



**DEPARTMENT OF BUSINESS,  
ECONOMIC DEVELOPMENT & TOURISM**

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**NEIL ABERCROMBIE**  
GOVERNOR

**RICHARD C. LIM**  
DIRECTOR

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Statement of

**RICHARD C. LIM**  
**Director**

Department of Business, Economic Development & Tourism  
before the

**SENATE COMMITTEE ON WAYS AND MEANS**

Wednesday, February 26, 2014

10:35 a.m.

State Capitol, Conference Room 211

in consideration of

**SB 2585, SD1**

**RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR  
EXPLORATION SYSTEMS (PISCES).**

Chair Ige, Vice Chair Kidani, and members of the Committee. The Department of Business, Economic Development and Tourism supports the intent of this bill to provide supplemental state funding to support administrative tasks, the purchase equipment, strategic program initiatives, and preliminary development of the PISCES research and development park.

This legislation builds upon and supplements funding from Act 169 from the 2012 Session and Act 273 from the 2013 Session, which established PISCES as a program administratively attached to our department through the Office of Aerospace Development. The supplemental funding requested will be critical to sustaining PISCES operations and buildout through the upcoming fiscal year.

We support this measure provided that its passage does not replace or adversely impact priorities indicated in the Executive Budget.

Thank you for the opportunity to testify on this bill.

DENNIS "FRESH" ONISHI  
Council Member  
District 3



PHONE: (808) 961-8396  
FAX: (808) 961-8912  
EMAIL: [donishi@co.hawaii.hi.us](mailto:donishi@co.hawaii.hi.us)

**HAWAI'I COUNTY COUNCIL**  
25 Aupuni Street, Hilo, Hawai'i 96720

February 25, 2014

The Honorable David Y. Ige, Chair  
and Members of the Committee on Ways and Means

Dear Senator Ige and Committee Members,

Thank you for the opportunity to provide comments in support of Senate Bill 2585.

Side benefits of this bill will help the entire State by supporting the local economy and by developing technologies and strategies that will lead to sustainable living and the reduction of carbon dioxide emissions in construction. It will also support STEM education.

This bill will allow PISCES to move forward with five key initiatives with applications on Earth and elsewhere. Working with NASA and international partners, PISCES will conquer the new challenges that will face astronauts living beyond low Earth orbit. They are:

- Fabrication of basaltic-based construction materials via 3-D printing.
- Living off the land and extracting water and fuel from the lunar and Martian soil.
- Additional development of an existing planetary analog test site.
- Working with NASA and local high school students to design an experiment that will be sent to the Moon in 2015 as part of a Google Lunar X-Prize mission.
- An international college robotics mining competition.

Each of these initiatives is an investment in the future that is worthy of your support. I respectfully ask that you recommend approval of this bill.

Sincerely,

Dennis "Fresh" Onishi  
Hawai'i County Council Member



**UNIVERSITY OF HAWAII SYSTEM**  
Legislative Testimony

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Testimony Presented Before the  
Senate Committee on Ways and Means  
February 26, 2014 at 10:35 a.m.  
by  
Donald O. Straney  
Chancellor, University of Hawai'i at Hilo

**SB 2585 SD1 – RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER  
FOR EXPLORATION SYSTEMS**

Chair Ige, Vice Chair Kidani and Members of the Committee:

My name is Donald Straney, Chancellor of the University of Hawai'i at Hilo (UH Hilo). We support the intent of SB 2585 SD1 to fund the Pacific International Space Center for Exploration Systems (PISCES) to support administrative and general tasks, strategic program initiatives, and the preliminary development of the PISCES research and development park.

This proposal will help to expand and diversify economic and workforce development opportunities throughout the State by promoting the establishment and growth of new sustainable and green industries, internships, and science, technology, engineering, and mathematics education programs. UH Hilo views the proposal as an opportunity to collaborate with PISCES to provide higher education and career options to the people of our Hawai'i Island.

We support SB 2585 SD1 provided its passage does not replace or adversely impact priorities in our BOR approved budget.

Thank you for the opportunity to testify on SB 2585 SD1. Aloha.

**George R. Ariyoshi**  
**999 Bishop Street, 23<sup>rd</sup> Floor**  
**Honolulu, HI 96813**

**January 28, 2014**

TESTIMONY IN SUPPORT OF SB2585 - RELATING TO THE PACIFIC  
INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS (PISCES)

Dear Members of the 27<sup>th</sup> State Legislature,

I strongly support the intent of this bill to provide state funding to employ staff, purchase equipment, and advance pioneering programs at the Pacific International Space Center for Exploration Systems (PISCES) during FY15.

Hawaii's strategic mid-Pacific/near-equatorial location, Moon/Mars-like terrain, resident expertise in multiple aerospace-related technologies, and long-standing ties with space-faring nations throughout Asia and the Pacific, clearly afford strategic assets and capabilities that can be leveraged to realize humankind's full potential in space, and in so doing enable our State to engage as both a major contributor to and beneficiary of the global space enterprise.

In addition, there are emerging trends in the aerospace industry – both national and global – that will afford additional opportunities for the Aloha State. Consider, for example, the recent emergence of commercial space enterprise and a resurgence of international space programs that will involve significant private sector investment in the development, testing, validation, and verification of robotics systems, broadband telecommunications, energy production, energy storage, and waste recycling – all of which could be supported through and led by innovative initiatives in Hawaii.

The Pacific International Space Center for Exploration Systems (PISCES), for which I formerly served as Board Chairman, is designed to leverage Hawaii's intrinsic assets and capabilities, as well as the emerging global trends in the aerospace industry, toward developing a world-class center of excellence in Hawaii that can facilitate the design, testing and validation of new technologies to support both robotic and human

missions to space. In so doing, PISCES will serve as an economic driver for the island of Hawaii that will promote the establishment and growth of new sustainable “green” industries, along with associated high-paying jobs, professional internships, and new science, engineering and math education programs statewide.

Recognizing this significant opportunity, the State Legislature established PISCES as an attached agency to the Department of Business, Economic Development and Tourism (DBEDT), appropriating general funds to support PISCES operations (through Act 169 in the 2012 Session and Act 273 in the 2013 Session). Although this funding has enabled the department to hire professional staff to manage PISCES operations and begin development of the proposed PISCES aerospace R&D park on the Big Island, additional general and CIP funding will be critically needed to maintain PISCES operations in FY15 and advance its efforts to establish a world-class center of excellence for space research and development.

As such, I would urge you pass SB2585 with the requested funding allocation, and would be happy to address any questions you may have concerning this recommendation. I can be reached by e-mail at [kyahiku@wik.com](mailto:kyahiku@wik.com) , by phone at (808) 544-6765 or by fax at (808) 544-8398.

Thank you for the opportunity to testify on this bill.

Aloha,

  
George R. Ariyoshi

GRA:khy



**BUZZ ALDRIN**  
*Astronaut*

01/28/2014

Testimony in strong support of Hawaii State SB2583, SB2584, and SB2585

Statement of Buzz Aldrin, Apollo XI

To the Members of the 27th Hawaii State Legislature:

I am pleased to offer my strongest endorsement of Hawaii State Bills SB2583, SB2584, and SB2585, which will provide continued support for the Pacific International Space Center for Exploration Systems (PISCES).

I commend the Great State of Hawaii for the outstanding leadership you are demonstrating in developing and maintaining this unique and vitally important capability that will serve Hawaii, the United States, and the international space community as a premier planetary analog test bed to help prepare for humanity's next bold frontier - the scientific investigation, sustainable exploration, commercial development, and settlement of space.

One of the most important lessons learned from our remarkably successful Apollo experience was the need to conduct high-fidelity simulation and training sessions in a highly relevant analog research environment, and Hawaii provides perhaps the best site on Earth to develop, test and validate the technologies, capabilities and systems that will be required to realize the vision I have articulated above.

The investment that you are making today in supporting this urgently needed capability will undoubtedly assure Hawaii a unique leadership role in this challenging new frontier – an investment that will also contribute substantially to the economic prosperity and well being of the State, while also inspiring Hawaii's future aerospace workforce to pursue Science, Technology, Engineering and Math (STEM) related academic training in your schools and universities.

I have had the pleasure of personally attending and participating in several PISCES conferences and workshops over the past several years, and have seen, first hand, how well this new capability is coming together. As such, I urge you to continue to support its development and operations so it can achieve its full potential to meet this critical need for our space program – an investment that I am confident will be returned many fold to the great State of Hawaii.

As you may be aware, I recently published my latest book – *Mission to Mars, My Vision for Space Exploration* – in which I lay out my long term strategy for the exploration and settlement of space, as well as the steps I feel are required to implement this strategy. As I emphasize in my book, it is my view that future journeys into space can and will begin here in Hawaii - with innovators, scientists, technologists, and explorers from across the world conducting vital research at PISCES on the Big Island. These Hawaii-based experiments will subsequently be operated tele-robotically from other sites around our planet to simulate the control of lunar robots on the surface of the Moon from stable orbits near our natural satellite - thus reducing the time delays associated with attempting to conduct these operations from Earth.

Ultimately, I expect this approach will enable space commerce on the surface of the Moon on a scale that we have yet to anticipate, and that PISCES will continue to serve as the premier Earth-based proving ground for these systems for the foreseeable future.

In the longer term, having demonstrated the value of conducting these planetary research investigations with PISCES, I anticipate we will use these same capabilities and procedures to prepare for a permanent international settlement of Mars by exploiting the moons of Mars to conduct similar, nearly real-time tele-robotic operations on the Martian surface.

This approach would afford PISCES several decades of sustained pioneering research on the Big Island, bringing long-term development and prosperity to this region, and indeed to all islands of Hawaii.

In support of the vision I have articulated in my new book, I have spent the past six-months meeting with senior leadership in the U.S. Administration and on the Hill, and have hosted book signings and forums all over the world. At each venue I have also made it clear that this bold journey into space can begin with PISCES and the Great State of Hawaii.

By supporting PISCES through the legislation before you today, you will affirm that Hawaii will expand its role as a leader in the international exploration and development of space, which in turn will afford exceptional economic and societal returns to humanity on Earth, as well as to the Aloha State – enhancing economic prosperity and wellbeing for generations to come.

I again, strongly encourage your continued leadership in supporting PISCES – a timely and vitally important asset not only for Hawaii, but also for our Nation and the broader international space community.

Thank you for the opportunity to testify on this important initiative.

Buzz Aldrin  
Apollo XI

A handwritten signature in black ink that reads "Buzz Aldrin". The signature is written in a cursive, flowing style and is underlined with a single horizontal line.

BUZZ ALDRIN





January 29, 2014

Mr. Jim Crisafulli, Director  
Office of Aerospace Development  
Strategic Industries Division  
DBEDT/State of Hawai'i  
P.O. Box 2359  
Honolulu, HI 96804

Dear Mr. Crisafulli and Members of the 27<sup>th</sup> Hawaii State Legislature:

I am very pleased to provide testimony in strong support of the State of Hawaii's efforts through Senate bills SB2383, SB 2384 and SB 2385 to continue development and promote the evolution in capabilities of the Pacific International Space Center for Exploration Systems (PISCES) into a world-class space center in Hawaii that can facilitate the design, testing, and validation of new technologies that support both robotic and human missions to space. Due in large measure to the State of Hawaii's steadfast support for PISCES during the past five years - as well as that of the PISCES team, led by former NASA Flight Director Mr. Robert Kelso - PISCES continues to make notable progress in laying the strategic foundation for such an ambitious endeavor, including endorsements by NASA, Google, Planetary Power, and other private sector and academic organizations involved in development of technologies that will be enabling to lunar and planetary exploration as well as to the future environmental and economic well being of the State of Hawaii. However, their efforts must continue to receive your unwavering support.

I continue to informally serve as a senior industry advisor and staunch advocate for the PISCES team; I am a seventeen-year participant in Hawaii's JUSTSAP forum (recently renamed PISA); I am currently the Chief Executive Officer of JAMSS America, Inc. (a U.S. registered aerospace company with U.S. and international contracts); I formerly served as Senior Vice President of SPACEHAB, Inc.; and, served as a former project manager within the NASA Mission Operations Directorate at the Johnson Space Center. My continuous 47 years in the U.S. aerospace business have made me acutely aware of the unique challenges that space exploration places on human innovation as well as on the resource limitations of sponsoring federal, state and local government, private sector and university organizations. However, it is my experience that the best way to mitigate project and program costs during space exploration hardware and software product development cycles is through rigorous planning on the front end and through use of those research and testing facilities that can best represent the in-space environments within which robots and human space explorers will conduct their actual operations using these products. Hawaii and PISCES provides such a research environment! As those whom I support within PISCES know, as a young NASA engineer during the Apollo Program, I was indeed fortunate to accompany several of the Apollo crews to the Big Island where they experienced a simulated lunar surface training environment unlike any other on Planet Earth. To a crewmember, each Apollo astronaut returning from the moon said that Hawaii was the most useful training environment that they experienced during their extensive geologic and surface operations training program.

With the establishment of the highly successful International Space Station Program, space utilization and exploration programs have become increasingly multinational in nature. Many nations have now executed robotic Earth orbit, lunar and planetary missions; Japan has returned surface debris samples from a far-away asteroid; ESA is within months of landing a robotic spacecraft on a comet; China has landed a robotic spacecraft on the lunar surface; India has a robotic spacecraft en route to Mars; and NASA is currently working with other space agencies and a growing number of commercial entities planning for





the start of expeditions to other worlds using their new Orion Spacecraft and mammoth Space Launch System rocket.

As an avid participant in several of these exploration initiatives, I am proud to have been a part of the evolution of Hawaii's PISCES organization and its capabilities and I have been encouraged by the continuing and enthusiastic bipartisan support received for PISCES from your office and from the State of Hawaii's Legislature. NASA also has taken note in your collective support - as have international space agencies, private sector companies and universities - and PISCES has received contract funding over the past five years from multiple sources to support technology development projects within NASA, CSA, DLR and private sector organizations. Within my familiar territory of Japanese industry, academia and the Japan Aerospace Exploration Agency (JAXA), I continue to speak to top management in each sector about the many opportunities for exploration technologies development, test and checkout that PISCES offers. I anticipate an ever-growing interest within Japan for collaboration with other international organizations in the utilization of Hawaii's PISCES assets going forward.

In particular, I strongly endorse the current PISCES plans to promote the use of PISCES assets in support of basaltic-based construction materials, in-situ resources utilization and integrated resources extraction technologies, a planetary analog test site, a secondary school's lunar surface flight experiment, and an international robotics mining competition. Additionally, PISCES plans to develop and beneficially exploit the applications of self-sufficient technologies in renewable energy, water reclamation and basaltic construction will inevitably result in benefits to local, State and National ground and space-based scientific, technological, educational and economic interests. Lastly, the development of a laser communications technology research center in Hawaii will further solidify Hawaii's and PISCES's reputation as forward thinking entities who intend to position themselves at the forefront of our nations efforts to directly improve life on Earth while developing technologies essential to robotic and human exploration of the cosmos. The increasing number of cash and in-kind and "investors" in PISCES programs including NASA, the State of California and Google among others is further evidence of the return-on-investment the State of Hawaii is receiving for its funding support to PISCES through the passage of bills such as those currently being considered.

Jim, and Rob Kelso, I applaud and encourage the continuation of your Hawaii aerospace and PISCES leadership. I also encourage the Hawaii State Government to continue its support of our nation's space exploration program through continuing funding support of PISCES. With the PISCES team of professionals and its access to the abundant resources of the Hawaiian Islands, along with your continuing support through the passage of these three legislative bills, I am confident that PISCES has a great future ahead!

My very best wishes for your continued success,

Dan A. Bland

Chief Executive Officer  
JAMSS America, Inc.  
16055 Space Center Blvd.  
Houston, Texas 77062



January 29th, 2014

Jim Crisafulli  
Office of Aerospace Development  
Dept. of Business, Economic Development & Tourism  
State of Hawaii  
Honolulu, Hawaii 96813

Dear Jim:

Per our recent discussions concerning aerospace initiatives in Hawaii, I commend your State for its visionary efforts to help grow and diversify both your local aerospace industry and our national space program. Hawaii has many diverse resources, capabilities and advantages that can positively contribute to our national space endeavors.

For example, your strategic mid-Pacific location and long-standing ties with nations across Asia and the Pacific make the islands an ideal site to support collaborative international scientific, educational, and commercial development programs related to space exploration. In particular, the Big Island's diverse volcanic terrain is most suitable for developing an analog lunar base to test and evaluate new technologies to support future robotic/human missions to the moon and Mars.

Hawaii also has resident expertise in space-related fields, with over forty NASA principal investigators at the University of Hawaii performing ongoing research in astronomy, planetary geosciences, robotics, satellite communications, laser-based power systems, and other technologies critical for supporting future space exploration missions around and beyond planet Earth.

The NASA Space Portal fully recognizes these strategic advantages, and looks forward to our continued collaboration with the State of Hawaii in advancing our nation's space exploration efforts. In my role as the NASA ex-officio member of the PISCES board, I would like to endorse the activities proposed by the three following Senate Bills that will help advance our mutual goals: S.B. No. 2585, "A Bill for An Act Relating to the Pacific International Space Center for Exploration Systems (PISCES)", S.B. No. 2584, "A Bill for an Act Relating to the PISCES Planetary Sustainability Technologies Initiative", and S.B. No. 2583, "A Bill for an Act Relating to the PISCES NASA Laser Communications Ground Station Initiative".

Sincerely and with best wishes,

A handwritten signature in blue ink that reads "Daniel J. Rasky".

Dr. Daniel J. Rasky  
Director, Space Portal, NASA Research Park  
Senior Scientist, NASA Ames Research Center  
M/S 555-3, Moffett Field, CA 94035  
Phone/fax: (650) 604-1098/4666



January 28, 2014

Members of the 27<sup>th</sup> Hawaii State Legislature

Re: Support for Senate Bills (SB) 2583, 2584 and 2585

Dear State Senators and State Representatives:

Ferraro Choi is a leader in the design of sustainable educational and research projects throughout the State of Hawaii and the Pacific. On the Island of Hawaii we were the architects for the USDA Institute for Pacific Islands Forestry Laboratory, the NELHA Gateway Energy Center and the West Hawaii Exploration Academy charter school. We have worked with NOAA on the planning and design of research and outreach facilities on Oahu, Maui, Kauai and throughout the Papahānaumokuākea Marine National Monument. In Antarctica we designed the Amundsen Scott South Pole Station and various remote support facilities for the National Science Foundation in conjunction with NASA as an analog for lunar and Mars habitats. Closer to home, we recently completed the design of the Stevenson Middle School's Science Center which will house among other projects, the school's award winning robotics program.

Ferraro Choi is in support of SB2583 to provide matching funds in partnership with NASA to assess the feasibility of a laser communication ground station in Hawaii. If established, the ground station would connect Hawaii to the 21<sup>st</sup> century network of super high speed optical communications to spacecraft and extraterrestrial sites on the moon and asteroids. It can stimulate and enhance STEM programs in elementary and secondary schools and provide opportunities for research at our university. If not enacted, Hawaii may be left behind in the space communications network.

We support SB2584 for applied research in self sufficient and sustainable technologies in partnership with the State of California and NASA. Hawaii's remote geographic location and unique natural resources are an analog for extraterrestrial settlement. They also provide our state an opportunity to move forward in independence from polluting energy sources and reduce importation of building materials. This bill will enable research in alternative basaltic construction modules, three dimensional printing, renewable energy systems, and water reclamation all systems.


We also support SB2585 for the procurement of land for the construction of the PISCES administrative offices and test facility on Hawaii Island. The project is currently in the pre-design and site investigation stage. Its development will initially support the design and construction industry in the state and thereafter attract a multitude of high technology institutions and national space programs to test their equipment *insitu* at this unique facility.

We respectfully ask your support of these bills during your legislative session. Thank you for your consideration.

Sincerely,



Joe Ferraro, FAIA, LEED AP  
Principal



William Brooks, AIA, LEED AP  
Principal



Troy Miyasato, AIA, MBA  
Principal

Hoyt L. Davidson  
Managing Partner  
Near Earth LLC  
243 Tresser Boulevard, 17<sup>th</sup> Floor  
Stamford, CT 06901

January 21, 2014

## TESTIMONY IN SUPPORT OF SB2585 – RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS (PISCES)

Dear Members of the 27<sup>th</sup> Hawaii State Legislature,

I strongly support the intent of this bill to provide Hawaii State funding to PISCES to continue and expand its research and development activities in planetary surface systems technologies and to support the financing and creation of a research and development park to focus and house these various activities.

Over the last fiscal year, PISCES has used its state funding to establish the core of its management team, analyze and plan its technology development initiatives, and attract numerous world class academic, government and corporate partners. In my opinion, the progress made to date has been impressive and the strategic plan of PISCES is sound and promising both for what it may achieve for the citizens of Hawaii as well as the value it offers to the broader scientific and industrial communities. As the PISCES team has proven to be a good steward of the State's funding and resources, I would encourage the State of Hawaii to continue and enhance the funding level for PISCES.

The five strategic areas of planetary surface systems technologies being pursued by PISCES are each critical to the future space exploration efforts of our nation and each have important terrestrial applications that may pay even larger and nearer term dividends in terms of economic development. In addition, the planetary analog test site and in-situ resource utilization test facilities proposed to be funded by this legislation have the potential to make Hawaii a global center of excellence for robotics and unmanned systems testing, and resource extraction. The proposed international robotics mining competition for college students is the ideal means to market these facilities and PISCES' broader capabilities to the future leaders of the international space and robotics communities. What might otherwise have been a hotly contested hosting opportunity for this international competition could simply fall into the waiting lap of Hawaii and forever mark Hawaii as the world's academic focal point for robotic competitions. This is a unique opportunity in time and one that, I would avow, puts Hawaii in a position others will one day envy greatly.

Lastly, this growing PISCES endeavor is attracting many desirable partners who would all benefit from co-locating in a vibrant new research park to share facilities, attract a critical mass of talent and provide

for beneficial cross-fertilization of ideas and technologies. PISCES can serve as the core of such research park by managing a shared testing and integrations facility and an operations control room for communications, data processing and control of remote systems.

I therefore strongly encourage you to pass SB2585 with the requested funding allocation. I am available to answer any questions you may have and can be reached at (203) 355-3527 or by email at [hoyt@nearearthllc.com](mailto:hoyt@nearearthllc.com).

Thank you for the opportunity to testify on this bill.

Aloha,

A handwritten signature in black ink that reads "Hoyt Davidson". The signature is written in a cursive style with a long horizontal flourish at the end.

Hoyt Davidson



**SHACKLETON ENERGY COMPANY**  
3511 Caldwell Lane, Del Valle, TX 78617-3017

24<sup>th</sup> January 2014

**Testimony in Support of SB2585  
Relating to the Pacific International Space Center for Exploration Systems (PISCES)**

Dear Members of the 27<sup>th</sup> State Legislature

I strongly support the intent of this bill to employ staff and purchase equipment essential for PISCES ongoing operations through June 2015.

There exists a gathering resurgence of commercial space exploration initiatives that include both surface to space launch activities but of more relevance a number of in-space commercial companies established to provide services such as resource utilization, habitation, autonomous operations and other activities.

Many of these organizations are of US origin but many are also developing in Europe, Asia and other territories. Unlike the large isolated space programs of a generation ago, today's commercial space activities are collaborative in nature over international boundaries. More than ever, cost efficiencies as well as standards and procedures collaboration are paramount in new space ventures and activities, even between National Space Agencies.

As the trend for collaboration meets with the emergence of space resource utilization companies, a pressing requirement emerges for a center of excellence that can cross international boundaries, yet offers unique operational value for the development and testing of new vehicles, processes and methods of resource extraction and surface mobility on other worlds and extreme environments. The unique geology of the Islands of Hawai'i serves as a testing ground for these and many other operational functions. More than that, the equitable location between the Americas and Asia provides a convenient convergence for a great majority of the participants involved in this field to cooperate and collaborate.

The inspiration, leadership and technology development undertaken by PISCES is fundamental to the future of Hawai'i. It is essential that this facility receives the required financing for staff and capital equipment to perform its duties as a flagship center to secure leadership in this new field which will enhance the local economy, provide jobs, education and inspiration for an entire generation.

In light of the above, I strongly support the intent of SB2585 and would urge the Legislature to appropriate the full funding amount requested through this legislation.

Best regards

Jim Keravala  
Chief Operating Officer  
Shackleton Energy Company, Inc.  
+1 650 387 0844  
jim.keravala@shackletonenergy.com  
www.shackletonenergy.com

**"Fueling the Space Frontier"**

Testimony in strong support of Hawaii State Bills SB2583, 2584, and, 2585

Statement of Lewis L. Peach, Jr., NASA (retired), and PISCES Board Secretary

To the Members of the 27th Hawaii State Legislature:

I would like to thank you for the opportunity to offer my strongest endorsement for Hawaii State Bills - SB2583, 2584, and, 2585 to provide continued international leadership in space with the establishment and operation the Pacific International Space Center for Exploration Systems (PISCES).

Having been involved with the development of this exceptional capability for much of its definition and execution phases, it has been very rewarding to see it coming to fruition, so I would like to commend the Great State of Hawaii for the outstanding leadership you are demonstrating by establishing this unique and vitally important capability that will serve Hawaii, the United States, and the international space community, as a premier planetary analog test bed to help prepare for humanity's next bold frontier - the scientific investigation, sustainable exploration, commercial development, and settlement of space.

If the unfortunate circumstances of our Nation's involvement in two World Wars helped establish America as a world super power, certainly our Nation's leadership in space has cemented the US as the technological leader and economic power that has enhanced the quality, prosperity, and well being of our Nation for more than five decades.

Many of the products and services that we now take for granted have direct origins to the technological and scientific advances that resulted from our leadership in space, and this relatively modest investment in our future has provided an exceptional returns that far outweigh their costs.

During my tenure as Director of Advanced Programs at NASA, I co-founded the NASA/NSF Antarctic Analog Program, which continues to serve the international space community as an important capability to validate some of the scientific investigations we will undertake in planetary science for the foreseeable future. Many of NASA's current leaders in planetary science participated in these investigations over the past nearly 25-years since it's founding in 1990.

I also supported other analog research in the northern arctic regions, and in the desert southwest, as well as at most of the NASA centers, as we have found that it is essential to conduct high-fidelity technology development and scientific research investigations in a highly relevant analog research environment.

Fortunately, Hawaii provides one of the very best analog sites to develop, test and validate the technologies, capabilities and systems that will be required to realize conduct the future scientific and human exploration missions that are



being planned within NASA, and by our international space partners, as well as by a growing and vigorous commercial space community.

By virtue of the investments that you are making today in supporting this unique and urgently needed capability, PISCES will undoubtedly help assure Hawaii's leadership role in this challenging new frontier, an investment that will also contribute substantially the economic prosperity and well being of the State, while also inspiring the State's future aerospace workforce to pursue Science, Technology, Engineering and Math (STEM) related academic training in your schools and universities.

I would like to close by thanking you for the opportunity to serve as Secretary to the PISCES Board of Directors, and again , strongly encourage your continued leadership in supporting PISCES - a timely and vitally important asset for not only your State, but also for our Nation, and for the broader international space community.

Thank you for the opportunity to testify on this important Legislation and opportunity for Hawaii, and for our Nation.



Lewis L. Peach, Jr.  
Aerospace Consultant  
Former Director, Advanced Programs, NASA (retired)  
Secretary, PISCES Board of Directors

## TESTIMONY IN SUPPORT OF SB 2585 – RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS (PISCES)

Dear Members of the 27th Hawaii State Legislature,

I strongly support the intent of this bill to provide Hawaii State funding to PISCES to continue and expand its research and development activities in planetary surface systems technologies and to support the financing and creation of a research and development park to focus and house these various activities.

Over the last fiscal year, PISCES has used its state funding to establish the core of its management team, analyze and plan its technology development initiatives, and attract numerous world class academic, government and corporate partners. ***In fact, PISCES has leveraged the \$800K of FY14 monies into \$4.2M in ROI value back into PISCES projects...a 5:1 leverage of State monies.*** Further, PISCES has vastly improved its recognition as a “center of excellence” within the NASA communities, universities and commercial-space sectors.

In my opinion, the progress made to date has been impressive and the strategic plan of PISCES is sound and promising both for what it may achieve for the citizens of Hawaii as well as the value it offers to the broader scientific and industrial communities. As the PISCES team has proven to be a good steward of the State’s funding and resources, I would encourage the State of Hawaii to continue and enhance the funding level for PISCES.

PISCES, as a state-funded organization has as its goals to advance the development and integration of technologies that will help space exploration but that will also have a direct benefit towards Hawai'i. It is recognized that in order to successfully establish space settlements it will be necessary to learn how to "Live from the Land".

What this means is that we need to be able to procure basic elements to build an infrastructure and to support life out of the available resources. Some examples include the ability to extract water from the rocks and ice caps to provide not only drinking water but rocket fuel ingredients, to develop means in which clean and reuse that water, to be able to use available materials for the construction of habitats, landing pads, etc.

These technologies will have a direct benefit to Hawai'i for they will provide an invaluable education opportunity to Hawai'i's children, create high tech jobs, and develop technologies with direct application to the islands. For example, the development of renewable energy systems to help reduce the dependency on fossil fuels; to reduce or eliminate the need to import concrete for construction purposes, water reclamation technologies, etc.

The five strategic areas of planetary surface systems technologies being pursued by PISCES are each critical to the future space exploration efforts of our nation and each have important terrestrial applications that may pay even larger and nearer term dividends in terms of economic development. In addition, the planetary analog test site and in-situ resource utilization test facilities proposed to be funded by this legislation have the potential to make Hawaii a global center of excellence for robotics and unmanned systems testing, and resource extraction. The proposed international robotics mining competition for college students is the ideal means to market these facilities and PISCES' broader capabilities to the future leaders of the international space and robotics communities. What might otherwise have been a hotly contested hosting opportunity for this international competition could simply fall into the waiting lap of Hawaii and forever mark Hawaii as the world's academic focal point for robotic competitions. This is a unique opportunity in time and one that, I would avow, puts Hawaii in a position others will one day envy greatly.

Lastly, this growing PISCES endeavor is attracting many desirable partners who would all benefit from co-locating in a vibrant new research park to share facilities, attract a critical mass of talent and provide for beneficial cross-fertilization of ideas and technologies. PISCES can serve as the core of such research park by managing a shared testing and integrations facility and an operations control room for communications, data processing and control of remote systems.

I therefore strongly encourage you to pass SB 2585 with the requested funding allocation. I am available to answer any questions you may have and can be reached at 832.628.1730 or by email at [rkelso54@gmail.com](mailto:rkelso54@gmail.com).

Thank you for the opportunity to testify on this bill.  
Aloha,

Robert M. Kelso

Executive Director, PISCES

## TESTIMONY IN SUPPORT OF SB 2585 – RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS (PISCES)

Dear Members of the 27th Hawaii State Legislature,

I strongly support the intent of this bill to provide Hawaii State funding to PISCES to continue and expand its research and development activities in planetary surface systems technologies and to support the financing and creation of a research and development park to focus and house these various activities.

Over the last fiscal year, PISCES has used its state funding to establish the core of its management team, analyze and plan its technology development initiatives, and attract numerous world class academic, government and corporate partners. ***In fact, PISCES has leveraged the \$800K of FY14 monies into \$4.2M in ROI value back into PISCES projects...a 5:1 leverage of State monies.*** Further, PISCES has vastly improved its recognition as a “center of excellence” within the NASA communities, universities and commercial-space sectors.

In my opinion, the progress made to date has been impressive and the strategic plan of PISCES is sound and promising both for what it may achieve for the citizens of Hawaii as well as the value it offers to the broader scientific and industrial communities. As the PISCES team has proven to be a good steward of the State’s funding and resources, I would encourage the State of Hawaii to continue and enhance the funding level for PISCES.

PISCES, as a state-funded organization has as its goals to advance the development and integration of technologies that will help space exploration but that will also have a direct benefit towards Hawai’i. It is recognized that in order to successfully establish space settlements it will be necessary to learn how to "Live from the Land".

What this means is that we need to be able to procure basic elements to build an infrastructure and to support life out of the available resources. Some examples include the ability to extract water from the rocks and ice caps to provide not only drinking water but rocket fuel ingredients, to develop means in which clean and reuse that water, to be able to use available materials for the construction of habitats, landing pads, etc.

These technologies will have a direct benefit to Hawai’i for they will provide an invaluable education opportunity to Hawai’i’s children, create high tech jobs, and develop technologies with direct application to the islands. For example, the development of renewable energy systems to help reduce the dependency on fossil fuels; to reduce or eliminate the need to import concrete for construction purposes, water reclamation technologies, etc.

The five strategic areas of planetary surface systems technologies being pursued by PISCES are each critical to the future space exploration efforts of our nation and each have important terrestrial applications that may pay even larger and nearer term dividends in terms of economic development. In addition, the planetary analog test site and in-situ resource utilization test facilities proposed to be funded by this legislation have the potential to make Hawaii a global center of excellence for robotics and unmanned systems testing, and resource extraction. The proposed international robotics mining competition for college students is the ideal means to market these facilities and PISCES' broader capabilities to the future leaders of the international space and robotics communities. What might otherwise have been a hotly contested hosting opportunity for this international competition could simply fall into the waiting lap of Hawaii and forever mark Hawaii as the world's academic focal point for robotic competitions. This is a unique opportunity in time and one that, I would avow, puts Hawaii in a position others will one day envy greatly.

Lastly, this growing PISCES endeavor is attracting many desirable partners who would all benefit from co-locating in a vibrant new research park to share facilities, attract a critical mass of talent and provide for beneficial cross-fertilization of ideas and technologies. PISCES can serve as the core of such research park by managing a shared testing and integrations facility and an operations control room for communications, data processing and control of remote systems.

I therefore strongly encourage you to pass SB 2585 with the requested funding allocation. I am available to answer any questions you may have and can be reached at 832.628.1730 or by email at [rkelso54@gmail.com](mailto:rkelso54@gmail.com).

Thank you for the opportunity to testify on this bill.

Aloha,

A handwritten signature in black ink, appearing to read "Robert M. Kelso", written over a faint, larger version of the same signature.

Robert M. Kelso

Executive Director, PISCES



TESTIMONY IN SUPPORT OF SB2585 –  
RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION  
SYSTEMS (PISCES)

Dear Members of the 27<sup>th</sup> Hawaii State Legislature,

NASA Kennedy Space Center (KSC) has collaborated with the Pacific International Space Center for Explorations Systems (PISCES) in the state of Hawaii since 2007, when the first NASA field test for In-Situ Resource Utilization (ISRU) was held on Mauna Kea in the Big Island. The unique volcanic basalt environment of the Hawaiian island chain is conducive to analogous testing for planetary surfaces which in many cases also have a basaltic composition.

NASA KSC is involved in developing new technologies for sustainable planetary surface systems in collaboration with the other NASA field centers across the USA. The key to “living off the land” in space is to use the local resources in order to achieve independence from the demanding and expensive logistics train for re-supply from Earth. The resources are contained in the soil (called regolith), atmosphere and the energy from the sun. Many of the technologies being developed for sustainable space exploration via ISRU have terrestrial benefits such as water purification, production of renewable and clean energy, building civil infrastructure with basaltic materials and advanced robotics for construction activities.

Just as these technologies will help humanity become a space faring civilization they may also help economic prosperity in Hawaii by reducing the amount of raw materials that have to be imported to Hawaii. Hawaii is rich in solar power and basaltic materials which are the key ingredients for sustainable ISRU construction on planetary surfaces. By collaborating with the space exploration sector, including advanced education training opportunities, it is possible that dual use technologies may be developed that will be highly beneficial to the Hawaiian quality of life and general prosperity of its people.

Best Regards,

Rob

***Robert P. Mueller***

**Senior Technologist**

**Advanced Projects Development**

**Surface Systems Office, NE-S**

**Engineering & Technology Directorate**

**NASA, Kennedy Space Center**

Office:SSPF 3023W

Phone: [321-867-2557](tel:321-867-2557)

Material transmitted in this message may not represent the opinion or policy of NASA.

*International Ventures Associates*

January 29, 2014

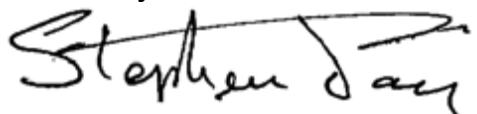
To: Members of the 27th Hawaii State Legislature:

I am writing as a member of the Hawaii Aerospace Advisory Committee (HAAC), and previous chairman of JUSTSAP, where I served for seven years.

In previous years, I have submitted testimonials for initial and continued funding for the Pacific International Space Center for Exploration systems (PISCES). I would like to do so again for Senate Bills 2583, 2584 and 2585.

In my judgment, these bills enhance Hawaii's competitive position in the international Aerospace sector, and provide an "accelerator" for important R&D projects, facilities testing, and higher skilled labor for the State - as PISCES develops funded projects that will no longer require State funding over the coming years. PISCES is developing a positively differentiated capability that the great State of Hawaii has incubated and nurtured, and that is now on the verge of providing sustainable ROI benefits.

Sincerely,

A handwritten signature in black ink that reads "Stephen Day". The signature is written in a cursive style with a horizontal line across the top.

Stephen Day  
President, International Ventures Associates

*IVA, 5333 Potomac Avenue, Suite 100, Washington, DC 20016*



Harvey S. Tajiri  
569 Puloku Street  
Hilo, HI 96720

TESTIMONY IN SUPPORT OF:

HB2150 and SB2584– RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS (PISCES) PLANETARY SUSTAINABILITY TECHNOLOGIES INITIATIVE.

HB2151 and SB2583 – RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS AND NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LASER COMMUNICATIONS GROUND STATION INITIATIVE.

HB2152 and SB2585 – RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS.

Dear Members of the 27<sup>th</sup> Hawaii State Legislature,

I am writing in support of the passage of HB2150/SB2584, HB2151/SB2583 and HB2152/SB2585.

The State of Hawaii has a genuine need to broaden its economic base. We now have the opportunity to move towards that end.

Section I of all six measures aptly elucidates the positive aspects of their enactment and funding.

Your affirmative consideration of these six bills will be deeply appreciated.

Mahalo,

A handwritten signature in black ink, appearing to read "Harvey S. Tajiri". The signature is written in a cursive, flowing style.

Harvey S. Tajiri



Henk B. Rogers  
55 Merchant Street, 17<sup>th</sup> floor  
Honolulu, HI 96813

January 28, 2014

TESTIMONY IN SUPPORT OF SB2585 – RELATING TO  
THE PACIFIC INTERNATIONAL SPACE CENTER FOR  
EXPLORATION SYSTEMS (PISCES)

Dear Members of the 27<sup>th</sup> State Legislature,

I strongly support the intent of this bill to Hawaii State funding to PISCES to employ staff, purchase equipment and build the facilities necessary for it to be able to carry out its mission.

Space exploration is really a perfect industry for Hawaii. We are one of the best destinations in the world for Space Tourism. Our unique geographical location enables us to launch satellites into any orbit because we are surrounded by thousands of miles of open ocean. Our geology has blessed us with the same rock types and rock formations (basaltic/ volcanic) as are found on the moon and Mars. As a result, Hawaii is in a great position to benefit from the upcoming surge in space exploration. PISCES is the organization that will make this happen.

Our young people have proven that they can compete on an international level with other young people in robotics. Robotics is the technology necessary for the successful exploration of other planets. Rather than let our student go overseas to find high paying software and hardware development jobs overseas, we should create a lasting high tech industry here in Hawaii. Space Exploration is the very heart of high tech. PISCES is the organization that will realize this vision.

The five strategic areas outlined in the bill, fabrication of basaltic-based construction materials, in-situ resource extraction and use, planetary analog test site development, the high-school student designed and built experiment that will go to the moon and the

international robotic mining competition are all worthy endeavors for the budding tech community in Hawaii. Help PISCES get these projects off the ground.

I strongly urge you to pass SB2585 with the requested funding allocation. You can reach me at 808-954-6100 or by e-mail at [henk@tetris.com](mailto:henk@tetris.com) should you have any questions about my testimony.

Thank you for the opportunity to testify on this bill.

Aloha,

A handwritten signature in black ink, appearing to read 'Henk', with a long horizontal flourish extending to the right.

Henk B. Rogers