space Environment", NASA Office of Education, **2-year total - $231,630.** FY14 – $106,213, FY 15 - $125,417.

04/16 – 04/18 Principal Investigator "The Hawaii Space Grant Consortium Augmentation 2016-2018", NASA Office of Education, **2-year total - $760,000.** FY16 – $360,000, FY 17 - $360,000.

10/16 – 06/17 Principal Investigator "Nanosatellite Attitude Determination and Control Procurement and Testing", DoD/SSC Pacific, **FY 16-17 - $125,510.**

05/17 – 04/18 Principal Investigator "STEM Workforce Project - Robotics", Department of Labor and Industrial Relations, State of Hawaii, **FY 17 - $50,000.** (Supports Art Kimura's VEX-IQ teams.)

12/17 – 04/18 Principal Investigator "Space-based Calibration Platform System Requirements Review Study", DoD/SSC Pacific, **4-month total - $150,000.**

04/18 – 04/19 Principal Investigator "The Hawaii Space Grant Consortium Extension", NASA Office of Education, **FY 18 total - $760,000.**

f. Grants and Contracts Submitted but Rejected:

1. NASA Space Technology Mission Directorate, Relative Attitude Navigation Using Distributed Testbeds, 10/16 – 9/18, $200,000. Flynn – PI, Nunes – Co-I.
2. DoD/USSOCOM, Cryocooled IR Hyperspectral CubeSat, 07/16 – 06/18, $2,249,000. Flynn – PI, Nunes – Co-I.
3. NASA Office of Education, Neutron-1: Detecting neutrons from low earth orbit, 03/01/16 – 02/28/18, $200,000, Flynn – PI.
4. NASA Office of Education, Space radiation detectors for nano- and picosatellites Hawaii Research Instrument Satellite One – HIRIS -1, 01/13 – 12/15, $749,805, Flynn – PI.

g. Awards:

1. 2016: University of Hawaii at Manoa Chancellor's Award for Outstanding Service by Specialist Faculty
2. 2017: University of Hawaii system nominee for State Employee of the Year

h. I supervise the Hawaii Space Grant Program and the Hawaii Space Flight Laboratory. The Hawaii Space Flight Lab has facilities at UH-Manoa (HSFL I&T Facility), Kauai CC (S-band and VHF/UHF-band antennas), and PMRF (World's biggest rail launcher system). I am also working with State (DBEDT) and commercial (Alaska Aerospace Corporation, and W M Shipman, Ltd) on a commercial small launch site in East Hawaii that has received $250,000 in State of Hawaii support for an Environmental Analysis. Six US small launch companies have expressed interest in the site that would be operational in 2019.

i. Major laboratory activities: September 2014: Built, installed and tested the world's largest rail launcher system for rockets at Pacific Missile Range Facility (PMRF) Kauai. Navy accepted the launcher which was built using NAVFAC safety standards. November 2014: Successfully delivered the HiakaSat 55-kg small satellite according to Air Force and NASA standards. Air Force formally accepted HiakaSat for launch. November 2015: Operationally Responsive Space-4 Mission involving 13 satellites launched on a Sandia National Laboratory Super-Strypi rocket from Kauai. The HSFL launcher was very successful, but the rocket was not successful.

3. SERVICE:

a. Service on departmental, SOEST, university, and community communities:

HIGP Acting Interim Director: March 18-24, 2018

Chair, HIGP tenure track search for two small satellite positions: July 1, 2018.

Chair, HIGP non-tenure track search for remote RAMAN position (008714T).

HIGP Acting Interim Director: June 2-6, 2018

HIGP Acting Interim Director: March 20-31, 2019

University of Hawaii at Manoa Tenure and Promotion Review Committee - 2012-2013

University of Hawaii at Manoa Tenure and Promotion Review Committee – 2016-2017

Chair, HIGP Personnel Committee – 2014-2015

Chair, HIGP Personnel Committee – 2015-2016

HIGP Personnel Committee – 2016 – 2017

HIGP Personnel Committee – 2017 - 2018

UH – USPACOM Strategic Partnership – UH Liaison for Space – 2015 - present

Acting Director, Hawaii Institute of Geophysics and Planetology – numerous times 2013-2015

b. Service on professional agency committees:

NASA Office of Small Business Technology Infusion Road Tour – Host August 14-16, 2018

Alaska-Hawaii Aerospace Development Board – co-Director for Hawaii, 2013-present.

National Space Grant Student Satellite Program – Board of Directors, 2007 – present.

National Space Grant CMIS Working Group – 2009 – 2015.

National Space Grant Student Satellite Program – National Chair, 2015 – present.

National Space Grant Executive Council – 2012 – present (Re-elected until 2018)

National Space Grant Fall 2017 National Meeting co-chair – 2017.

National Space Grant 10-Year Strategic Planning Group – National Chair, 2017-2018.
Oregon Space Grant External Review and Advisory Committee – 2008 - present
Operationally Responsive Space – 4 Mission Project Manager – 2009 – 2016
Operationally Responsive Space – 4 Mission Accident Investigation Team – 2015 -2016
PISCES Board of Directors – State of Hawaii Governor Appointee – 2016 – present
Hawaii Technology Development Corporation – Multi-Purpose Processing Facility for East Hawaii – 2017 – present: Planning $8.5M manufacturing and innovation facility on Big Island
NASA Office of Small Business Technology Infusion Road Tour Chair – 2017-2018

c. Service on professional organization committees: None

d. Public education and outreach efforts: See Specialist statement below

e. Evidence of other professional service: See Specialist statement below

f. Supervision of technical or engineering staff: Hawaii Space Grant Consortium – Supervised 11 faculty members in UH system and University of Guam and 5 other staff members. Hawaii Space Flight Laboratory – Supervised 4 faculty members, 8 RCUH staff, 3 post-graduate engineering fellows, and 4 graduate students.

g. Service as administrator:
Director, Hawaii Space Grant Consortium – 2002 – present
Director, Hawaii NASA EPSCoR Program – 2005 – present
Director, Hawaii Space Flight Laboratory – 2007 – present

h. Entrepreneurial activities: I am working with State (DBEDT, PISCES) and industry (Alaska Aerospace Corporation, W M Shipman, Ltd) to set up a commercial equatorial small launch site on the Big Island of Hawaii. Six US aerospace companies (RocketLab, X-Bow Launch Services, Virgin Galactic, Astra, Vector Space, and Interorbital Systems) have expressed interest to use the site. I am also helping X-Bow Launch Systems and Spaceflight Industries to get a second rail launch test from PMRF in early 2019.

4. SERVICE IN SPECIALTY AREA and STATEMENT OF FUTURE GOALS:

Overall: As part of my Specialist duties, I am Director of the Hawaii Space Grant Consortium, the Hawaii NASA EPSCoR Program, and the Hawaii Space Flight Laboratory. In the last five years, I have managed $14,010,458.25 in research grants and contracts. I summarize these activities below as well as provide a summary of future activities. I provide supporting statistics in the previous sections of this review.

Summary of Hawaii Space Grant Consortium (HSGC) Activities: In terms of satisfying requirements of my Specialist position, I am the Director of the Hawaii Space Grant Consortium. UHCC science faculty have become much more NASA-oriented since I have been Director and in the past 3 years have won their own $500,000 in NASA funding for the Project IMUA program to build suborbital payloads. Project IMUA has had 3 successful suborbital launches from NASA Wallops. In Spring and Summer 2017, UHCC's received ~$125K from HSGC to attend NASA-related competitive events like CanSat, Rock-On, and ARLISS. I am especially happy to see this huge upswing in interest in NASA Space Grant activities. HSGC is supporting

Kauai CC interns that are operating HSFL ground and weather stations on Kauai, and with the support of Kauai Associate Director Stewart Burley, HSGC has funded numerous industry interns with various high-tech businesses on Kauai. Many of these students have gone on after graduation to get jobs at these businesses. In a five year period, HSGC/HSFL supported 693 undergraduate students in various experiential projects. I am especially proud to note that our underrepresented participation (55%) is over double of our requirement (23.2%), HSGC K-12 programs are very effectively led by Art and Rene Kimura. The number of parent/student participants in workshops (~5000 per year in Family Science Nights and ~500-600 during Astronaut Appreciation Days in Hilo and Honolulu) shows remarkable sustainability and interest given the level of funding that Space Grant receives for K-12 programs. I am especially enthusiastic to have HIGP faculty take a more active role in the Lacy Veach Astronaut Appreciation Day at Punahou School as it will showcase what HIGP does. I have taken a very active role in the management of Space Grant. I have been elected by my peers to the 8-member Space Grant Executive Council for numerous years. I have been a co-chair of the National Space Grant Student Satellite Program for the last 3 years, but have recently become the sole chairperson of this organization. I have also co-chaired the Fall 2017 National Space Grant Meeting, and have been selected to chair a panel of Space Grant Directors to draft the next Space Grant 10-year Strategic Plan. Finally, I am working with NASA Office of Small Business to bring the NASA OSB Technology Infusion Road Tour to UH-Manoa on August 14-15, 2018. I have started working with the UH System to prepare Statements of Capability that can be used to attract Minority Institution funding from NASA, NASA's prime aerospace contractors, and other Government agencies.

Summary Facts for Hawaii NASA EPSCoR: The NASA EPSCoR Program represents yet another way that I am building the research and workforce infrastructure within the University of Hawaii System. NASA EPSCoR funds have been used to build the Kauai CC UHF/VHF ground station and a co-located weather station. Kauai CC students have successfully tracked and down-loaded communications from 9 small satellites belonging to the US and other countries. They have also successfully uplinked a message to a small sat and received confirmation through a subsequent downlink at another station. The Kauai CC station will be an important part of the HSFL Mission Operations System. As part of the NASA EPSCoR effort, I am part of the EPSCoR Statewide committee and take part in biyearly discussions of the State EPSCoR Program. NASA also provides a yearly Cooperative Agreement Notice for two proposals per jurisdiction at $750K of support over a three year period. I manage the announcements for these opportunities and numerous SOEST and UH-System faculty have taken advantage of writing proposals. In the past 5 years, Drs. Misra, Hermalyn, Mouginis-Mark, and Azimov (CoE) have won CAN awards. EPSCoR funding is also being used to facilitate development of a new small launch vehicle site on East Hawaii. In the past 5 years, I was tasked by the NASA EPSCoR Program Manager to mentor Guam, and Guam is now its own EPSCoR jurisdiction with close ties to Hawaii.

Summary Facts for HSFL: The Hawaii Space Flight Laboratory (HSFL) is a multidisciplinary research and education venture bringing together researchers from diverse areas to work on the exploration and understanding of the space environment. The HSFL was created on May 7, 2007 as a joint activity between the College of Engineering (CoE) and the School of Ocean and Earth Science and Technology (SOEST). The HSFL is also a Hawaii Space Grant Consortium

(HSGC) research infrastructure development project that caps all three of the HiSTEM educational pipelines in engineering, terrestrial remote sensing, and planetary science. Through HSFL, the University of Hawaii will be able to design, build, test, launch, and operate its own satellites in low-Earth orbit. HSFL has four objectives: (1) promote innovative engineering and science research for terrestrial and planetary space missions; (2) develop, launch, and operate small spacecraft from the Hawaiian Islands to accelerate the validation of new space technologies; (3) provide workforce training in all aspects of unmanned space missions, and (4) promote synergistic collaborations between educational, governmental, and corporate institutions interested in space exploration.

The Operationally Responsive Space-4 Mission launched on November 3, 2015. HSFL successfully demonstrated the largest sounding rocket launch (63,000 pounds) ever attempted; however, the rocket had problems during the first stage burn, and it broke up less than a minute after launch. Over 130 University of Hawai'i students, staff, and faculty designed, built, and tested HiakaSat, and got hands-on experience delivering a satellite according to Air Force and NASA standards. HSFL is the only organization that has an operations and maintenance agreement with PMRF/US Navy to operate the rail launcher system; however, we are planning to either turn over the launcher operation to PMRF or move the launcher to a new launch site after 2019. X-Bow Launch Services and Spaceflight Industries are working on a second launch attempt from PMRF in early 2019. Nevertheless, Hawai'i is not yet a spacefaring State. HSFL is building the Neutron-1 3-U CubeSat for a NASA ELaNa launch in late 2018 – We experienced a delay because we lost our science payload during a Project IMUA RockSat-X suborbital flight in 2016 (Payloads were not recovered).

HSFL is also working with Alaska Aerospace Corporation to develop an easterly small launch site from the Big Island of Hawaii called Pacific Spaceport Complex – Hawaii (PSCH). The site will allow equatorial launches from the southern-most launch site in the US. The State of Hawaii has allocated $225K in FY 2018 for an environmental study as well as $8.5M in FY 2017-2019 for a Multi-Purpose Processing Facility that can be used to support any of the 6 US small launch companies that have expressed interest in using the site (X-Bow Launch Services, Astra, Vector Space, RocketLab, Virgin Galactic, and Interorbital Systems). PSCH will be a commercial small launch site with first launch in mid-2019 and will have a maximum launch capacity of 24 launches/year.

Finally, HSFL has had significant interaction with the DoD that will continue to grow in the near future. HSFL has one of only 3 Attitude Determination and Control units in the world that has a level of accuracy necessary to test high-precision satellite parts. HSFL has now received 3 contracts from SSC Pacific (NAVY) to work on a satellite ADCS system test, software defined radios, and the system requirements review for the Space-based Calibration Platform. The latter project is a $315K 9-month effort that could lead to a $12M HSFL satellite project. HSFL has already submitted a full satellite white paper for SBCP that has been very favorably reviewed by the Air Force Research Lab.

Future Prospects: The near future is bright for HSFL as we continue to push towards launches from both PMRF and East Hawaii. In the next 18-24 months, the East Hawaii launch site will be established. This will not only attract the 6 small launch vehicle companies but also DoD and commercial projects. Our goal is to build an aerospace economy in Hawaii around small satellites and small launch. The NASA Office of Small Business Technology Infusion Road Tour in August 2018 is the equivalent of the State's and University's aerospace coming out party. By

that time, we should have a very good idea to the progress of the Environmental Analysis for the launch site. That is the time when HSFL will be looking for commitments from aerospace companies to invest in projects and infrastructure (branch offices) in Hawaii. Already, we have a tentative commitment with Lockheed-Martin to be one of the participating Minority Serving Institutions in their Orion Program – this would bring $5M over 5 years to HSFL. NASA Science Mission Directorate is also coming to the NASA OSB event in August because they claim that MSI's are underrepresented in NASA missions. With NASA Ames support, HSFL is working on 4-5 full mission concepts ($5-15M) to pitch to NASA SMD with the goal of having a UH PI on a NASA mission that will be built at the University of Hawaii. We are also looking to increase our project work with NASA Ames through our new Space Act Agreement and SSC Pacific.

My goals for the next 10 years are three-fold: (1) Increase total grants and contracts funding to $100M by attracting small sat missions in conjunction with UH faculty. (2) Build a commercial launch small launch site on the Big Island of Hawaii that will allow for the most payload mass to orbit of any US site. (3) Work with commercial and government partners to fly a small sat/rover mission to the Moon. With the East Hawaii site functioning, Hawaii would be the natural gateway for these missions.

At present, I would like to remain at the University for another 12 years and retire at 65 years old. This will have brought my University commitment to 43 years as a graduate student and UH employee. Although it sounds premature, in order for HSFL and associated programs to continue growing, I am already thinking about an orderly transition to new management. My tentative plan for HSFL would be to remain as Director for another 7 years and transition HSFL leadership to another person in 7-10 years from now. I would like to remain as the Space Grant/EPSCoR Director for another 10-12 years, and then transfer Space Grant to another faculty member in years 11 and 12. I always found that the most effective transitions for Space Grant were those jurisdictions that had both the experienced Director and new Director attending a few National meetings together so the new Director could make alliances more effectively and learn the ropes of the job. I feel very fortunate to have worked within HIGP and SOEST for so long. I have benefited from a lot of support from the University – in terms of the leadership who believed in the crazy vision; the colleagues who offered ideas, mentoring support, and research talent; and especially the creativity and enthusiasm of the students and HSFL staff who can always make the impossible happen.

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GRANTS RECEIVED

9/94 – 2/95 Principal Investigator "MODIS Fire Test Maps from Remotely Sensed Data", NASA/University of Maryland, Dr. Chris Justice, Amount - $24,105.

5/95 – 5/96 Principal Investigator "MODIS Fire Algorithm Development and Testing", NASA/University of Maryland, Dr. Chris Justice, Amount - $40,000.

8/95 – 6/98 Principal Investigator "Hot Spot Detection Using the Hyperspectral Imager", NASA's Office of Mission to Planet Earth, Code Y, Dr. Diane Wickland, Amount – Data only and Team membership.

6/96 – 11/97 Principal Investigator "MODIS Fire Algorithm Development and Testing", NASA/University of Maryland, Dr. Chris Justice, Amount - $40,000.

8/96 – 6/01 Principal Investigator "Analysis of Volcanic Eruptions and Fires Using Landsat 7 Data", NASA's Office of Mission to Planet Earth, Code YS, Dr. Anthony Janetos, Landsat Program Scientist, Amount - $294,131.

9/98 – 8/01 Principal Investigator "Interactive Teaching Using Landsat 5 and 7 Data", NASA's Office of Mission to Planet Earth, Code YM, Ms. Nora Normandy, Amount - $90,600.

11/99 – 10/01 Principal Investigator "Quantitative Analysis of Hot Spots Using EO-1 and Landsat 7", NASA's Office of Earth Science, Code Y, Dr. Diane Wickland, EO-1 Program Scientist, Amount - $59,238.

03/00 – 02/01 Principal Investigator "LUAU Learners Using ERAST Aircraft Missions for Understanding Remote Sensing, Atmospheric Sampling, and Aircraft Technologies", NASA Dryden, Amount - $80,000.

03/00 – 01/03 Principal Investigator "LUAU II Learners Using ERAST Aircraft Missions for Understanding Remote Sensing, Atmospheric Sampling, and Aircraft Technologies", NASA/ Penn State, Amount - $241,709.

05/00 – 04/03 Principal Investigator "Tracking Eruptions and Fires Within the Ring of Fire", NASA's Earth Science Enterprise, Code YS, Amount - $521,500.

07/02 – 01/05 Principal Investigator "The Hawaii Space Grant Consortium", NASA's Office of Human Resources and Education, Code FE, Amount - $412,000/year

09/02 – 08/03 Principal Investigator "Implementing the HSGC Remote Sensing Master Plan for Workforce Development in Hawaii", NASA's Office of Human Resources and Education, Code FE, Amount - $100,000.

01/04 – 02/05	Principal Investigator "Augmenting Technical and Engineering Work Force Development in Hawaii", NASA's Office of Human Resources and Education, Code FE, Amount - $30,000.
01/04 – 02/05	Principal Investigator "Sponsoring Research Opportunities for Workforce Development using Uninhabited Aerial Vehicles", NASA's Office of Human Resources and Education, Code FE, Amount - $20,000.
09/04 – 01/05	Principal Investigator "Increasing Community College Opportunities Through the HISTEM Pipeline", NASA's Office of Human Resources and Education, Code FE, Amount - $62,500.
04/05 – 03/09	Principal Investigator "The Hawaii Space Grant Consortium", NASA's Office of Education, Office of Strategic Communications, Amount - $580,000/year.
04/05 – 03/06	Principal Investigator "Undergraduate Research Opportunities for Technical Workforce Development", NASA's Office of Education, Office of Strategic Communications, Amount - $82,352.
04/05 – 03/06	Principal Investigator "National Space Grant Student Mission to Mars", NASA's Office of Education, Office of Strategic Communications, Amount - $20,000.
08/06 – 07/07	Principal Investigator "The Hawaii Space Grant Consortium: Student Opportunities to Support NASA Exploration" NASA's Office of Education, Office of Strategic Communications, Amount - $34,000.
08/06 – 07/11	Principal Investigator "The Hawaii NASA EPSCoR Project", NASA's Office of Education, Office of Strategic Communications, Amount - $150,000 in Year 1, $125,000 each subsequent year.
02/07 – 10/13	Principal Investigator "LEONIDAS: Low-Earth Orbit, Nanosat-Integrated Defense Autonomous System", Total FY07- 12: $31,435,000 FY07 - Space Missile Defense Command, Amount - $3,277,000 FY08 – Operationally Responsive Space - $3,884,000 FY 09 – Operationally Responsive Space - $5,024,000 FY 10 – Operationally Responsive Space - $4,500,000 FY 11 – Operationally Responsive Space – $5,000,000 FY12 – Operationally Responsive Space - $9,750,000 thus far.
04/10 – 03/15	Principal Investigator "The Hawaii Space Grant Consortium", NASA's Office of Education, Office of Strategic Communications, Amount - $575,000/year. Actual amounts – 2010 - $845,000, 2011 - $790,000, 2012 - $1,150,000 (year 4 funds allocated).

10/10 – 10/13 Principal Investigator "The Hawaii NASA EPSCoR Project", NASA's Office of Education, Office of Strategic Communications, Amount - $125,000/year for three years.

ADDITIONAL GRANT DATA FOR 2013-2015 provided in 5-year summary.

PROPOSALS NOT FUNDED

1. NASA, Volcano Hazard Management Support Tool, 04/01/05 – 03/31/08, $1,218,457 (3 years), Flynn-PI.

2. State of Hawaii Department of Health, Empowering Student Resiliency to Drug and Alcohol Use Through Robotics Education, 05/15/05 – 05/14/06, $83,534 (1 year), Flynn-PI.

3. NSF, Alaska Science Technology Center, 06/15/05 – 06/14/10, $2,140,731 (5 years), Flynn – PI of Hawaii portion, J. Eichelberger – overall PI Alaska – Faribanks.

4. NSF, Conduit Dynamics during Persistent, Silicic Volcanic Activity, 01/01/05 – 12/31/06, $272,986 (2 years), Flynn – PI.

5. NASA, Detecting Eruption Precursors Using GOES, Landsat 7, Terra, and EO-1 Data, 07/01/99 – 06/30/02, $302,000 (3 years), Flynn – PI.

6. NASA, Effects of Volcanoes on the Global Environment, 01/01/04 – 12/31/06, $1,974,219 (3 years), Flynn – PI.

7. DoD IED Proposal, SparkleNet: Distributed Phase-Conjugated Atmosphere for IED Detection, 01/01/05 – 12/31/07, $750,000 (3 years), Flynn –PI.

8. DoD IED Proposal, Pattern Recognition and Change Detection Algorithms for IED Detection, 01/01/05 – 12/31/07, $750,000 (3 years), Flynn –PI.

9. MASINT, A Fully Automated Subsurface Anomaly Detection System Using Gravity Gradiometry, 06/01/04 – 05/31/05, $298,444 (1 year), Flynn – co-PI.

10. NSF, Automated Deployable Environmental Surveillance System, 01/01/04 – 12/31/08, $2,234,901 (5 years), Flynn- co-PI.

11. NURI/NIMA, Fully Automated Gravity Gradient Anomaly Detection System, 07/01/04 – 06/30/07, $444,000 (3 years), Flynn – co-PI.

12. NASA, Volcano Hazard Monitoring Support Tool, 04/01/05 – 03/31/08, $1,248,851 (3 years), Flynn – PI.

13. NASA, Global Patterns of Eruptions and Fires, 11/01/02 – 10/31/05, $252,500 (3 years), Flynn – PI.

14. NIMA, An Intelligent Automated Detection System, 01/01/00 – 12/31/04, $655,500 (5 years), Flynn – PI.

15. NASA, REASON CAN: Effects of Volcanoes on the Global Environment, 05/01/03 – 04/30/08, $2,146,775 (5 years), Flynn – PI.

16. NURI/NIMA, Automated Detection, Mapping, and Change Analysis of Global Hot Spots in Near Real-time, 06/21/04 – 06/20/07, $385,928 (3 years), Flynn – co-PI.

17. NSF, Temporal and Spatial Trends in Lava Storage, 01/01/04 – 12/31/06, $205,350 (3 years), Flynn – co-PI.

18. NASA, Disaster Assessment Using High Temporal Resolution UAV Measurements, 08/01/00 – 07/31/03, $6,345,024 (3 years), Flynn – PI.