

Testimony to the Senate Committee on Ways and Means
Thursday, March 29, 2012
9:00 AM
Conference Room 211

**RE: HOUSE BILL NO. 2873, HD2, SD1, RELATING TO THE PACIFIC
INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS**

Chair Ige, Vice Chair Kidani, and members of the committee.

My name is Charles Ota and I am the Vice President for Military Affairs at The Chamber of Commerce of Hawaii (The Chamber). I am here to state The Chamber's support of House Bill No. 2873, HD2, SD1, Relating to The Pacific International Space Center for Exploration Systems.

The measure proposes to transfer the Pacific International Space Center for Exploration Systems from the University of Hawaii to DBEDT's office of aerospace development and establishes a PISCES Board of Directors. Appropriates funds.

The Chamber's Military Affairs Council has served as the state liaison in matters relating to the military since 1985 and provides oversight for Hawaii's multi-billion dollar defense industry. This includes the combatant and major component commands for all of the armed services.

Hawaii has the unique presence of diversified US military commands that offer expanded opportunities in high technology development and growth for the emerging R&D sector and aerospace ventures.

The proposal in this measure is one of several steps being considered to create a diversified high technology sector that will encourage innovation and stimulate new commercial industries and provide needed job opportunities in Hawaii.

Thank you for the opportunity to testify in support of this measure.

From: mailinglist@capitol.hawaii.gov
To: [WAM Testimony](#)
Cc: jcrisafu@dbedt.hawaii.gov
Subject: Testimony for HB2873 on 3/29/2012 9:00:00 AM
Date: Wednesday, March 28, 2012 3:39:36 PM
Attachments: [Letters of Support for PISCES-ILRP \(HB2873\).pdf](#)

Testimony for WAM 3/29/2012 9:00:00 AM HB2873

Conference room: 211
Testifier position: Support
Testifier will be present: Yes
Submitted by: Jim Crisafulli
Organization: Office of Aerospace Development
E-mail: jcrisafu@dbedt.hawaii.gov
Submitted on: 3/28/2012

Comments:

These letters of support on behalf of the Pacific International Space Center for Exploration Systems (PISCES) and the International Lunar Research Park (ILRP) initiative (the subject of HB2873) were submitted to our Office of Aerospace Development, and I'm forwarding these as comments in support of this legislation for the hearing on March 29.

George R. Ariyoshi
Governor of Hawaii
(1973 - 1986)

Welcome Remarks by Gov. George Ariyoshi
ILRP Leaders Summit - Hilton Waikoloa Village
November 14, 2011

Aloha ILRP Summit Delegates!

It is a great pleasure for me to welcome all of you to the 2011 Leaders Summit for the International Lunar Research Park initiative – a most inspiring and visionary program that I believe holds tremendous potential for advancing humankind’s exploration of space.

As you may know, the ILRP concept was initially conceived at last year’s meeting of the Japan-U.S. Science, Technology & Space Applications Program (or JUSTSAP), now known as the Pacific International Space Alliance – a program for which I have served as U.S. Advisor for nearly two decades, and for which Dr. Osamu Odawara, from the Tokyo Institute of Technology, now serves as Chairman.

The 2010 JUSTSAP conference explored opportunities for building sustainable robotic and human settlements beyond low-Earth orbit – a strategic goal set forth in both President Obama’s National Space Policy and the 2010 Congressional NASA Authorization Act. Particular emphasis was given to evaluating both the benefits and challenges to establishing a multinational research park on the Moon that would be developed and operated by a consortium of nations from around the world – aligning common space-faring goals with complementary resources and capabilities to substantially reduce the costs, enhance the benefits, and accelerate the timetables for future space missions

Those deliberations eventually led to the ILRP concept, and ultimately to this Summit – the primary goal of which is to explore how the ILRP vision might be realized in ways that are both cost-effective and achievable within current global economic constraints.

Hawaii has maintained a strong interest in and support for human spaceflight since the Apollo astronauts trained in the islands for their historic missions to the Moon. Looking to the future, I believe our State's strategic mid-Pacific location, unique geographic terrain, world-renowned expertise in planetary geosciences, and long-standing ties with Asia and the Pacific will enable us to advance humankind's spaceward quest through multinational initiatives such as the ILRP.

Most notably, we have established a Pacific International Space Center for Exploration Systems, or PISCES, on this island at the University of Hawaii at Hilo, that is leveraging these strategic assets to develop and evaluate new technologies and integrated systems required for future exploration of the Moon, Mars, and other solar system bodies.

PISCES is being developed through partnerships among industry, academia and governments of space-faring nations around the world, and since its inception has facilitated multinational research and field demonstration programs in Hawaii to test and validate equipment and concepts for utilizing resources on extraterrestrial bodies in ways that will significantly advance humankind's ability to establish sustainable settlements on other worlds.

PISCES will build upon these activities and capabilities to help establish the ILRP terrestrial prototype at the University Research Park in Hilo, which I understand Chancellor Straney from the University of Hawaii at Hilo will be discussing this morning.

I believe the ILRP prototype will be a powerful asset to both our nation and the world in advancing our exploration of space, in part because it will embrace a collaborative vision for this enterprise – one that incorporates the knowledge, resources and capabilities developed through our nation's missions to the Moon, Mars, asteroids and other solar system bodies, along with the substantial experience and achievements of other space-faring nations worldwide, to enable a collectively affordable and sustainable roadmap to space.

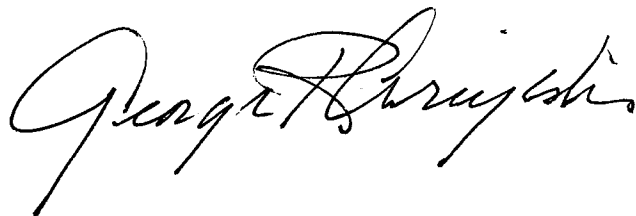
The ILRP will also leverage the substantial assets, competencies and entrepreneurial spirit of the private sector in pioneering the space frontier – not only to maximize the opportunities and benefits from exploration and scientific research, but also to facilitate the development and utilization of extraterrestrial resources that can support sustainable settlements beyond low-Earth orbit.

Finally, and perhaps most importantly, the ILRP will enable an inclusive, participatory approach to the exploration and settlement of space that will engage and empower the public to both envision and realize a future that will benefit all humankind, as well as inspire the next generation of scientists, engineers, educators, doctors, lawyers, government leaders, and other key professionals that will enable our spaceward migration.

In summary, I believe the ILRP concept represents a fundamentally new and timely approach to pioneering the space frontier – a cost-effective means toward establishing a permanent human presence beyond Earth that will leverage government funding with both private and international resources to yield substantial scientific, educational and economic benefits “for all mankind”.

I applaud your collective efforts to nurture the spirit of international collaboration that ultimately will enable the ILRP, and wish you every success as you deliberate opportunities to bring this most promising initiative to fruition.

Thank you for your kind attention, and Aloha!

A handwritten signature in black ink, appearing to read "George H. W. Bush". The signature is written in a cursive, flowing style with a large initial 'G'.



Lieutenant Governor Mead Treadwell
STATE OF ALASKA

October 21, 2011

The Honorable Brian Schatz
Lieutenant Governor
State Capitol
Honolulu, HI 96813

Dear Lt. Governor Schatz,

As Chair of the Aerospace States Association (ASA), I write to convey ASA's congratulations on your state's hosting of the International Lunar Research Park (ILRP) Leaders' Summit. Having worked with two NASA-sponsored lunar initiatives in the 1980's, I find Hawaii's proposal to develop a terrestrial prototype for an International Lunar Research Park no less than thrilling. This is yet another example of Hawaii's sustained leadership in aerospace development over the years.

The ILRP is an initiative at the state level which could mark a new milestone in human history. As I've learned on Alaska's frontier, it's often individual or state initiatives, rather than large, national government programs, that pioneer the cutting edge of civilization. The Pacific, the Arctic and the Moon have much in common: for each frontier we constantly need to show skeptics that these regions are accessible and valuable.

Though I am unable to attend the ILRP Leaders' Summit in November, please know that ASA is very interested in helping to advance the recommendations derived at this meeting. ASA's network is growing in government and industry, and we have long enjoyed Hawaii's participation in our organization. We look forward to our continued partnership as we advocate for innovation and excellence on the frontiers of space.

Sincerely,

A handwritten signature in blue ink that reads "Mead Treadwell".

Mead Treadwell



February 26, 2012

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 moon and Mars.

In addition, Hawaii 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 Pacific International Space Center for Exploration Systems (PISCES) on the Big Island also provides unique and strategic resources and locations for testing and validating new robotic, energy, resource utilization and other critical technologies that will be essential for future space missions.

The NASA Space Portal fully recognizes these strategic advantages, and looks forward to our continued partnership with the State of Hawaii in advancing our nation's space exploration efforts, especially through the new annex to our Space Act Agreement that focuses on developing analog test facilities at PISCES. This program will not only help extend humankind's investigation of our solar system, but also bring the manifold scientific, educational, economic and humanitarian benefits of space back to Earth – including promotion of a Hawaii-based regional economic innovation cluster with an associated community of multidisciplinary engineers, scientists, educators and students that will help maximize the opportunities and benefits of space exploration.

With best wishes,

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

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



Elliot Holokauahi Pulham, Chair

February 6, 2012

The Honorable Calvin K. Y. Say
Speaker of the House of Representatives
Hawaii State Legislature

The Honorable Shan S. Tsutsui
President of the Senate
Hawaii State Legislature

SUBJECT: Support for the Pacific International Space Center for Exploration Systems (PISCES)
And the International Lunar Research Park Initiative

Dear Speaker Say and President Tsutsui:

On behalf of the Hawai'i State Aerospace Advisory Committee, I am writing to encourage the Hawaii State Legislature's strongest possible support for developing the Pacific International Space Center for Exploration Systems (PISCES), which we believe would significantly advance the growth and diversification of the aerospace industry in Hawai'i.

As you know, the creation of the Hawai'i Aerospace Advisory Committee (HAAC) was authorized by the Legislature (Act 52, 2009 Session) and approved by then Governor Lingle on May 6, 2009. Our purpose, per this Act, is to advise and assist the Legislature and State agencies in monitoring, assessing and promoting aerospace development statewide. The Committee is comprised of leading aerospace industry executives, distinguished academicians from across the state, and economic development executives from Oahu, Kauai, Maui and Hawai'i – all united with a common purpose to help the State diversify its economy and promote innovative education and employment opportunities for the people of Hawai'i.

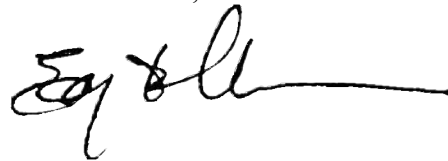
Since its inception, the HAAC has been exploring these opportunities and ways to realize them. One such opportunity that we believe holds tremendous potential to help realize Hawaii's full potential in aerospace is the Pacific International Space Center for Exploration Systems (PISCES) - a multinational space research and education center headquartered at the University of Hawaii at Hilo that already has brought over \$2 million in research funding and private investments to Hawaii, established undergraduate space science curricula at the University, conducted public outreach programs on aerospace at local schools and community centers, and sponsored national aerospace design competitions enabling undergraduate students to apply their skills in STEM-related disciplines to develop prototype models for future human habitats in space.

In collaboration with PISCES, the State of Hawaii (through its Office of Aerospace Development, or OAD) is currently under contract with NASA to develop “an infrastructure-based model for a sustainable human settlement beyond low-Earth orbit”, which is translating into a “blueprint” for an International Lunar Research Park (or ILRP) on the surface of the Moon. In conjunction with this grant, the State has also signed a Space Act Agreement with NASA to develop terrestrial analog sites to test and validate innovative technologies for future space exploration that could support development of an ILRP, as well as other robotic and human missions to other planetary bodies in our solar system.

These analog facilities are targeted for development at PISCES, and will provide an enormous opportunity for Hawai’i to play a major leadership role in humankind’s future exploration of space, with substantial opportunities for new federal research grants, private sector investment, and innovate space education and training programs throughout the islands – all of which will help expand Hawaii’s role as both a major contributor to and beneficiary of global space enterprise.

As such, and on behalf of the Hawai’i Aerospace Advisory Committee, I strongly encourage your support for PISCES and the analog test facilities on the Big Island of Hawaii.

Me ka ha’aha’a,

A handwritten signature in black ink, appearing to read 'E. Pulham', with a long horizontal line extending to the right.

Elliot Holokauahi Pulham

cc: Governor Neil Abercrombie
Lt. Governor Brian Schatz
Senator Brickwood Galuteria, Majority Leader
Senator Sam Slom, Minority Leader
Richard Lim, Director - DBEDT
Jim Crisafulli, Director - Office of Aerospace Development



January 19, 2012

Jim Crisafulli, Director
Office of Aerospace Development
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Dear Jim:

I am delighted to be able to send you a letter to summarize our support of the continued existence and growth of PISCES as well as the exciting concept of the International Lunar Research Park.

The Google Lunar X PRIZE is the largest incentive prize of all time with \$30 million available to the first privately funded teams who successfully land on the Moon, send back a “Mooncast”, travel 500 meters and send back a further transmission.

The key word here is privately funded. In providing this prize, Google is seeking to inspire entrepreneurs and businesses to do something that only governments have done before and in so doing, kick start this next phase of commercial development in the space industry. Typically X PRIZES can generate more than ten times the prize purse in related investment, as well as numerous jobs and spin off opportunities. PISCES and the ILRP represent significant opportunities for the State of Hawaii to capture some of the new investment and development that springs from the Google Lunar X PRIZE, among similar related endeavors.

By way of example, after the successful winning of the \$10 million Ansari X PRIZE in 2004 by Scaled Composites, a human spaceflight revolution occurred that now includes Virgin Galactic, Blue Origin, Armadillo Aerospace, XCOR and many other companies. Entrepreneurs with dreams of going to space have taken their fledgling companies from “crazy idea” to solid commercial entity in a relatively short space of time. Some now even have the government as a customer! We have witnessed the growth of major infrastructure projects such as the New Mexico SpacePort for space tourism. And Mohave SpacePort – formerly a small airfield – is now a major rocket and space plane manufacturing area. None of these would be here without the impetus provided by the Ansari X PRIZE.

Revolution Through Competition.

5510 Lincoln Blvd. • Suite 100 • Playa Vista, CA 90094
T: 310.741.4880 • F: 310.741.4974
www.googlelunarxprize.org



So why is the Google Lunar X PRIZE so interested in PISCES and the wider possibility of the International Lunar Research Park? Firstly, from a practical point of view, many of our teams will need to test their lander, rover and communications technologies. The lunar analog sites operated by PISCES provide a unique location for those activities and over the next couple of years we fully expect to see some of our teams taking advantage of the facilities. This will provide a corresponding opportunity in PR as well as some small economic benefit.

Secondly, for the Google Lunar X PRIZE teams to be able to evolve into a new industry, just as the teams have done in the human spaceflight area, customers are needed. These are companies who have a reason to need to get to the Moon in an efficient and effective way, perhaps for energy, resource, media or science purposes. While our teams and other commercial space entities are developing a new lunar infrastructure, the International Lunar Research Park can be a key location for generating new technologies (that can also be used on Earth) and incubating the companies that will become the first to explore this new frontier. Clearly those companies will eventually need access to talented workforces and a friendly business environment.

In support of that workforce development, PISCES provides us with a natural partner for The Google Lunar X PRIZE flagship STEM education programs, including our Moonbots robotics competition which is a partnership with Lego (www.moonbots.org). Of note is that we have had one team from Molokai whose members have participated in Moonbots for the last two years (<http://molokaimahina.yolasite.com/>). Our experience is that children are more motivated in STEM if they have real life examples of what mastering certain skills could allow them to do. By having access to the engineers and scientists in Google Lunar X PRIZE teams who are coming to Hawaii or working with the new endeavors in the ILRP to further their businesses, Hawaiian students and their parents will be able to see the relevance of high tech skill acquisition and the possible future that this can bring.

In conclusion The Google Lunar X PRIZE sees the continued existence and growth of PISCES, as well as the development of the ILRP as key pieces for the commercial exploration of space.

Revolution Through Competition.

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www.googlelunarxprize.org



Sincerely

A handwritten signature in black ink that reads 'Alexandra Hall'.

Alexandra Hall
Senior Director, Google Lunar X PRIZE
X PRIZE Foundation.

CC: Dr. Frank Schowengerdt
Professor of Physics and Director of PISCES
University of Hawai'i at Hilo

Revolution Through Competition.

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William P. Kenoi
Mayor



Randall M. Kurohara
Director

Laverne R. Omori
Deputy Director

County of Hawaii

DEPARTMENT OF RESEARCH AND DEVELOPMENT

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Thursday, January 19, 2012

Senator Will Espero, Chair
Senator Michelle N. Kidani, Vice Chair
Committee on Public Safety, Government Operations, and Military Affairs

Representative Angus L.K. McKelvey, Chair
Representative Isaac W. Choy, Vice Chair
Committee on Economic Revitalization and Business

RE: Support for Pacific International Space Center for Exploration Systems
(PISCES) International Lunar Research Park (ILRP) on Hawai'i Island

Dear Senators Espero and Kidani, and the Committee on Public Safety,
Government Operations, and Military Affairs, and
Representatives McKelvey and Choy, and the Committee on Economic
Revitalization and Business:

The Department of Research and Development's mission is to provide proactive leadership, enhancing the quality of life for Hawai'i Island communities through economic development programs. As Department Director of Research and Development, I urge you to support the International Lunar Research Park on Hawai'i Island.

The ILRP program at the University of Hawai'i at Hilo Science and Technology Park represents Hawai'i County's significant strengths, assets and aspirations. It also represents an important addition to Hawai'i Island's emerging innovation economy.

The combination of our unique natural resources and gifted communities has created the premier environment for world class exploration and research. Complementing the existing observatory community, the new Thirty Meter Telescope project, the University of Hawai'i at Hilo's new Sciences and Technology facility, 'Imiloa Astronomy Center, and the United States Pacific Basin Agricultural Research Center, the ILRP will provide the community an industry that:

Senators Espero and Kidani, and the Committee on Public Safety, Government Operations, and Military Affairs, and
Representatives McKelvey and Choy, and the Committee on Economic Revitalization and Business

January 18, 2012

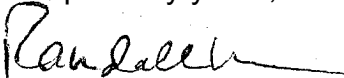
Page 2

- Attracts companies engaged in clean, high-tech research and development activities in aerospace, renewable energy and sustainable agriculture;
- Attracts investment that will help to leverage costs of expanding Hawai'i Island's broadband capacity;
- Creates high-paying 21st century jobs that are designed to support the ILRP, jobs that cannot be outsourced overseas;
- Creates new revenue streams through research and commercial development that will grow our knowledge industry; and
- Supports STEM education for Hawai'i Island and for the State.

Besides the direct economic benefits listed above, this project will help to attract visitors drawn to Hawai'i Island's edu-tourism offerings and the meetings and convention market; and build our Island's and the State's reputation as an international leader in collaborative research and educational excellence.

Thank you for the opportunity to express support for this important project. I humbly ask that the Hawai'i State Legislature provide support for the development of the International Lunar Research Park on Hawai'i Island.

Respectfully yours,



RANDALL M. KUROHARA
Director

RMK:bd

February 6, 2012

Jim Crisafulli, Director
Office of Aerospace Development
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Dear Mr. Crisafulli,

I am writing this letter because it seems that space exploration - from earth based astronomy to astro-robotic moon missions to the eventual human colonization of the Moon, Mars and beyond - is suffering from a lack of understanding, and therefore a lack of support. It is my intention in this letter to perhaps shed some light on why we need to be doing these things and why they are essential economic drivers of our economy, as well as a key to both inspiring young people in Hawaii to become scientists and engineers, and to creating high paying jobs that can ensure our state's future economic strength.

It was the ability to navigate by the stars, coupled with the daring to set off and explore thousands of miles of open ocean in tiny fragile canoes, that gave us the basis for our present day Hawaiian culture. Where is this spirit today?

For it is this very spirit that is once again needed by humankind in these very trying times. For all of the reasons that we, throughout history, have explored and colonized every last habitable spot on this planet, we must now explore and colonize our celestial neighbors.

The most amazing thing that ever happened to this planet is life. It doesn't matter if it was spontaneous generation, divine intervention or pan spermia. It matters that life is here. What could nobler, more historic, than to bring life to another planet? Why would we pass up the chance to be part of such an endeavor?

With the end of the Space Shuttle program, NASA and the rest of the world are scrambling to figure out what the “next step” will be, and where it might be taken – perhaps in Texas, or maybe in Florida? Could it be in Hawaii? Indeed, the next step is up for grabs; and with a Hawaii-born president in the White House, our chances of having it be in the Aloha State have never been better!

If we can base the next phase of space exploration here in Hawaii, leveraging our State’s unique resources and capabilities through our Pacific International Space Center for Exploration Systems (PISCES), the benefits would truly be incredible.

- 1] We would invigorate aerospace as well as other emerging technology-based industries statewide.
- 2] We would attract companies engaged in clean, high-tech research and development activities in diverse areas, including (to name a few) aerospace, alternative energy, recycling, telemedicine, robotics, artificial intelligence and sustainable agriculture.
- 3] We will generate new revenue streams through research and commercial development that will help grow Hawaii's knowledge-based industries.
- 4] We will create high-paying 21st century jobs that cannot be outsourced overseas.
- 5] We will spur investments that will leverage the costs of expanding Hawaii's broadband capacity - especially on the Big Island.
- 6] We will help enrich/diversify educational and community outreach programs in science, technology, engineering and mathematics (the STEM disciplines).
- 7] We will strengthen Hawaii's stature as a center of excellence for exploration, and fuel new opportunities to grow Hawaii's visitor industry.

- 8] We will expand Hawaii's global leadership in space science and exploration, enhancing its role (and recognition) as both a major contributor to and beneficiary of space enterprise.
- 9] We will help catalyze and inspire the next generation of scientists, engineers and entrepreneurs that will pioneer new horizons on the frontiers of space.

For all of these reasons, we should do everything in our power to make Hawaii the next center for space exploration by supporting PISCES, the proposed analog facilities for an International Lunar Research Park (ILRP), and of course our Office of Aerospace Development!

Sincerely Yours,

A handwritten signature in black ink, appearing to read 'H. B. Rogers', with a horizontal line underneath the name.

Henk B. Rogers
Entrepreneur
55 Merchant Street, Suite 1700
Honolulu HI, 96813

February 21, 2012

Senator Will Espero, Chair
Senator Michelle N. Kidani, Vice Chair
Committee on Public Safety, Government Operations and Military Affairs

Representative Angus I. K. McKelvey, Chair
Representative Isaac Choy, Vice Chair
Committee on Economic Revitalization and Business

RE: Support for Pacific International Space Center for Exploration Systems (PICES)
International Lunar Research Park (ILRP) on Hawaii Island

Dear Senators Espero and Kidani and Representatives McKelvey and Choy:

Ferraro Choi has been a leader in the design of sustainable educational and research projects throughout the State of Hawaii and for agencies of the Federal Government. On the Island of Hawaii we were honored to be the architects for the USDA Pacific Island Forestry Laboratory in Hilo, the NELHA, Gateway Center and the new West Hawaii Explorers Academy campus both in Kailua Kona. On Oahu, Maui, Kauai, and throughout the Papahānaumokuākea Marine National Monument we have worked with NOAA on the planning and design of research laboratories and scientific outreach facilities. Throughout the Antarctic we have worked with the National Science Foundation most recently on the design of the Amundsen Scott South Pole Station, in conjunction with NASA as an analog for future lunar and Mars based habitats.

Ferraro Choi ~~strongly~~ support~~s~~ the PICES and ILRP projects since they will:

- Promote Hawaii's leadership in space research and technology to nations pursuing space exploration.
- Showcase Hawaii's unique geographic terrain for extraterrestrial analog research and testing.
- Make a significant contribution to research programs at the University of Hawaii's Hilo Campus
- Support STEM education on Hawaii Island and throughout the State.
- Support architectural and engineering jobs from companies such as ours.
- Attract a multitude of high technology consultants throughout the world who collaborate on such projects and bring not only revenue but intellectual capital to our state.
- Boost educational tourism to Hawaii Island

I respectfully ask for your support at the State Legislature for development for these unique and important projects for our state. Thank you for your consideration.

Sincerely,



Joe Ferraro FAIA, LEED AP
Principal



January 31, 2012

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

I am writing this letter in firm support of the State of Hawaii's efforts to develop and promote the University of Hawaii-Hilo's Pacific International Space Center for Exploration Systems (PISCES) and its future Prototype remote surface analog facility supporting the evolution of an International Lunar Research Park (ILRP).

As a current member of the PISCES management team and the ILRP steering committee; a fifteen-year participant in Hawaii's JUSTSAP forum (recently renamed PISA); the current Chief Executive Officer of JAMSS America, Inc. (a U.S. registered aerospace company with U.S. and international contracts); the former Senior Vice President of SPACEHAB, Inc.; and, former manager within the NASA Mission Operations Directorate at the Johnson Space Center, I am acutely aware of the unique challenges that space exploration places on human innovation as well as on the resource limitations of sponsoring government, private sector and university organizations. However, it has been my experience that the best way to mitigate project and program costs during space hardware and software development cycles is through use of simulation facilities that are most representative of those in-space environments within which or on which robots or space explorers will conduct operations using these products.

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.

Post-Apollo, exploration missions have become increasingly multinational in nature with many nations now having participated in earth orbit, lunar and planetary missions, with Japan even returning surface debris samples from an far-away asteroid. Today, NASA, other space faring nations and the commercial private sector now have their sights set on furthering robotic and human outreach into the cosmos through innovative private ventures as well as through joint, international Agency-sponsored missions; Google Lunar X-Prize contestants are busy preparing their hardware for competition beginning as early as 2014; and NASA and its ISS partners are currently preparing a Global Exploration Roadmap which will define space exploration destinations and schedules which will guide current and future generations in this quest to explore - and eventually inhabit remote lunar and planetary destinations within our solar system.

As an avid participant in several of these exploration journeys, I am proud to have been a part of the evolution of Hawaii's PISCES and ILRP projects and have been encouraged by the continuing and enthusiastic bipartisan support received for these two endeavors from the State of Hawaii's Legislature. NASA also has taken note - as have international space agencies - as PISCES has more than matched its State funding to date with NASA, CSA, DLR and private sector research contracts awarded over the past



four years. Within my familiar territory of Japanese industry, academia and the Japan Aerospace Exploration Agency (JAXA), I have recently had the privilege of speaking to top management in each sector about the many opportunities for exploration technologies development, test and checkout that PISCES offers. I have also recently informed them of the exciting ILRP vision and I anticipate an ever-growing interest within Japan for collaboration with other international organizations in the utilization of Hawaii's PISCES and ILRP Prototype assets going forward.

Jim, your continued ardent support of PISCES and ILRP will surely help facilitate the next remarkable chapter of human space exploration in ways that are a fundamental departure from the Apollo program of over four decades ago: This renewed journey will be international in nature with all major space faring nations as participants. Robotic and human explorers returning to the moon and beyond will require advanced and reliable technologies to sustain their missions. The developers of these technologies will use PISCES and the ILRP Prototype facilities as test beds for verification of their operability. The ILRP will continue to receive international attention as an achievable and efficient way for multinational participants from the government and private sector to synergistically work together to provide stellar *from* the moon, *on* the moon and *about* the moon research results while mitigating exploration costs through shared infrastructure and efficient utilization of lunar resources using technologies developed at the planet's premier two lunar analog facilities, PISCES and the ILRP Prototype - all the while, facilitating the involvement and growth of Hawaiian small businesses and industry and local area use of spinoff (and importantly, green) technologies.

And last but most assuredly not least, the student explorers of Hawaii's K-12 schools and universities - as well as those from other states and nations - will participate in and learn from the many PISCES and ILRP Prototype projects, demonstrations and capabilities evolution and will have an unprecedented opportunity to become tomorrow's space voyagers to the Moon, Asteroids, Mars and beyond.

I applaud and encourage the continuation of your leadership and that of Hawaii's State Government in supporting our nation's space exploration program and in continuing funding support of PISCES and the ILRP Prototype.

Sincerely,

A handwritten signature in black ink that reads 'Dan A. Bland'.

Dan A. Bland

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



PACIFIC SCIENCE ASSOCIATION

1525 BERNICE STREET • HONOLULU, HI 96817 • USA
TEL. (808) 848-4124 • FAX (808) 847-8252
INFO@PACIFICSCIENCE.ORG • WWW.PACIFICSCIENCE.ORG

3 February 2012

Jim Crisafulli
Director
Office of Aerospace Development
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Dear Jim:

I write in support of the State of Hawaii's initiative to empower and fund the effort by the International Space Center for Exploration Systems (PISCES) to create an International Lunar Research Park (ILRP) on the Big Island of Hawaii. This initiative will be an important catalyst for research and testing in several important areas of research, including robotics, engineering, and green energy. In so doing PICES and ILRP activities will help support critical international, regional as well as local priorities to advance sustainable development goals, STEM education efforts, as well as the important mission of increasing public support and interest in science, technology, and engineering.

The Pacific Science Association (PSA) is a regional non-governmental, scholarly organization that advances science, technology, and sustainable development in the Asia-Pacific region by actively promoting interdisciplinary and international meetings, research, and collaboration. The PSA Secretariat has been based at the Bernice P. Bishop Museum in Honolulu since our founding in 1920. PSA hosts large scientific meetings known as Congresses and Inter-Congresses every two years in rotating venues throughout the Asia-Pacific. These well-attended meetings are recognized as critical venues for the region's senior and junior scientists to meet, present research findings, and forge new interdisciplinary collaborations with colleagues elsewhere in the region.

PSA is composed of national-level members, which are National Academies of Science or leading universities of Australia, China-Beijing, China-Hong Kong, China-Taipei, France, Guam, Indonesia, Japan, Korea, Malaysia, Okinawa, Philippines, the Pacific Islands (Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu), Russia, Singapore, Thailand, United States, and Vietnam, as well as individual member scientists.

Increasingly, the future of science and technology research lies in cross-disciplinary collaborations that link various research networks, and so we are encouraged that ILRP is specifically designed as such an international collaboration. In addition, while space exploration may seem a non-intuitive research priority given other seemingly more immediate concerns in the Asia-Pacific, there are unique needs of island states that

make ILRP highly relevant for Hawaii and the region. The pursuit of new and more effective technologies to keep a crew safely housed with reliable food supplies and access to energy, telemedicine, and communication on the ultimate resource-poor “island” of the moon will surely help drive innovations that facilitate sustainability solutions for the island states of the Pacific.

PISCES and the ILRP project will leverage Hawaii’s unique resources and put the state at the center of international and multilateral efforts to advance science and technology. PSA supports the maximally inclusive international scope of this project, and believes that the PISCES / ILRP project will benefit not only the exploration of space, but also lead to new and greater opportunities for sustainable development on Earth, and for all nations.

PSA strongly supports the State of Hawaii’s PISCES initiative to establish ILRP. We look forward to the project’s success and will encourage our national members to participate in discussions on its goals and operations, as appropriate.

Sincerely,

A handwritten signature in black ink, appearing to read "Burke Burnett". The signature is fluid and cursive, with the first name "Burke" being more prominent than the last name "Burnett".

Burke Burnett
Executive Secretary
Pacific Science Association

KELSO AEROSPACE CONSULTING

2838 Misty Springs

Manvel, Texas 77578

832.628.1730 - E-mail: rkelso54@gmail.com

Monday, February 06, 2012

Senator Will Espero, Chair

Senator Michelle N. Kidani, Vice Chair

Committee on Public Safety, Government Operations, and Military Affairs

Representative Angus L.K. McKelvey, Chair

Representative Isaac W. Choy, Vice Chair

Committee on Economic Revitalization and Business

Support for Pacific International Space Center for Exploration Systems (PISCES)
International Lunar Research Park (ILRP) on Hawai'i Island

Dear Senators Espero and Kidani, and the Committee on Public Safety,
Government Operations, and Military Affairs, and
Representatives McKelvey and Choy, and the Committee on Economic
Revitalization and Business:

I take this opportunity to indicate firm support of the State of Hawaii's efforts in the development and promotion of the Pacific International Space Center for Exploration Systems (PISCES) and the International Lunar Research Park (ILRP) project on Hawai'i Island.

As a member of the ILRP steering committee over the last two years, I am very aware of the potential that these programs/projects bring to both the aerospace community and the State of Hawaii.

As a former NASA senior executive with 38 years of government service, I most recently led NASA's efforts in beyond-Low Earth Orbit (LEO) commercial initiatives. Specifically, I worked with many within the commercial sector that have interest in providing lunar transportation services (landers) and surface robotic mobility systems on the lunar surface. These efforts have grown significantly over the last few years.

Senators Espero and Kidani, and the Committee on Public Safety, Government Operations, and Military Affairs, and
Representatives McKelvey and Choy, and the Committee on Economic Revitalization and Business

February 6, 2012

Page 2

It is clear to me that there is a significant interest in both the commercial and international sector in re-initiating lunar surface exploration for the first time in over 40 years! It is my belief, that we will see some of these commercial groups (example: Google Lunar X-Prize) successfully achieve a lunar landing and surface activity within the next 2-3 years (by late 2014). As such, the opportunity presents itself in providing suitable test locations for pre-mission checkout/validation of these systems prior to launch.

Further, having been a key part of NASA's assessment in regard to testing key technologies on the Moon (like in-situ resource utilization (ISRU)), there will be a growing need to continue to expand NASA's testing of these technologies in field sites having suitable environments/analogues leading to launch.

With the State of Hawai'i providing the "outer ring" of infrastructure/support capabilities at the ILRP test site, the aerospace community (international, commercial, NASA) can supply the "demand " for the site with its robotic systems and associated prototyping hardware. ILRP could become a state-of-the-art test site serving and supporting the emergence of world-wide demand in space exploration.

The ILRP program at the University of Hawai'i at Hilo Science and Technology Park represents Hawai'i County's significant strengths, assets and aspirations. It also represents an important addition to Hawai'i Island's emerging innovation economy.

The combination of our unique natural resources and gifted communities has created the premier environment for world class exploration and research. Complementing the existing observatory community, the new Thirty Meter Telescope project, the University of Hawai'i at Hilo's new Sciences and Technology facility, 'Imiloa Astronomy Center, and the United States Pacific Basin Agricultural Research Center, the ILRP will provide the community an industry that will:

Senators Espero and Kidani, and the Committee on Public Safety, Government Operations, and Military Affairs, and Representatives McKelvey and Choy, and the Committee on Economic Revitalization and Business

February 6, 2012, 2012

Page 3

- Attract companies engaged in clean, high-tech research and development activities in aerospace, renewable energy and sustainable agriculture;
- Attract investment that will help to leverage costs of expanding Hawai'i Island's broadband capacity;
- Create high-paying 21st century jobs that are designed to support the ILRP, jobs that cannot be outsourced overseas;
- Create new revenue streams through research and commercial development that will grow our knowledge industry; and
- Support STEM education for Hawai'i Island and for the State.

Besides the direct economic benefits listed above, this project will help to attract visitors drawn to Hawai'i Island's edu-tourism offerings and the meetings and convention market; and build the Island's and the State's reputation as an international leader in collaborative research and educational excellence.

Thank you for the opportunity to express support for this important project. I humbly ask that the Hawai'i State Legislature provide support for the development of the International Lunar Research Park on Hawai'i Island.

Respectfully yours,

Robert M. Kelso

ROBERT M. KELSO
President

February 5, 2012

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

Dear Jim,

I am writing to voice my strong support for two interlinked initiatives in the State of Hawaii, namely the Pacific International Space Center for Exploration Systems (PISCES) and efforts to establish an International Lunar Research Park (i-LRP) analog facility as a component of this Center – both on the Big Island of Hawaii. Once fully developed, I believe these important initiatives will provide substantial global as well as local scientific, educational and economic opportunities and benefits.

Over the past two decades, the Japan-U.S. Science, Technology & Space Applications Program (JUSTSAP), for which I served as Chairman (from 2003 - 2010), has worked closely with the Hawaii State Government to spawn a broad range of innovative projects promoting advanced satellite communications, remote sensing for disaster management, microgravity research, the development of solar-powered alternative energy systems, etc., benefiting communities within the Asia-Pacific region.

I also had the pleasure of overseeing the creation of PISCES, the most recent brainchild of JUSTSAP, which is now being developed in Hawaii as an international center for space related research and development, aerospace education, professional training, and the formulation of collaborative multinational space exploration missions. All of these programs have engaged the substantial scientific and technological expertise resident statewide to promote collaborative research and educational partnerships with University of Hawaii faculty and students, as well as with local business entrepreneurs.

PISCES has already demonstrated its ability to secure NASA contracts over the last few years, especially as a test bed for both robotic as well as longer-term human space exploration. Continued State support for PISCES (and the proposed i-LRP within PISCES) should enable this facility to attract sufficient external funding to make it self-sufficient within the next 1-3 years. One specific and highly visible benefit will be the development and testing of advanced robotics necessary for most future space exploration programs. This should help strengthen and advance our nation's competitive position in this critical technology.

From a local perspective, support for these interrelated initiatives will also generate substantial benefits to the State, including high-expertise jobs and development of a vibrant aerospace industry in Hawaii embracing an “arc of technologies” (including world class astronomy; commercial space transportation; supercomputing/ IT/informatics; robotics with space, marine and terrestrial applications; advanced telecommunications; and next generation aviation). Although it is difficult to quantify the benefits of a \$1 million investment in PISCES/i-LRP for fiscal 2013, the payback will probably be in the order of 10+ times over the next few years, and therefore should provide an attractive investment opportunity for the Hawaii Legislature to consider.

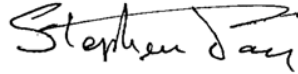
International Ventures, 5333 Potomac Ave. NW. Washington, DC 20016

Looking to the future, innovative programs like PISCES and the proposed i-LRP will be able to leverage Hawaii's diverse natural resources, abundant scientific and technological expertise, unique geographical terrain, and strategic mid-Pacific location to support the development and implementation of pioneering global space missions, including Earth orbiting systems supporting global communications and space-based observations of our planet, as well as robotic and manned missions to the Moon, Mars, and other solar system bodies.

Collectively, I believe such efforts will provide a broad range of scientific, economic, and educational opportunities to help grow Hawaii's research and development infrastructure, expand and diversify private sector initiatives in aerospace-related technologies, enhance secondary and college-level training and mentorship programs in advanced mathematics, engineering and science disciplines; and ultimately strengthen Hawaii's role as a significant participant in space related technologies and exploration.

I wish you and your colleagues every success as you continue to champion Hawaii's expanding potential in aerospace!

Sincerely,



Stephen M. D. Day.

Chairman emeritus, JUSTSAP

President, International Ventures

Member of the Hawaii Aerospace Advisory Committee (HAAC).

4 February 2012

PISCES and ILRP Letter of Support

To whom it may concern,

I participated in the International Lunar Research Park (ILRP) Workshop in San Jose, California (04/05/11) and the Leaders' Summit in Waikoloa, Hawaii (11/13-17/11) to help define a viable concept for permanent human and economic expansion from geosynchronous orbit out to and including the Moon. An ILRP, integrated with commercial lunar development activities in the planning stage, provides the opportunity to reduce individual country, corporate, and personal cost to travel to, explore, and use the Moon through shared reusable cislunar transportation systems, habitation and laboratory facilities, surface vehicles, and utilities. Therefore, I wish to add my personal support for the PISCES organization and its efforts related to the ILRP project.

The first step in realizing the ILRP on the Moon is to emplace an Earth analog site where lunar systems from around the world can be tested individually and as part of an integrated operational construct. Hawaii offers a unique mix of lunar analog environments, educational facilities, accessibility, and labor force that can provide the backbone of the first ILRP analog.

An ILRP analog site linked to a future Moon base will be inspirational to the Hawaiian youth, giving them hope for a brighter future, encouraging them to higher educational and professional goals, and offers immediate local job opportunities upon graduation as well as to supporting industries.

Local jobs will be created in construction, transportation, science, technology, education, training, media, and other vocations as the ILRP analog site is developed, new educational facilities are constructed, crew and equipment is moved between locations, and activities are filmed and broadcast worldwide. In addition, tourism related jobs are increased as ILRP participants will likely bring their families during their planned activities at the site and, as other high-tech endeavors show, the ILRP will itself become a tourist draw.

Lunar and other exploration missions will benefit through reduced mission risk and cost as hardware from various nations and organizations are initially tested and integrated into a broader system of systems before ever leaving Earth.

I believe the ILRP, integrated with Bigelow Aerospace (lunar habitats) and Shackleton Energy Company (lunar ice mining and propellant production), can benefit NASA, JAXA, ESA, RSA, ISRO, and other national space agencies by becoming a stepping stone from Earth to the Moon as mankind extends its economic sphere to include all cislunar space.



Dallas Bienhoff

Dallas is a project manager at The Boeing Company focused on human exploration mission definition, in-space transportation system conceptualization, and surface systems development. The opinions expressed in this email are his own and do not reflect the position of The Boeing Company.

Dallas Bienhoff
In-Space & Surface Systems
The Boeing Company
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Skycorp Incorporated
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Mountain View, CA 94041
310-403-1346
www.skycorpinc.com
wingod@skycorpinc.com
wingod@earthlink.net

February 4, 2011

To: Jim Crisafulli, Director - Hawaii Office of Aerospace Development
From: Dennis Wingo, CEO Skycorp Incorporated
Subject: Letter in Support of PISCES and the International Lunar Research Park

Dear Jim,

I would like to express my company's support for the ideals and goals of the International Lunar Research Park (ILRP) at the Pacific International Space Center for Exploration Systems (PISCES).

Skycorp Incorporated strongly supports the ideals and vision of the ILRP:

To establish (at PISCES) the world's premiere environment for collaborative development, testing and evaluation of space systems for use on the Moon, Mars, and other extraterrestrial bodies, thereby expanding Earth's economic sphere and advancing science, education and the creation of new technologies for terrestrial application, all of which, in turn, will produce substantial benefits for the people of Hawaii.

I would first like to emphasize the terrestrial applications of the developments that will most certainly spring forth from the ILRP effort. Automation and robotics is the wave of the future. Today robotics is exploding as a discipline in a manner largely unreported in the press. Most certainly we have all seen robots welding cars in Detroit or Japan, but the robotics revolution goes far beyond these large industrial robots.

Robotics technologies are being used today for the most delicate eye surgery, and the robots doing this are controlled over the Internet. The value to Hawaii is large in that in surgeries where there is no local island expertise, lives can be saved through these remote operations. Of course, these sophisticated robots must be maintained, which in turn creates high paying technical jobs in the local economy.

An extension of robotics is 3D printing. Three-dimensional printers are devices that take raw materials and directly "print" parts. These parts can today be made from plastics, metals, wood pulp and other materials. This technology is in its nascent stage, but its value is already being proven in the world of small manufacturing. The value to the Hawaiian economy could be enormous, as the high cost of shipping impacts virtually every person on the island. Think of replacement parts that could be made locally, using local materials to replace parts in machines, appliances, cars, or other devices that otherwise would have to be shipped at great expense from distant host countries. Not

only would this help lower shipping costs for Hawaii consumers, but also help foster local cottage manufacturing industry for those who design, build, operate, and maintain such systems.

There is a resource that Hawaii has more than just about any other place in the world – volcanic rock. Work being undertaken by NASA, industry, and international partners use Hawaiian volcanic rock as a simulant for lunar rocks in developing processes to extract oxygen and metals from these rocks. These efforts could help turn the most plentiful resource in the Hawaiian Islands into feedstock for 3D printing and other industries statewide.

All of these technologies will be tested at the ILRP, and constitute only a representative sample of what lies ahead in the near future. For both NASA and international partners, the Hawaiian volcanic landscape offers a rough simulation of the environment that we expect to encounter on the Moon and Mars. It is also a centralized and desirable location for international partners to bring their equipment to Hawaii for development and testing. This in turn facilitates a brain trust of world leaders in robotics that universities in the islands can utilize for training future leaders in this effort. The best part of the equation is that Hawaii, in a manner of speaking, is conceptually similar to the economic development of the Moon – a locality logistically far from the main planetary economy that, to be maximally successful, must leverage local resources to bolster the local economy and grow more self sufficient.

Skycorp Incorporated, through its sister company Greentrail Energy Inc. is proposing a means whereby to accelerate this development.



Figure 1: GSW-7000 Providing Power and Communications in Arizona Desert 2010

Figure 1 shows the GTE GSW-7000 in operation at the NASA Desert RATS event in September of 2010. This device is a self-contained trailer that is capable of generating up to 4.4 kilowatts of power from the sun and 2.4 kilowatts of power from wind energy.

The GSW-7000 has proven itself in NASA remote operations in the desert of Arizona in providing power and communications (through our smaller GSC-1000 on the right), which provided NASA Ames Center Director Dr. Pete Worden with the opportunity to remotely pilot a NASA rover in the desert from his office at Moffett Field, California. We also would like to bring these advanced capabilities to the ILRP in Hawaii. In keeping with the Hawaiian philosophy of limiting permanent changes to the landscape of the islands, this system is fully self-contained and requires no permanent infrastructure (after removal from a site, no trace remains of its presence).

As Skycorp CEO I have mentored many students over my career, and continue to do so. We will extend this assistance to Hawaii to provide talented science and engineering students with opportunities to work, understand, and incorporate lessons learned from practical field experiences into their educational development. This will help nurture a cadre of trained engineers and scientists in the islands who will not have to leave the State in order to reach their full potential in science and technology.

In my last trip to Hawaii, I read of the last king of the islands who brought many of the world's latest advances to Hawaii for the benefit of its people. The work of your local community on the ILRP is a fine addition to that tradition of forward thinking, which ultimately can position your State and its people to be a major contributor toward improving our qualities of life around the world.

Sincerely

Dennis Wingo

Dennis Wingo

CEO

Skycorp Incorporated



January 18, 2012

Senator Will Espero, Chair
Senator Michelle N. Kidani, Vice Chair
Committee on Public Safety, Government Operations, and Military Affairs

Representative Angus L.K. McKelvey, Chair
Representative Isaac W. Choy, Vice Chair
Committee on Economic Revitalization and Business

**RE: Pacific International Space Center for Exploration Systems
(PISCES)/International Lunar Research Park on Hawaii Island**

Dear Sirs/Madams:

W. H. Shipman, Limited is a Kama'aina corporation with a history of 130 years on the Island of Hawaii. We support carefully planned economic growth of the Island and the State. Our ever-growing population has an increasing need for quality jobs in a safe and clean environment.

Long term economic well being for our islands is based on a number of factors that we all know well including a strengthening agricultural sector increasingly able to support our population's needs. It also includes a careful embrace of those industries where our unique location and culture are a particular fit.

One such industry is astronomy and sciences dealing with space and its exploration. We can expect dynamic growth in this arena as governments and industry work increasingly closely in coming years. In this State, and particularly on this Island, we have a significant location advantage over other competitors. Our location in the mid pacific near the equator residing in a dynamic and open economic environment is a combination that will provide particular efficiencies to the industry. At the same time this industry will provide high quality, well paying jobs available to a wide spectrum of our population.

In a community already moving rapidly to fill the requirements of this industry, we ask for your support for the International Lunar Research Park to be located in East Hawaii.

Sincerely,

Bill Walter

Bill Walter
President



February 6, 2012

Jim Crisafulli, Director
Office of Aerospace Development and
Hawaii Aerospace Advisory Committee Secretariat
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Aloha Jim!

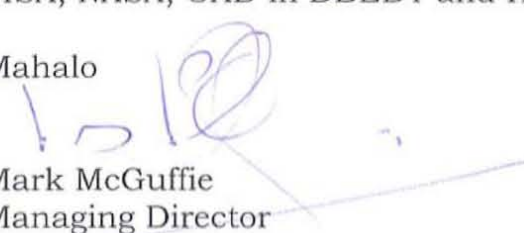
This letter serves as my enthusiastic support for the development of both PISCES and the ILRP here in Hawai'i. PISCES, has already demonstrated many aspects of critical acclaim, by discovering technologies that aid in system design, for uses here on Earth for food and energy security and for survival in places such as the Moon and Mars.

Expanding PISCES and incorporating the ILRP will attract companies engaged in clean, high-tech research and development activities in diverse areas, including aerospace, renewable energy, sustainable agriculture and robotics. There is the possibility to produce new revenue streams, generated through research and commercial development that will help grow Hawaii's knowledge-based industries.

As a member of the Hawai'i Aerospace Advisory Committee, it is an aspiration that the private sector with the collaboration of local communities, State of Hawai'i, academia and federal agencies, engage in furthering these unique opportunities for the people of our state and our country. The process to arrive at solutions is not only the technologies themselves, but about what we value and how we collaborate together – *inclusively*.

Thank you for all the work you are doing to move these initiatives forward through PISA, NASA, OAD in DBEDT and HAAC – and keeping us focused on our mission.

Mahalo


Mark McGuffie
Managing Director



U N I V E R S I T Y O F H A W A I I ' I A T M Ā N O A

Institute for Astronomy

February 6, 2012

Jim Crisafulli, Director
Office of Aerospace Development and
Hawaii Aerospace Advisory Committee Secretariat
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Dear Mr. Crisafulli

I am writing you this letter to express my support of the State of Hawaii's efforts to develop and promote the University of Hawaii-Hilo's Pacific International Space Center for Exploration Systems (PISCES) and its future Prototype remote surface analog facility supporting the evolution of an International Lunar Research Park (ILRP).

Because the PISCES/ILRP initiative combines public and private partnerships this program offers high potential to support and invigorate aerospace as well as other emerging high-tech based industries throughout the state. By attracting companies engaged in clean, high-tech research and development activities in diverse areas, including but not limited to aerospace, renewable energy and sustainable agriculture, we can generate new revenue streams through research and commercial development. This is especially important due to the loss of tax credits and other incentives for high-tech growth in Hawaii

The PISCES/ILRP initiative also promotes educational and community outreach programs in science, technology, engineering and mathematics (STEM), which aligns with President Obama's goals for America's space program and helps prepare Hawaii's students for high-paying 21st century jobs right here at home.

I applaud the hard work of the Hawaii Office of Aerospace Development and your commitment to the expansion of Hawaii's global leadership in space science and exploration. It is amazing what you accomplish with such limited resources. I strongly urge Hawaii's legislative and executive branches to fully fund your office so Hawaii may realize the potential economic diversity of initiatives like PISCES/ILRP, which are so badly needed.

Sincerely,



Michael Maberry
Assistant Director

From: mailinglist@capitol.hawaii.gov [mailto:mailinglist@capitol.hawaii.gov]
Sent: Friday, February 24, 2012 8:28 AM
To: ERBtestimony@capitol.hawaii.gov
Cc: Henley, Mark W
Subject: Testimony for HB2873 on 2/27/2012 1:00 PM

Testimony for HB2873 HD1

Conference room: 312
Testifier position: Support
Testifier will be present: No
Submitted by: Mark Henley
Organization: Individual
E-mail: Mark.W.Henley@Boeing.com
Submitted on: 2/24/2012

Comments:

Dear State Representatives,

I am writing another private note to again thank you for helping start the Pacific International Space Center for Exploration Systems, and to encourage you to help PISCES grow, including a Space Research and Technology Park. I work for Boeing Research and Technology, a major Aerospace Company which has also supported some of my own efforts to help develop PISCES, but I am writing as a private citizen and a part-time resident of Hawaii.

PISCES offers unique promise to bring together many nations of the Pacific Rim in the best place on Earth to simulate robotic and human space exploration technologies for lunar and planetary surface operation.

PISCES also offers a track to encourage education as well as future employment for the youth of Hawaii in growing high tech industries, motivated and building upon the foundation of PISCES and the associated Research and Technology Park

Please also recognize Jim Crisafulli's incredible drive to help Hawaii enter the Space Age. The State Office of Aerospace Development DBEDT is the best organization to manage PISCES at this time, while continuing strong involvement of the University of Hawaii (including both Hilo and Manoa representatives), but also increasing the involvement of space industry and commercial entrepreneurship.

Thank you again,

Mark Henley

National Aeronautics and Space Administration
Kennedy Space Center
Kennedy Space Center, FL 32899



Reply to Attn of: NE-P

March 3, 2010

TO: Dr. John Hamilton, PISCES, University of Hawaii Hilo
FROM: NE-P/ Space Resources Utilization Project Manager
SUBJECT: PISCES Support for 2010 ISRU Field Test

The 2010 International Lunar Surface Operations and In-Situ Resource Utilization (ILSO/ISRU) Field Test on Mauna Kea, Hawaii, was a resounding success. The test advanced the readiness of critical pieces of space technology and demonstrated a level of technology integration that was far greater than had previously been achieved. That success was due to the dedication of multiple organizations and their personnel, but especially the Pacific International Space Center for Exploration Systems (PISCES)

Through PISCES we were able to access a unique test area that has many characteristics of the lunar surface. This allowed us to test a prototype system to produce oxygen on the Moon because the volcanic tephra deposits at the test site were very similar to the mineralogy of the regolith found on the Moon. Not only did the test site have the needed minerals, the altitude of the test site allowed us to obtain higher levels of solar flux than we can obtain at NASA Field Centers. This boosted the oxygen yield of the system under test which uses the power of the sun to provide the energy necessary to produce oxygen.

In addition to our oxygen production system we also were able to test a prototype system that will search for water at the poles of the Moon and also the mid-latitudes on Mars. The system, named RESOLVE (Regolith and Environmental Science & Oxygen and Lunar Volatiles Extraction), will drive around on the moon and extract numerous core samples which will be analyzed by the payload's instruments to help NASA determine if we can obtain usable quantities of water to enable exploration beyond low earth orbit. Finding usable water on the Moon and Mars will fundamentally change our exploration architectures. No longer will we have to launch everything we need for a mission on our launch vehicles. Instead, we will be able to refuel our space exploration vehicles at our destination. This will save billions of dollars.

Let me close by saying that I want to express my heartfelt appreciation for the contributions that you and the PISCES team made to the 2010 field test. The spirit of cooperation and excitement shown by your team was an important element that helped us all succeed. I wish you success in your efforts to obtain continued support from the State of Hawaii so that NASA's ISRU project can return to the Big Island for future field tests as we move closer and

closer to the day when we will change the way we explore space. When that day arrives, PISCES and Hawaii will have played an important role in enabling the use of space resources.

Warmest regards,

A handwritten signature in blue ink that reads "William E. Larson". The signature is written in a cursive style with a prominent initial "W" and a long, sweeping underline.

William E. Larson

February 3, 2012

To Whom It May Concern:

Northern Centre for Advanced Technology Inc (NORCAT) would like to recognize the positive contributions of PISCES (the Pacific International Space Center for Exploration Systems) in promoting education, research and technology advancement on the Island of Hawai'i.

NORCAT recognizes that PISCES and its International Lunar Research Park project could be an economic development opportunity for the State of Hawaii which could attract companies engaged in clean, high-tech research and development in sustainable energy, sustainable agriculture and in recycling technologies. PISCES should be tasked with providing the nucleus of a 21st century technology research park based in Hilo. We believe this park has the potential to attract corporations which could provide and support an increased need for broadband service, to create high-tech jobs for the future and engage Hawaii's unique resources and skill-sets. It can also create new revenue streams for scientific research and commercial applications.

As such we support efforts by the State of Hawaii to increase the effectiveness of PISCES via pending legislation such as HB 2873 and HB 2145.

Yours truly,

A handwritten signature in blue ink, appearing to read 'Dale Boucher', with a long horizontal flourish extending to the right.

Dale Boucher
Senior Director, Innovation and Development

6 February 2012

Letter of Support for PISCES and
The International Lunar Research Park

To whom it may concern,

I recently had the opportunity to attend the International Lunar Research Park (ILRP) Leader's Summit at Waikoloa, Hawaii the week of November 13, 2011. The goal of the ILRP Leader's Summit was to investigate ways to move the ILRP and PISCES forward toward becoming a true multi-national, industrial-academic partnership. This was accomplished by sharing experiences in international consortiums gained by attendees from a wide variety of backgrounds, including the US State Department, the Pacific Science Association, the Japan Aerospace Exploration Agency, NASA, the University of Hawaii, and over twenty potential industrial partners.

During the course of this conference, several noteworthy announcements were made by the participants. These included a visionary dream of the Shimizu Corporation to create solar panels on the surface of the Moon to beam power to Earth, and the intent of two US companies, Moon Express and Shackleton Energy, to begin industrial operations on the Moon. These announcements present Hawaii with a unique opportunity to leap to the forefront of this wave of research, technology and industrial development. By taking the lead with the ILRP, Hawaii has the chance to generate dramatic economic growth and become the focal point of a new high-tech region similar to Silicon Valley.

As an example of this type of economic growth, let me describe my experiences with the World's leading research consortium, the Advanced Manufacturing Research Centre (AMRC) in Sheffield, England. The AMRC is the anchor tenant for the Advanced Manufacturing Park, the site of a now defunct coal mine.

After the collapse of UK Coal in 1980, Sheffield became an economically impoverished region. In 2001, with the aid of Boeing, the University of Sheffield created the AMRC, with a staff of 6 people in a vacant warehouse. By the end of 2011 (after only 10 years), the AMRC has grown to a world renowned research center, with 70 industrial partners and a staff of over 200, which is expected to double in the next 2 years. Their partners include Boeing, Rolls-Royce, BAE Systems, Messier-Dowty, ALCOA, TiMet, and Carpenter Steels. Their 200 staff members are mostly engineering graduates with PhDs and Masters Degrees, earning substantial salaries. They have won over \$300 MILLION in research grants over their 10 year existence.

The AMRC is now housed in 3 new, purpose-built buildings, with 3 more under construction, for a total under-roof area of 180,000 square feet. These include a new Knowledge Transfer Centre, and an Apprentice Training Centre, both of which are aimed at continuing to improve the Yorkshire region's competitive economic standing. In addition, more than a dozen companies have moved onto the AMP. Rolls-Royce has recently announced plans to build 2 new factories on the AMP, with plans to employ over 300 people at this site.

The AMRC has also had a tremendous effect on the University of Sheffield. Always known for its fine cutting tools, the University's faculty now ranks NUMBER 2 in the UK, ahead of such prestigious institutions as Oxford and Cambridge. The AMRC brings over \$25 Million of research funds to the University, and in 2009 was awarded the Queen's Anniversary Prize, which led to Her Majesty's recent visit to the AMRC (only the second time a Monarch has visited Sheffield).

With the AMRC as its guide, the International Lunar Research Park could likewise vault Hawaii and the University of Hawaii to the forefront of a variety of technological fields, including tele-operated robotics, remote site material processing, telecommunications, low cost sustainable solar energy, astronaut & crew training and a variety of science and mathematics disciplines. The potential for job creation in these high tech fields, as well as construction and infrastructure support is extremely large. Transportation and entertainment sectors will likewise benefit, as a host of international partners' employees and representatives make Hawaii their preferred vacation spot. Image the impact if, after ten years, the ILRP and PISCES are able to bring \$100 Million to the State of Hawaii.

I believe the ILRP and PISCES are crucial to the economic development of a high-technology sector in Hawaii, as well as for the development of Lunar Commerce. This Lunar Commerce has the potential to create massive economic benefit to the world, and could provide a clean, continuous source of Space Based Solar Power (the only truly green energy source).

Finally, with the vision of Mālama Hawai'i (caring for and protecting Hawai'i) and Mālama Honua (for the Earth), the Hawaiian people can again navigate the stars by leading the way back to the Moon.

Mahalo nui loa!

David Heck

David Heck

David Heck is an Associate Technical Fellow at The Boeing Company on the Manufacturing Technology Team and works with several domestic and international research consortiums to develop new manufacturing technology for the aerospace industry.

The opinions expressed in this document are his own and do not reflect the position of The Boeing Company

David Heck
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Phone: +27 74 117 4494

19 January 2012

To whom it may concern

SASRA supports the PISCES International Lunar Research Park

The South African Space Resources Association (SASRA) finds much merit in the PISCES International Lunar Research Park (ILRP) concept. It will serve as a vessel for the development of existing and new technologies enabling energy and space mining techniques, with potential for significant Earth-based benefits.

Despite being geographically distanced from South Africa, PISCES have demonstrated they are capable of fostering collaboration with our country. Having partaken in one of the PISCES teleoperations demonstrations, SASRA is reassured we can contribute remote experiments to the ILRP.

South Africa has a long and successful history of mining and associated technologies and engineering, while growing its participation in space activities. These will certainly be assets for future involvement in the ILRP.

We support the planning and build-out of such a commercial research and development park as the first important step in incorporating the moon into the Earth's economic sphere.

Yours truly

2012/01/19

X 

Michael Neale
SASRA President
Signed by: Michael Neale

With support of the SASRA executive committee:
Johan Kruger
JJ Mare
Miguel Coelho
Theo Ireton
Bernhardt Garlipp

HONEYBEE ROBOTICS 
Spacecraft Mechanisms Corporation

John Hamilton
Deputy Director, PISCES

6 February 2012

Dear John,

Over the past few year PISCES has proven itself to be instrumental to the success of the Lunar-focused field campaigns and in promoting of the space exploration. I strongly support the work PISCES has done in the past, and in addition I strongly support its further activities as well as establishing of the exciting new venture: the International Lunar Research Park (ILRP).



Kris Zacny, PhD

PISCES Advisory Board member.

Kris Zacny, PhD
Vice President
Director, Exploration Technology Group

Honeybee Robotics Spacecraft Mechanisms Corporation
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E-mail: sales@ARGOutv.com

Corporate E-mail Signature

February, 2011

Dear Mr. Hamilton,

I would like to formally offer our thanks for the support you and your team provided during the analog deployment missions in November 2008 and January 2010. The test site that PISCES facilitated was an ideal location for us to test and develop our rovers. The natural terrain that we found at the work site is an important contribution to our work in developing lunar mobility platforms. Additionally, the logistical support made our lives much easier and enabled us to complete all of our test objectives.

It was also great to learn so much about Hawaii. Both Christian and you gave us a much deeper insight into Hawaiian culture and history than we would have received without such great ambassadors.

We look forward to working with your organization in the future.

Aloha,

Peter Visscher

Space/Robotics Program Manager



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Extreme Off-Road Performance

February 3, 2012

Representative Calvin K. Y. Say
Representative Angus L. K. McKelvey
Representative Jerry L. Chang
Representative Cindy Evans
Representative Mark M. Nakashima
Representative Cliff Tsuji

Aloha,

My name is Rodrigo Romo, I have been living in Hilo for almost 6 years now. Shortly after my family and I moved here, we had the honor to meet some of the people involved with The Pacific International Space Center for Exploration Systems (PISCES). Having worked for five years at the Biosphere 2 project in Arizona, and being a member of the second crew that resided inside, I see PISCES as an unparalleled opportunity to promote education, research and technology advancement on the Island of Hawai'i.

I strongly believe that PISCES and its International Lunar Research Park project will be an economic development opportunity for the County of Hawai'i and State that could attract companies engaged in clean, high-tech research and development in sustainable energy, sustainable agriculture and in recycling technologies. It is ventures like this what the Big Island needs to further diversify its employment potential. PISCES has worked closely with local High Schools in teaching the local youth the opportunities that exist in high tech careers, this project would set a leading project in Hawai'i's own back yard.

I strongly endorse and support the efforts by the State of Hawaii to increase the effectiveness of PISCES via pending legislation such as HB 2873 and HB 2145.

Sincerely,

Rodrigo F.V. Romo, Ch.E., MBA
Vice President Engineering
Zeta Corporation
1445 Waianuenue Ave
Hilo HI

February 3, 2012

Representative Calvin K. Y. Say
Representative Angus L. K. McKelvey
Representative Jerry L. Chang
Representative Cindy Evans
Representative Mark M. Nakashima
Representative Clift Tsuji

Aloha,

My name is Charlotte Romo, my husband and I decided to move to Hilo six years ago. We both participated in the Biosphere 2 project in Arizona. I am a Science High School teacher now at Hilo High. We met people from the Pacific International Space Center for Exploration Systems (PISCES) a few years ago and we have shared many positive experiences with them. As a High School teacher I see PISCES as an unparalleled opportunity to promote education, research and technology advancement on the Island of Hawai'i. Members of PISCES have come to my classroom to talk to my students about the opportunities available to them right here in space exploration, they allowed my students to experiment with a remote controlled NASA rover. These unique opportunities would not have been available to my students if it weren't for PISCES.

I strongly believe that PISCES and its International Lunar Research Park project will be an economic development and educational opportunity for the County of Hawai'i and State that could attract companies engaged in clean, high-tech research and development in sustainable energy, sustainable agriculture and in recycling technologies.

I strongly endorse and support the efforts by the State of Hawaii to increase the effectiveness of PISCES via pending legislation such as HB 2873 and HB 2145.

Sincerely,

Charlotte Romo
High School Science Teacher
Hilo High School
1445 Waianuenue Ave
Hilo HI

February 5, 2012

Hello Mr Bland and Mr Todome, and thank you very much for your interesting emails about PISCES, ILRP and JAMMS.

Regarding PISCES and I have been discussing this within our team and I can report back to you that we are most definitely interested to look further into the opportunity of making use of that facility. We have heard in the past that it is a very good lunar analog site and it's also in a relatively convenient location for our Japanese team, which is responsible for our rover developments. Our team's long term strategy is to conduct the final qualification testing of our lunar surface elements (i.e. lander + rover) at such an analog site. If all goes well with our technology developments and fund-raising, we would be in a position to undertake such tests some time in late 2013 I think.

The chances are high that we will have at least one attendee at the GLEX since it will take place directly before the GLXP Team Summit which we plan to attend. That might be a good opportunity to explore the PISCES cooperation further.

Regarding ILRP too, I would certainly be willing to discuss how we could support your vision in the European aerospace community.

Finally, I was very happy to receive the contact from Mr Todome from JAMMS. As you might know, in Japan we are currently working hard to raise the profile of White Label Space, as well as lunar exploration and science in general. We would be quite interested to explore what type of cooperation would be possible with JAMMS in these areas.

Best regards,
Andrew

Andrew Barton
Chairman, White Label Space Foundation
email: andrew.barton@whitelabelspace.com
tel: +31 615867626
<http://www.whitelabelspace.com>

**Testimony Presented Before the
Senate Committees on
Ways and Means
March 29, 2012 at 9:00 a.m.**

**by
John C. Hamilton
Deputy Director, PISCES**

HB2873HD2SD1 RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS

Chair Senator David Ige, Vice-Chairs Senator Michelle Kidani and Members of the Committees,

Aloha. I am John Hamilton, currently serving as Deputy Director of PISCES. I am testifying in favor of HB 2873 relating to the Pacific International Space Center for Exploration Systems.

This bill is essential to the further growth of PISCES and the entire aerospace surface systems testing and development industry in Hawai'i. My comments also apply to these related bills HB 2145 (relating to Economic Development), HB 2319 (relating to Economic Development) and HB 2872 (relating to Aerospace High Technology Districts).

I have served with PISCES¹ since its creation in 2007², first as Research Operations Manager and now as Deputy Director. During this time, PISCES has successfully led two major analog field tests with NASA and partner agencies (Canadian Space Agency, CSA and German Aerospace Agency, DLR) and companies (e.g. Michelin, Orbitec, Norcat). PISCES has also conducted smaller tests with other individual companies and universities, participated in national and international conferences, workshops and symposia, and presented at APEC with interisland and international remote internet controlled NASA robotic rovers at our field test site on the Island of Hawai'i. Our team has garnered the attention of the press nationally (Aviation Week and Space Technology) and internationally (Canada, Chile, South Africa). PISCES has received an individual total of 8 NASA Group Achievement Awards. (I hold 3 of these). "This prestigious NASA certificate is awarded to any combination of Government and/or non-Government individuals for an outstanding group accomplishment that has contributed substantially to NASA's mission".³ Due to our record of past successes, we have been selected to host the 3rd International ISRU (*In-situ* Resource Utilization) and Human and Robotic Systems Test this summer.

PISCES has earned the credentials, expertise and the requisite professional network for moving forward in a manner that will rapidly establish an industrial applied research and development cluster uniquely focused on the core technologies for ISRU and surface systems. This cluster will not only include a sub-sector of the traditional aerospace industry (Boeing, Lockheed) and the "new space" companies (Astrobotics, Sierra Nevada, Space-X) but will also include non-aerospace industries

representing the broadband/software/communications market (Google, Neptec), energy collection, generation and storage (Physical Sciences Inc., Aerospace Research Corp., Sky Corp.), superconducting technologies (Flexure), mining and processing (Norcat, SASRA, Hatch), non-petroleum based fuels (Orbitec), robotics (Honeybee, MDA Corp., Michelin), construction equipment (Caterpillar, Kamatsu, Kawasaki Heavy Industries) and management (Battelle). Even agriculture technologies are a needed component for long duration space flights and eventual manned Lunar and Martian surface facilities. It is quite evident that this is not all “Rocket Science”! Applied research and multiple development stages will produce commercially viable, marketable products, techniques and patents along the pathway between the now proven concept tests and the final production systems.

Our current business plan was crafted by over 70 industry representatives at our Leaders Summit conference last November. These participants included global partners such as the Japan Space Agency (JAXA) and the Kazakhstan Space Agency (home to the Russian launch facility Baikonur) as well as private organizations like the Google Lunar-X Prize Foundation. This plan represents the consensus analysis of what PISCES would need to possess along with a sound operational model so that a core minimum infrastructure could be developed. This would then allow direct and immediate participation of industry and government and NGOs in the vitally needed validation and verification areas. This proposed Technology Acceleration Program and a Regional Innovation Cluster for Aerospace and Surface Systems will be able to garner customers world-wide from each of these economic sectors.

This research and development technology park (of which PISCES will be both manager and lead participant) represents a clear value to the Big Island economy with multiple new companies (most of which do not compete with or duplicate services of existing local companies). The real potential for job creation across all sectors from support, supply to the desired high-tech workforce development is crucial and needed immediately for our State (and Big Island) economy. This urgency is doubly reinforced by the global timelines imposed by the rapidly expanding new space industry and their soon-to-be-met benchmark goals. The ground testing for the Lunar-X Prize teams, the development of lunar industrial fuel and water plants and the nationally declared goals of China, Japan, Russian and India to return to the moon with long duration facilities each contain rapidly approaching implementation times. These timelines are the ones for which PISCES and Hawai`i must be prepared. They will not be adjusted to meet our desires.

Today, Hawai`i has this one chance to become the recognized global leader in such an integration and testing facility with a broad customer base. We must start now to prepare for these customers. For if we are not ready to meet their timelines then they will perform this work elsewhere. Hawaii has the advantage now with its access to close proximity high-fidelity analog sites, central geographic location, requisite transportation infrastructure (2 international airports, 2 deep-water ports) and an operational Space Act Annex with NASA allowing their immediate participation and use. It will only take a modest investment in PISCES to link these assets into a project that has great potential and unlimited future growth. This requested State funding support (although not manini) is on the order of the cost of installing traffic light systems in a few intersections (~ \$500K each for design and installation)⁴. The investment in PISCES has a very good potential for returns many times over (not even

considering the secondary economic multipliers on the community businesses). As near term example, during the summer analog test (for which I am the Principle Investigator on the Cooperative Agreement), NASA will spend over \$300,000 on my home island for this 3 week test.

It is for these reasons that the proper home for PISCES is with the Dept of Business, Economic Development and Tourism (DBEDT). PISCES is not and has never been an academic research unit but instead is closely involved with applied research within industry. PISCES main mission is to facilitate the creation and development of technologies for applications both here in Hawaii and elsewhere. The University has the primary mission for education of students. PISCES creates the jobs for the graduates.

In conclusion, I wish to thank the committees for their attention and allowing me to share my mānao with you. Now is the time, Hawai`i is the place. Please support our island, our economy, our workers and our future. Imua!

John Hamilton
Deputy Director, PISCES

¹ <http://pisces.uhh.hawaii.edu/>

² **SB 907**, http://www.capitol.hawaii.gov/session2007/Bills/SB907_CD1_.htm

³ <http://nasapeople.nasa.gov/awards/nasamedals.htm>

⁴ **\$450,000 traffic light cost eyed**. “while the price tag might seem high for one traffic light, city officials insist that's the going rate to design and install such an item.”

http://www.masslive.com/news/index.ssf/2009/02/450000_traffic_light_cost_eyed.html



EP

Feb. 6, 2012

TO: Dr. John Hamilton, PISCES, University of Hawaii Hilo

FROM: NASA JSC-EP/ ISRU Analog Field Test Manager

SUBJECT: PISCES Support for ISRU Analog Field Tests

To prepare hardware and software for future missions in space requires lots of testing. This is especially true for concepts that have never been flown in space. The ability to utilize resources at the site of future robotic and human exploration, known as In-Situ Resource Utilization or ISRU, is an important goal for NASA's human exploration program beyond low Earth orbit. While ISRU holds much promise to reduce the cost and risk of future exploration, it has never been flown in space. Therefore, it requires lots of testing on Earth to increase confidence in its success. One form of testing used by NASA is to test hardware, software, and systems at locations on Earth that replicate the soil, rock distribution, and terrain of the site of future exploration. These 'analog' tests are important since they stress the hardware, engineers, and operations in similar manners as an actual mission would.

In November 2008 and February 2010, NASA performed two International Lunar Surface Operations and In-Situ Resource Utilization (ILSO/ISRU) analog field tests on Mauna Kea, Hawaii that were resounding successes. These tests advanced the readiness of critical pieces of space technology and demonstrated a level of technology integration that was far greater than had previously been achieved. That success was due to the dedication of multiple organizations and their personnel, but especially the Pacific International Space Center for Exploration Systems (PISCES)

Through PISCES we were able to access a unique test area that has many characteristics of the lunar surface. This allowed us to test a prototype system to excavate and produce oxygen on the Moon because the volcanic tephra deposits at the test site were very similar to the mineralogy of the regolith found on the Moon. Not only did the test site have the needed minerals, rock distribution and terrain, the altitude of the test site allowed us to obtain higher levels of solar flux than we can obtain at NASA Field Centers. This boosted the oxygen yield of one of the system under test which used the power of the sun to provide the energy necessary to produce oxygen from the local tephra. In addition, we also were able to test a prototype system that will search for water/ice and other volatiles at the poles of the Moon and also on Mars. The system, named RESOLVE (Regolith and Environmental Science & Oxygen and Lunar Volatiles Extraction), will rove around on the moon and extract numerous core samples which will be analyzed by the payload's instruments to help NASA determine if we can obtain usable quantities of water to enable exploration beyond low earth orbit.

Finding usable water on the Moon and Mars will fundamentally change our exploration architectures. No longer will we have to launch everything we need for a mission on our launch vehicles. Instead, we will be able to refuel our space exploration vehicles at our destination. This will save billions of dollars.

Let me close by saying that I want to express my heartfelt appreciation for the contributions that you and the PISCES team made both the 2008 and 2010 field tests. The spirit of cooperation and excitement shown by your team was an important element that helped us all succeed. I wish you success in your efforts to obtain continued support from the State of Hawaii so that NASA's ISRU project can return to the Big Island for future field tests as we move closer and closer to the day when we will change the way we explore space. When that day arrives, PISCES and Hawaii will have played an important role in enabling the use of space resources.

Sincerely,

A handwritten signature in cursive script, appearing to read "Gerald Sanders". The signature is written in black ink and is positioned above the printed name.

Gerald B. Sanders



Flexure Engineering

4423 Lehigh Road, STE 235
College Park, MD 20740
P: 410-864-8921
F: 443-320-9813

6 February 2012

Christian Andersen
PISCES
Operations Manager
University of Hawaii at Hilo

Dear Mr. Andersen:

Flexure Engineering would like to thank you and John Hamilton for the tour of the lunar analog site on Mauna Kea.

We were impressed with your facility and the overall goals of PISCES. As an aerospace start-up, we understand the need to think big and create a valuable infrastructure for amazing things to happen.

Flexure supports your efforts to bring economic development opportunities to Hawaii through the IRLP. We agree that a research park will motivate both small and large companies to come to Hawaii and collaborate with PISCES to engage in clean, high-tech research and the development of sustainable energy, agriculture, and recycling.

Flexure is also excited about PISCES' focus on outreach and education. We feel that helping future scientists and engineers from grade school through college is crucial to the continued development of our national space program.

I know that I speak for the entire Flexure Executive Team when I say that we are eager to begin collaborating with PISCES and look forward to our future Flexure Office on Mauna Kea!

Please keep us informed of your progress and any opportunities to contribute to your vision!

Sincerely,

Gregory Scharfstein
Owner and Chief Engineer
Flexure Engineering

**Testimony Presented Before the
Senate Committees on
Ways and Means
March 29, 2012 at 9:00 a.m.**

**by
Christian Andersen
Operations Manager, PISCES**

SB 3037, SD2 RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS

Chair Senator David Ige, Vice-Chairs Senator Michelle Kidani and Members of the Committees,

As the Operations Manager for PISCES, a resident of Hawai'i and a native Hawaiian, I support Senate Bill 3037 SD2. In November of 2011, the Office of Aerospace Development held the *ILRP Leaders Summit* in Kailua-Kona. In attendance were NASA directors of Space Commercialization (from Johnson Space Center and Ames Research Center), the CEO of Google Lunar X-Prize, the CEO of ISU, the CEO of Moon Express, the CEO of JAMSS America, Batelle Memorial Institute, Google, Boeing, Lockheed Martin, NORCAT, the Japanese Space Agency (JAXA), Electric Vehicle Control (EVC), Ontario Drive Gear (ODG), MDA Corporation, Shackleton Energy, Shimizu Corporation and many others in attendance. These groups all have interest in joining a research park here in Hilo to work cooperatively on In-Situ Resource Utilization Technologies and related fields. What looks like a concept that is purely space related is in fact rife with direct local applications and benefits to our state. In-Situ Resource Utilization technologies involve energy generation (non-combustive & sustainable), data and power transmission, energy storage, sustainable agriculture, waste processing, and robotics. This provides a local market for these companies here in Hawaii, because ISRU technologies can be applied to the same problems here in Hawaii: energy sustainability, food sustainability, construction, and broadband to name a few. The outcome of the November summit was an updated business plan for PISCES and an action plan to make the research and technology park a reality in Hilo. These plans were the direct result of input from our industry partners at the *ILRP Leaders Summit*. The plan calls for a 3 year buildup of PISCES and needed support infrastructure. Their urgency is a reflection of industry timelines that require PISCES be fully operating by 2015.

House bill 2873 reflects the industry consensus that PISCES needed to be moved out from under UH and into an organization like DBEDT that is structured to promote and foster economic development. To be a successful economic driver, we also need to be funded at levels that will enable us to succeed in our plan. The opportunities that make PISCES and our technology park viable are not going to wait a couple of years; they are coming and are coming fast. We may be the best place in the world for a project of this caliber, but unless we act it is for naught.

From: mailinglist@capitol.hawaii.gov
To: [WAM Testimony](#)
Cc: jcrisafu@dbedt.hawaii.gov
Subject: Testimony for HB2873 on 3/29/2012 9:00:00 AM
Date: Wednesday, March 28, 2012 3:39:36 PM
Attachments: [Letters of Support for PISCES-ILRP \(HB2873\).pdf](#)

Testimony for WAM 3/29/2012 9:00:00 AM HB2873

Conference room: 211
Testifier position: Support
Testifier will be present: Yes
Submitted by: Jim Crisafulli
Organization: Office of Aerospace Development
E-mail: jcrisafu@dbedt.hawaii.gov
Submitted on: 3/28/2012

Comments:

These letters of support on behalf of the Pacific International Space Center for Exploration Systems (PISCES) and the International Lunar Research Park (ILRP) initiative (the subject of HB2873) were submitted to our Office of Aerospace Development, and I'm forwarding these as comments in support of this legislation for the hearing on March 29.

George R. Ariyoshi
Governor of Hawaii
(1973 - 1986)

Welcome Remarks by Gov. George Ariyoshi
ILRP Leaders Summit - Hilton Waikoloa Village
November 14, 2011

Aloha ILRP Summit Delegates!

It is a great pleasure for me to welcome all of you to the 2011 Leaders Summit for the International Lunar Research Park initiative – a most inspiring and visionary program that I believe holds tremendous potential for advancing humankind’s exploration of space.

As you may know, the ILRP concept was initially conceived at last year’s meeting of the Japan-U.S. Science, Technology & Space Applications Program (or JUSTSAP), now known as the Pacific International Space Alliance – a program for which I have served as U.S. Advisor for nearly two decades, and for which Dr. Osamu Odawara, from the Tokyo Institute of Technology, now serves as Chairman.

The 2010 JUSTSAP conference explored opportunities for building sustainable robotic and human settlements beyond low-Earth orbit – a strategic goal set forth in both President Obama’s National Space Policy and the 2010 Congressional NASA Authorization Act. Particular emphasis was given to evaluating both the benefits and challenges to establishing a multinational research park on the Moon that would be developed and operated by a consortium of nations from around the world – aligning common space-faring goals with complementary resources and capabilities to substantially reduce the costs, enhance the benefits, and accelerate the timetables for future space missions

Those deliberations eventually led to the ILRP concept, and ultimately to this Summit – the primary goal of which is to explore how the ILRP vision might be realized in ways that are both cost-effective and achievable within current global economic constraints.

Hawaii has maintained a strong interest in and support for human spaceflight since the Apollo astronauts trained in the islands for their historic missions to the Moon. Looking to the future, I believe our State's strategic mid-Pacific location, unique geographic terrain, world-renowned expertise in planetary geosciences, and long-standing ties with Asia and the Pacific will enable us to advance humankind's spaceward quest through multinational initiatives such as the ILRP.

Most notably, we have established a Pacific International Space Center for Exploration Systems, or PISCES, on this island at the University of Hawaii at Hilo, that is leveraging these strategic assets to develop and evaluate new technologies and integrated systems required for future exploration of the Moon, Mars, and other solar system bodies.

PISCES is being developed through partnerships among industry, academia and governments of space-faring nations around the world, and since its inception has facilitated multinational research and field demonstration programs in Hawaii to test and validate equipment and concepts for utilizing resources on extraterrestrial bodies in ways that will significantly advance humankind's ability to establish sustainable settlements on other worlds.

PISCES will build upon these activities and capabilities to help establish the ILRP terrestrial prototype at the University Research Park in Hilo, which I understand Chancellor Straney from the University of Hawaii at Hilo will be discussing this morning.

I believe the ILRP prototype will be a powerful asset to both our nation and the world in advancing our exploration of space, in part because it will embrace a collaborative vision for this enterprise – one that incorporates the knowledge, resources and capabilities developed through our nation's missions to the Moon, Mars, asteroids and other solar system bodies, along with the substantial experience and achievements of other space-faring nations worldwide, to enable a collectively affordable and sustainable roadmap to space.

The ILRP will also leverage the substantial assets, competencies and entrepreneurial spirit of the private sector in pioneering the space frontier – not only to maximize the opportunities and benefits from exploration and scientific research, but also to facilitate the development and utilization of extraterrestrial resources that can support sustainable settlements beyond low-Earth orbit.

Finally, and perhaps most importantly, the ILRP will enable an inclusive, participatory approach to the exploration and settlement of space that will engage and empower the public to both envision and realize a future that will benefit all humankind, as well as inspire the next generation of scientists, engineers, educators, doctors, lawyers, government leaders, and other key professionals that will enable our spaceward migration.

In summary, I believe the ILRP concept represents a fundamentally new and timely approach to pioneering the space frontier – a cost-effective means toward establishing a permanent human presence beyond Earth that will leverage government funding with both private and international resources to yield substantial scientific, educational and economic benefits “for all mankind”.

I applaud your collective efforts to nurture the spirit of international collaboration that ultimately will enable the ILRP, and wish you every success as you deliberate opportunities to bring this most promising initiative to fruition.

Thank you for your kind attention, and Aloha!

A handwritten signature in black ink, appearing to read "George H. W. Bush". The signature is written in a cursive, flowing style with large, connected letters.



Lieutenant Governor Mead Treadwell
STATE OF ALASKA

October 21, 2011

The Honorable Brian Schatz
Lieutenant Governor
State Capitol
Honolulu, HI 96813

Dear Lt. Governor Schatz,

As Chair of the Aerospace States Association (ASA), I write to convey ASA's congratulations on your state's hosting of the International Lunar Research Park (ILRP) Leaders' Summit. Having worked with two NASA-sponsored lunar initiatives in the 1980's, I find Hawaii's proposal to develop a terrestrial prototype for an International Lunar Research Park no less than thrilling. This is yet another example of Hawaii's sustained leadership in aerospace development over the years.

The ILRP is an initiative at the state level which could mark a new milestone in human history. As I've learned on Alaska's frontier, it's often individual or state initiatives, rather than large, national government programs, that pioneer the cutting edge of civilization. The Pacific, the Arctic and the Moon have much in common: for each frontier we constantly need to show skeptics that these regions are accessible and valuable.

Though I am unable to attend the ILRP Leaders' Summit in November, please know that ASA is very interested in helping to advance the recommendations derived at this meeting. ASA's network is growing in government and industry, and we have long enjoyed Hawaii's participation in our organization. We look forward to our continued partnership as we advocate for innovation and excellence on the frontiers of space.

Sincerely,

A handwritten signature in blue ink that reads "Mead Treadwell".

Mead Treadwell



February 26, 2012

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 moon and Mars.

In addition, Hawaii 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 Pacific International Space Center for Exploration Systems (PISCES) on the Big Island also provides unique and strategic resources and locations for testing and validating new robotic, energy, resource utilization and other critical technologies that will be essential for future space missions.

The NASA Space Portal fully recognizes these strategic advantages, and looks forward to our continued partnership with the State of Hawaii in advancing our nation's space exploration efforts, especially through the new annex to our Space Act Agreement that focuses on developing analog test facilities at PISCES. This program will not only help extend humankind's investigation of our solar system, but also bring the manifold scientific, educational, economic and humanitarian benefits of space back to Earth – including promotion of a Hawaii-based regional economic innovation cluster with an associated community of multidisciplinary engineers, scientists, educators and students that will help maximize the opportunities and benefits of space exploration.

With best wishes,

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

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



Elliot Holokauahi Pulham, Chair

February 6, 2012

The Honorable Calvin K. Y. Say
Speaker of the House of Representatives
Hawaii State Legislature

The Honorable Shan S. Tsutsui
President of the Senate
Hawaii State Legislature

SUBJECT: Support for the Pacific International Space Center for Exploration Systems (PISCES)
And the International Lunar Research Park Initiative

Dear Speaker Say and President Tsutsui:

On behalf of the Hawai'i State Aerospace Advisory Committee, I am writing to encourage the Hawaii State Legislature's strongest possible support for developing the Pacific International Space Center for Exploration Systems (PISCES), which we believe would significantly advance the growth and diversification of the aerospace industry in Hawai'i.

As you know, the creation of the Hawai'i Aerospace Advisory Committee (HAAC) was authorized by the Legislature (Act 52, 2009 Session) and approved by then Governor Lingle on May 6, 2009. Our purpose, per this Act, is to advise and assist the Legislature and State agencies in monitoring, assessing and promoting aerospace development statewide. The Committee is comprised of leading aerospace industry executives, distinguished academicians from across the state, and economic development executives from Oahu, Kauai, Maui and Hawai'i – all united with a common purpose to help the State diversify its economy and promote innovative education and employment opportunities for the people of Hawai'i.

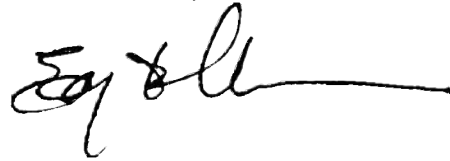
Since its inception, the HAAC has been exploring these opportunities and ways to realize them. One such opportunity that we believe holds tremendous potential to help realize Hawaii's full potential in aerospace is the Pacific International Space Center for Exploration Systems (PISCES) - a multinational space research and education center headquartered at the University of Hawaii at Hilo that already has brought over \$2 million in research funding and private investments to Hawaii, established undergraduate space science curricula at the University, conducted public outreach programs on aerospace at local schools and community centers, and sponsored national aerospace design competitions enabling undergraduate students to apply their skills in STEM-related disciplines to develop prototype models for future human habitats in space.

In collaboration with PISCES, the State of Hawaii (through its Office of Aerospace Development, or OAD) is currently under contract with NASA to develop “an infrastructure-based model for a sustainable human settlement beyond low-Earth orbit”, which is translating into a “blueprint” for an International Lunar Research Park (or ILRP) on the surface of the Moon. In conjunction with this grant, the State has also signed a Space Act Agreement with NASA to develop terrestrial analog sites to test and validate innovative technologies for future space exploration that could support development of an ILRP, as well as other robotic and human missions to other planetary bodies in our solar system.

These analog facilities are targeted for development at PISCES, and will provide an enormous opportunity for Hawai’i to play a major leadership role in humankind’s future exploration of space, with substantial opportunities for new federal research grants, private sector investment, and innovate space education and training programs throughout the islands – all of which will help expand Hawaii’s role as both a major contributor to and beneficiary of global space enterprise.

As such, and on behalf of the Hawai’i Aerospace Advisory Committee, I strongly encourage your support for PISCES and the analog test facilities on the Big Island of Hawaii.

Me ka ha’aha’a,

A handwritten signature in black ink, appearing to read "E. Pulham", with a long horizontal line extending to the right.

Elliot Holokauahi Pulham

cc: Governor Neil Abercrombie
Lt. Governor Brian Schatz
Senator Brickwood Galuteria, Majority Leader
Senator Sam Slom, Minority Leader
Richard Lim, Director - DBEDT
Jim Crisafulli, Director - Office of Aerospace Development



January 19, 2012

Jim Crisafulli, Director
Office of Aerospace Development
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Dear Jim:

I am delighted to be able to send you a letter to summarize our support of the continued existence and growth of PISCES as well as the exciting concept of the International Lunar Research Park.

The Google Lunar X PRIZE is the largest incentive prize of all time with \$30 million available to the first privately funded teams who successfully land on the Moon, send back a “Mooncast”, travel 500 meters and send back a further transmission.

The key word here is privately funded. In providing this prize, Google is seeking to inspire entrepreneurs and businesses to do something that only governments have done before and in so doing, kick start this next phase of commercial development in the space industry. Typically X PRIZES can generate more than ten times the prize purse in related investment, as well as numerous jobs and spin off opportunities. PISCES and the ILRP represent significant opportunities for the State of Hawaii to capture some of the new investment and development that springs from the Google Lunar X PRIZE, among similar related endeavors.

By way of example, after the successful winning of the \$10 million Ansari X PRIZE in 2004 by Scaled Composites, a human spaceflight revolution occurred that now includes Virgin Galactic, Blue Origin, Armadillo Aerospace, XCOR and many other companies. Entrepreneurs with dreams of going to space have taken their fledgling companies from “crazy idea” to solid commercial entity in a relatively short space of time. Some now even have the government as a customer! We have witnessed the growth of major infrastructure projects such as the New Mexico SpacePort for space tourism. And Mohave SpacePort – formerly a small airfield – is now a major rocket and space plane manufacturing area. None of these would be here without the impetus provided by the Ansari X PRIZE.

Revolution Through Competition.

5510 Lincoln Blvd. • Suite 100 • Playa Vista, CA 90094
T: 310.741.4880 • F: 310.741.4974
www.googlelunarxprize.org



So why is the Google Lunar X PRIZE so interested in PISCES and the wider possibility of the International Lunar Research Park? Firstly, from a practical point of view, many of our teams will need to test their lander, rover and communications technologies. The lunar analog sites operated by PISCES provide a unique location for those activities and over the next couple of years we fully expect to see some of our teams taking advantage of the facilities. This will provide a corresponding opportunity in PR as well as some small economic benefit.

Secondly, for the Google Lunar X PRIZE teams to be able to evolve into a new industry, just as the teams have done in the human spaceflight area, customers are needed. These are companies who have a reason to need to get to the Moon in an efficient and effective way, perhaps for energy, resource, media or science purposes. While our teams and other commercial space entities are developing a new lunar infrastructure, the International Lunar Research Park can be a key location for generating new technologies (that can also be used on Earth) and incubating the companies that will become the first to explore this new frontier. Clearly those companies will eventually need access to talented workforces and a friendly business environment.

In support of that workforce development, PISCES provides us with a natural partner for The Google Lunar X PRIZE flagship STEM education programs, including our Moonbots robotics competition which is a partnership with Lego (www.moonbots.org). Of note is that we have had one team from Molokai whose members have participated in Moonbots for the last two years (<http://molokaimahina.yolasite.com/>). Our experience is that children are more motivated in STEM if they have real life examples of what mastering certain skills could allow them to do. By having access to the engineers and scientists in Google Lunar X PRIZE teams who are coming to Hawaii or working with the new endeavors in the ILRP to further their businesses, Hawaiian students and their parents will be able to see the relevance of high tech skill acquisition and the possible future that this can bring.

In conclusion The Google Lunar X PRIZE sees the continued existence and growth of PISCES, as well as the development of the ILRP as key pieces for the commercial exploration of space.

Revolution Through Competition.

5510 Lincoln Blvd. • Suite 100 • Playa Vista, CA 90094
T: 310.741.4880 • F: 310.741.4974
www.googlelunarxprize.org



Sincerely

A handwritten signature in black ink that reads 'Alexandra Hall'.

Alexandra Hall
Senior Director, Google Lunar X PRIZE
X PRIZE Foundation.

CC: Dr. Frank Schowengerdt
Professor of Physics and Director of PISCES
University of Hawai'i at Hilo

Revolution Through Competition.

5510 Lincoln Blvd. • Suite 100 • Playa Vista, CA 90094
T: 310.741.4880 • F: 310.741.4974
www.googlelunarxprize.org

William P. Kenoi
Mayor



Randall M. Kurohara
Director

Laverne R. Omori
Deputy Director

County of Hawaii

DEPARTMENT OF RESEARCH AND DEVELOPMENT

25 Aupuni Street, Room 1301 • Hilo, Hawaii 96720-4252
(808) 961-8366 • Fax (808) 935-1205
E-mail: chresdev@co.hawaii.hi.us

Thursday, January 19, 2012

Senator Will Espero, Chair
Senator Michelle N. Kidani, Vice Chair
Committee on Public Safety, Government Operations, and Military Affairs

Representative Angus L.K. McKelvey, Chair
Representative Isaac W. Choy, Vice Chair
Committee on Economic Revitalization and Business

RE: Support for Pacific International Space Center for Exploration Systems
(PISCES) International Lunar Research Park (ILRP) on Hawai'i Island

Dear Senators Espero and Kidani, and the Committee on Public Safety,
Government Operations, and Military Affairs, and
Representatives McKelvey and Choy, and the Committee on Economic
Revitalization and Business:

The Department of Research and Development's mission is to provide proactive leadership, enhancing the quality of life for Hawai'i Island communities through economic development programs. As Department Director of Research and Development, I urge you to support the International Lunar Research Park on Hawai'i Island.

The ILRP program at the University of Hawai'i at Hilo Science and Technology Park represents Hawai'i County's significant strengths, assets and aspirations. It also represents an important addition to Hawai'i Island's emerging innovation economy.

The combination of our unique natural resources and gifted communities has created the premier environment for world class exploration and research. Complementing the existing observatory community, the new Thirty Meter Telescope project, the University of Hawai'i at Hilo's new Sciences and Technology facility, 'Imiloa Astronomy Center, and the United States Pacific Basin Agricultural Research Center, the ILRP will provide the community an industry that:

Senators Espero and Kidani, and the Committee on Public Safety, Government Operations, and Military Affairs, and
Representatives McKelvey and Choy, and the Committee on Economic Revitalization and Business

January 18, 2012

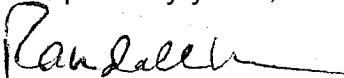
Page 2

- Attracts companies engaged in clean, high-tech research and development activities in aerospace, renewable energy and sustainable agriculture;
- Attracts investment that will help to leverage costs of expanding Hawai'i Island's broadband capacity;
- Creates high-paying 21st century jobs that are designed to support the ILRP, jobs that cannot be outsourced overseas;
- Creates new revenue streams through research and commercial development that will grow our knowledge industry; and
- Supports STEM education for Hawai'i Island and for the State.

Besides the direct economic benefits listed above, this project will help to attract visitors drawn to Hawai'i Island's edu-tourism offerings and the meetings and convention market; and build our Island's and the State's reputation as an international leader in collaborative research and educational excellence.

Thank you for the opportunity to express support for this important project. I humbly ask that the Hawai'i State Legislature provide support for the development of the International Lunar Research Park on Hawai'i Island.

Respectfully yours,



RANDALL M. KUROHARA
Director

RMK:bd

February 6, 2012

Jim Crisafulli, Director
Office of Aerospace Development
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Dear Mr. Crisafulli,

I am writing this letter because it seems that space exploration - from earth based astronomy to astro-robotic moon missions to the eventual human colonization of the Moon, Mars and beyond - is suffering from a lack of understanding, and therefore a lack of support. It is my intention in this letter to perhaps shed some light on why we need to be doing these things and why they are essential economic drivers of our economy, as well as a key to both inspiring young people in Hawaii to become scientists and engineers, and to creating high paying jobs that can ensure our state's future economic strength.

It was the ability to navigate by the stars, coupled with the daring to set off and explore thousands of miles of open ocean in tiny fragile canoes, that gave us the basis for our present day Hawaiian culture. Where is this spirit today?

For it is this very spirit that is once again needed by humankind in these very trying times. For all of the reasons that we, throughout history, have explored and colonized every last habitable spot on this planet, we must now explore and colonize our celestial neighbors.

The most amazing thing that ever happened to this planet is life. It doesn't matter if it was spontaneous generation, divine intervention or pan spermia. It matters that life is here. What could nobler, more historic, than to bring life to another planet? Why would we pass up the chance to be part of such an endeavor?

With the end of the Space Shuttle program, NASA and the rest of the world are scrambling to figure out what the “next step” will be, and where it might be taken – perhaps in Texas, or maybe in Florida? Could it be in Hawaii? Indeed, the next step is up for grabs; and with a Hawaii-born president in the White House, our chances of having it be in the Aloha State have never been better!

If we can base the next phase of space exploration here in Hawaii, leveraging our State’s unique resources and capabilities through our Pacific International Space Center for Exploration Systems (PISCES), the benefits would truly be incredible.

- 1] We would invigorate aerospace as well as other emerging technology-based industries statewide.
- 2] We would attract companies engaged in clean, high-tech research and development activities in diverse areas, including (to name a few) aerospace, alternative energy, recycling, telemedicine, robotics, artificial intelligence and sustainable agriculture.
- 3] We will generate new revenue streams through research and commercial development that will help grow Hawaii's knowledge-based industries.
- 4] We will create high-paying 21st century jobs that cannot be outsourced overseas.
- 5] We will spur investments that will leverage the costs of expanding Hawaii's broadband capacity - especially on the Big Island.
- 6] We will help enrich/diversify educational and community outreach programs in science, technology, engineering and mathematics (the STEM disciplines).
- 7] We will strengthen Hawaii's stature as a center of excellence for exploration, and fuel new opportunities to grow Hawaii's visitor industry.

- 8] We will expand Hawaii's global leadership in space science and exploration, enhancing its role (and recognition) as both a major contributor to and beneficiary of space enterprise.
- 9] We will help catalyze and inspire the next generation of scientists, engineers and entrepreneurs that will pioneer new horizons on the frontiers of space.

For all of these reasons, we should do everything in our power to make Hawaii the next center for space exploration by supporting PISCES, the proposed analog facilities for an International Lunar Research Park (ILRP), and of course our Office of Aerospace Development!

Sincerely Yours,

A handwritten signature in black ink, appearing to read 'H. B. Rogers', with a horizontal line underneath.

Henk B. Rogers
Entrepreneur
55 Merchant Street, Suite 1700
Honolulu HI, 96813

February 21, 2012

Senator Will Espero, Chair
Senator Michelle N. Kidani, Vice Chair
Committee on Public Safety, Government Operations and Military Affairs

Representative Angus I. K. McKelvey, Chair
Representative Isaac Choy, Vice Chair
Committee on Economic Revitalization and Business

RE: Support for Pacific International Space Center for Exploration Systems (PICES)
International Lunar Research Park (ILRP) on Hawaii Island

Dear Senators Espero and Kidani and Representatives McKelvey and Choy:

Ferraro Choi has been a leader in the design of sustainable educational and research projects throughout the State of Hawaii and for agencies of the Federal Government. On the Island of Hawaii we were honored to be the architects for the USDA Pacific Island Forestry Laboratory in Hilo, the NELHA, Gateway Center and the new West Hawaii Explorers Academy campus both in Kailua Kona. On Oahu, Maui, Kauai, and throughout the Papahānaumokuākea Marine National Monument we have worked with NOAA on the planning and design of research laboratories and scientific outreach facilities. Throughout the Antarctic we have worked with the National Science Foundation most recently on the design of the Amundsen Scott South Pole Station, in conjunction with NASA as an analog for future lunar and Mars based habitats.

Ferraro Choi ~~strongly~~ support~~s~~ the PICES and ILRP projects since they will:

- Promote Hawaii's leadership in space research and technology to nations pursuing space exploration.
- Showcase Hawaii's unique geographic terrain for extraterrestrial analog research and testing.
- Make a significant contribution to research programs at the University of Hawaii's Hilo Campus
- Support STEM education on Hawaii Island and throughout the State.
- Support architectural and engineering jobs from companies such as ours.
- Attract a multitude of high technology consultants throughout the world who collaborate on such projects and bring not only revenue but intellectual capital to our state.
- Boost educational tourism to Hawaii Island

I respectfully ask for your support at the State Legislature for development for these unique and important projects for our state. Thank you for your consideration.

Sincerely,



Joe Ferraro FAIA, LEED AP
Principal



January 31, 2012

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

I am writing this letter in firm support of the State of Hawaii's efforts to develop and promote the University of Hawaii-Hilo's Pacific International Space Center for Exploration Systems (PISCES) and its future Prototype remote surface analog facility supporting the evolution of an International Lunar Research Park (ILRP).

As a current member of the PISCES management team and the ILRP steering committee; a fifteen-year participant in Hawaii's JUSTSAP forum (recently renamed PISA); the current Chief Executive Officer of JAMSS America, Inc. (a U.S. registered aerospace company with U.S. and international contracts); the former Senior Vice President of SPACEHAB, Inc.; and, former manager within the NASA Mission Operations Directorate at the Johnson Space Center, I am acutely aware of the unique challenges that space exploration places on human innovation as well as on the resource limitations of sponsoring government, private sector and university organizations. However, it has been my experience that the best way to mitigate project and program costs during space hardware and software development cycles is through use of simulation facilities that are most representative of those in-space environments within which or on which robots or space explorers will conduct operations using these products.

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.

Post-Apollo, exploration missions have become increasingly multinational in nature with many nations now having participated in earth orbit, lunar and planetary missions, with Japan even returning surface debris samples from an far-away asteroid. Today, NASA, other space faring nations and the commercial private sector now have their sights set on furthering robotic and human outreach into the cosmos through innovative private ventures as well as through joint, international Agency-sponsored missions; Google Lunar X-Prize contestants are busy preparing their hardware for competition beginning as early as 2014; and NASA and its ISS partners are currently preparing a Global Exploration Roadmap which will define space exploration destinations and schedules which will guide current and future generations in this quest to explore - and eventually inhabit remote lunar and planetary destinations within our solar system.

As an avid participant in several of these exploration journeys, I am proud to have been a part of the evolution of Hawaii's PISCES and ILRP projects and have been encouraged by the continuing and enthusiastic bipartisan support received for these two endeavors from the State of Hawaii's Legislature. NASA also has taken note - as have international space agencies - as PISCES has more than matched its State funding to date with NASA, CSA, DLR and private sector research contracts awarded over the past



four years. Within my familiar territory of Japanese industry, academia and the Japan Aerospace Exploration Agency (JAXA), I have recently had the privilege of speaking to top management in each sector about the many opportunities for exploration technologies development, test and checkout that PISCES offers. I have also recently informed them of the exciting ILRP vision and I anticipate an ever-growing interest within Japan for collaboration with other international organizations in the utilization of Hawaii's PISCES and ILRP Prototype assets going forward.

Jim, your continued ardent support of PISCES and ILRP will surely help facilitate the next remarkable chapter of human space exploration in ways that are a fundamental departure from the Apollo program of over four decades ago: This renewed journey will be international in nature with all major space faring nations as participants. Robotic and human explorers returning to the moon and beyond will require advanced and reliable technologies to sustain their missions. The developers of these technologies will use PISCES and the ILRP Prototype facilities as test beds for verification of their operability. The ILRP will continue to receive international attention as an achievable and efficient way for multinational participants from the government and private sector to synergistically work together to provide stellar *from* the moon, *on* the moon and *about* the moon research results while mitigating exploration costs through shared infrastructure and efficient utilization of lunar resources using technologies developed at the planet's premier two lunar analog facilities, PISCES and the ILRP Prototype - all the while, facilitating the involvement and growth of Hawaiian small businesses and industry and local area use of spinoff (and importantly, green) technologies.

And last but most assuredly not least, the student explorers of Hawaii's K-12 schools and universities - as well as those from other states and nations - will participate in and learn from the many PISCES and ILRP Prototype projects, demonstrations and capabilities evolution and will have an unprecedented opportunity to become tomorrow's space voyagers to the Moon, Asteroids, Mars and beyond.

I applaud and encourage the continuation of your leadership and that of Hawaii's State Government in supporting our nation's space exploration program and in continuing funding support of PISCES and the ILRP Prototype.

Sincerely,

A handwritten signature in black ink that reads 'Dan A. Bland'.

Dan A. Bland

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



PACIFIC SCIENCE ASSOCIATION

1525 BERNICE STREET • HONOLULU, HI 96817 • USA
TEL. (808) 848-4124 • FAX (808) 847-8252
INFO@PACIFICSCIENCE.ORG • WWW.PACIFICSCIENCE.ORG

3 February 2012

Jim Crisafulli
Director
Office of Aerospace Development
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Dear Jim:

I write in support of the State of Hawaii's initiative to empower and fund the effort by the International Space Center for Exploration Systems (PISCES) to create an International Lunar Research Park (ILRP) on the Big Island of Hawaii. This initiative will be an important catalyst for research and testing in several important areas of research, including robotics, engineering, and green energy. In so doing PICES and ILRP activities will help support critical international, regional as well as local priorities to advance sustainable development goals, STEM education efforts, as well as the important mission of increasing public support and interest in science, technology, and engineering.

The Pacific Science Association (PSA) is a regional non-governmental, scholarly organization that advances science, technology, and sustainable development in the Asia-Pacific region by actively promoting interdisciplinary and international meetings, research, and collaboration. The PSA Secretariat has been based at the Bernice P. Bishop Museum in Honolulu since our founding in 1920. PSA hosts large scientific meetings known as Congresses and Inter-Congresses every two years in rotating venues throughout the Asia-Pacific. These well-attended meetings are recognized as critical venues for the region's senior and junior scientists to meet, present research findings, and forge new interdisciplinary collaborations with colleagues elsewhere in the region.

PSA is composed of national-level members, which are National Academies of Science or leading universities of Australia, China-Beijing, China-Hong Kong, China-Taipei, France, Guam, Indonesia, Japan, Korea, Malaysia, Okinawa, Philippines, the Pacific Islands (Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu), Russia, Singapore, Thailand, United States, and Vietnam, as well as individual member scientists.

Increasingly, the future of science and technology research lies in cross-disciplinary collaborations that link various research networks, and so we are encouraged that ILRP is specifically designed as such an international collaboration. In addition, while space exploration may seem a non-intuitive research priority given other seemingly more immediate concerns in the Asia-Pacific, there are unique needs of island states that

make ILRP highly relevant for Hawaii and the region. The pursuit of new and more effective technologies to keep a crew safely housed with reliable food supplies and access to energy, telemedicine, and communication on the ultimate resource-poor “island” of the moon will surely help drive innovations that facilitate sustainability solutions for the island states of the Pacific.

PISCES and the ILRP project will leverage Hawaii’s unique resources and put the state at the center of international and multilateral efforts to advance science and technology. PSA supports the maximally inclusive international scope of this project, and believes that the PISCES / ILRP project will benefit not only the exploration of space, but also lead to new and greater opportunities for sustainable development on Earth, and for all nations.

PSA strongly supports the State of Hawaii’s PISCES initiative to establish ILRP. We look forward to the project’s success and will encourage our national members to participate in discussions on its goals and operations, as appropriate.

Sincerely,

A handwritten signature in black ink, appearing to read "Burke Burnett". The signature is fluid and cursive, with the first name "Burke" being more prominent than the last name "Burnett".

Burke Burnett
Executive Secretary
Pacific Science Association

KELSO AEROSPACE CONSULTING

2838 Misty Springs

Manvel, Texas 77578

832.628.1730 - E-mail: rkelso54@gmail.com

Monday, February 06, 2012

Senator Will Espero, Chair

Senator Michelle N. Kidani, Vice Chair

Committee on Public Safety, Government Operations, and Military Affairs

Representative Angus L.K. McKelvey, Chair

Representative Isaac W. Choy, Vice Chair

Committee on Economic Revitalization and Business

Support for Pacific International Space Center for Exploration Systems (PISCES)
International Lunar Research Park (ILRP) on Hawai'i Island

Dear Senators Espero and Kidani, and the Committee on Public Safety,
Government Operations, and Military Affairs, and
Representatives McKelvey and Choy, and the Committee on Economic
Revitalization and Business:

I take this opportunity to indicate firm support of the State of Hawaii's efforts in the development and promotion of the Pacific International Space Center for Exploration Systems (PISCES) and the International Lunar Research Park (ILRP) project on Hawai'i Island.

As a member of the ILRP steering committee over the last two years, I am very aware of the potential that these programs/projects bring to both the aerospace community and the State of Hawaii.

As a former NASA senior executive with 38 years of government service, I most recently led NASA's efforts in beyond-Low Earth Orbit (LEO) commercial initiatives. Specifically, I worked with many within the commercial sector that have interest in providing lunar transportation services (landers) and surface robotic mobility systems on the lunar surface. These efforts have grown significantly over the last few years.

Senators Espero and Kidani, and the Committee on Public Safety, Government Operations, and Military Affairs, and
Representatives McKelvey and Choy, and the Committee on Economic Revitalization and Business
February 6, 2012
Page 2

It is clear to me that there is a significant interest in both the commercial and international sector in re-initiating lunar surface exploration for the first time in over 40 years! It is my belief, that we will see some of these commercial groups (example: Google Lunar X-Prize) successfully achieve a lunar landing and surface activity within the next 2-3 years (by late 2014). As such, the opportunity presents itself in providing suitable test locations for pre-mission checkout/validation of these systems prior to launch.

Further, having been a key part of NASA's assessment in regard to testing key technologies on the Moon (like in-situ resource utilization (ISRU)), there will be a growing need to continue to expand NASA's testing of these technologies in field sites having suitable environments/analogues leading to launch.

With the State of Hawai'i providing the "outer ring" of infrastructure/support capabilities at the ILRP test site, the aerospace community (international, commercial, NASA) can supply the "demand " for the site with its robotic systems and associated prototyping hardware. ILRP could become a state-of-the-art test site serving and supporting the emergence of world-wide demand in space exploration.

The ILRP program at the University of Hawai'i at Hilo Science and Technology Park represents Hawai'i County's significant strengths, assets and aspirations. It also represents an important addition to Hawai'i Island's emerging innovation economy.

The combination of our unique natural resources and gifted communities has created the premier environment for world class exploration and research. Complementing the existing observatory community, the new Thirty Meter Telescope project, the University of Hawai'i at Hilo's new Sciences and Technology facility, 'Imiloa Astronomy Center, and the United States Pacific Basin Agricultural Research Center, the ILRP will provide the community an industry that will:

Senators Espero and Kidani, and the Committee on Public Safety, Government Operations, and Military Affairs, and Representatives McKelvey and Choy, and the Committee on Economic Revitalization and Business

February 6, 2012, 2012

Page 3

- Attract companies engaged in clean, high-tech research and development activities in aerospace, renewable energy and sustainable agriculture;
- Attract investment that will help to leverage costs of expanding Hawai'i Island's broadband capacity;
- Create high-paying 21st century jobs that are designed to support the ILRP, jobs that cannot be outsourced overseas;
- Create new revenue streams through research and commercial development that will grow our knowledge industry; and
- Support STEM education for Hawai'i Island and for the State.

Besides the direct economic benefits listed above, this project will help to attract visitors drawn to Hawai'i Island's edu-tourism offerings and the meetings and convention market; and build the Island's and the State's reputation as an international leader in collaborative research and educational excellence.

Thank you for the opportunity to express support for this important project. I humbly ask that the Hawai'i State Legislature provide support for the development of the International Lunar Research Park on Hawai'i Island.

Respectfully yours,

Robert M. Kelso

ROBERT M. KELSO
President

February 5, 2012

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

Dear Jim,

I am writing to voice my strong support for two interlinked initiatives in the State of Hawaii, namely the Pacific International Space Center for Exploration Systems (PISCES) and efforts to establish an International Lunar Research Park (i-LRP) analog facility as a component of this Center – both on the Big Island of Hawaii. Once fully developed, I believe these important initiatives will provide substantial global as well as local scientific, educational and economic opportunities and benefits.

Over the past two decades, the Japan-U.S. Science, Technology & Space Applications Program (JUSTSAP), for which I served as Chairman (from 2003 - 2010), has worked closely with the Hawaii State Government to spawn a broad range of innovative projects promoting advanced satellite communications, remote sensing for disaster management, microgravity research, the development of solar-powered alternative energy systems, etc., benefiting communities within the Asia-Pacific region.

I also had the pleasure of overseeing the creation of PISCES, the most recent brainchild of JUSTSAP, which is now being developed in Hawaii as an international center for space related research and development, aerospace education, professional training, and the formulation of collaborative multinational space exploration missions. All of these programs have engaged the substantial scientific and technological expertise resident statewide to promote collaborative research and educational partnerships with University of Hawaii faculty and students, as well as with local business entrepreneurs.

PISCES has already demonstrated its ability to secure NASA contracts over the last few years, especially as a test bed for both robotic as well as longer-term human space exploration. Continued State support for PISCES (and the proposed i-LRP within PISCES) should enable this facility to attract sufficient external funding to make it self-sufficient within the next 1-3 years. One specific and highly visible benefit will be the development and testing of advanced robotics necessary for most future space exploration programs. This should help strengthen and advance our nation's competitive position in this critical technology.

From a local perspective, support for these interrelated initiatives will also generate substantial benefits to the State, including high-expertise jobs and development of a vibrant aerospace industry in Hawaii embracing an "arc of technologies" (including world class astronomy; commercial space transportation; supercomputing/ IT/informatics; robotics with space, marine and terrestrial applications; advanced telecommunications; and next generation aviation). Although it is difficult to quantify the benefits of a \$1 million investment in PISCES/i-LRP for fiscal 2013, the payback will probably be in the order of 10+ times over the next few years, and therefore should provide an attractive investment opportunity for the Hawaii Legislature to consider.

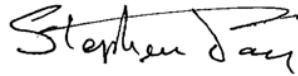
International Ventures, 5333 Potomac Ave. NW. Washington, DC 20016

Looking to the future, innovative programs like PISCES and the proposed i-LRP will be able to leverage Hawaii's diverse natural resources, abundant scientific and technological expertise, unique geographical terrain, and strategic mid-Pacific location to support the development and implementation of pioneering global space missions, including Earth orbiting systems supporting global communications and space-based observations of our planet, as well as robotic and manned missions to the Moon, Mars, and other solar system bodies.

Collectively, I believe such efforts will provide a broad range of scientific, economic, and educational opportunities to help grow Hawaii's research and development infrastructure, expand and diversify private sector initiatives in aerospace-related technologies, enhance secondary and college-level training and mentorship programs in advanced mathematics, engineering and science disciplines; and ultimately strengthen Hawaii's role as a significant participant in space related technologies and exploration.

I wish you and your colleagues every success as you continue to champion Hawaii's expanding potential in aerospace!

Sincerely,



Stephen M. D. Day.

Chairman emeritus, JUSTSAP

President, International Ventures

Member of the Hawaii Aerospace Advisory Committee (HAAC).

4 February 2012

PISCES and ILRP Letter of Support

To whom it may concern,

I participated in the International Lunar Research Park (ILRP) Workshop in San Jose, California (04/05/11) and the Leaders' Summit in Waikoloa, Hawaii (11/13-17/11) to help define a viable concept for permanent human and economic expansion from geosynchronous orbit out to and including the Moon. An ILRP, integrated with commercial lunar development activities in the planning stage, provides the opportunity to reduce individual country, corporate, and personal cost to travel to, explore, and use the Moon through shared reusable cislunar transportation systems, habitation and laboratory facilities, surface vehicles, and utilities. Therefore, I wish to add my personal support for the PISCES organization and its efforts related to the ILRP project.

The first step in realizing the ILRP on the Moon is to emplace an Earth analog site where lunar systems from around the world can be tested individually and as part of an integrated operational construct. Hawaii offers a unique mix of lunar analog environments, educational facilities, accessibility, and labor force that can provide the backbone of the first ILRP analog.

An ILRP analog site linked to a future Moon base will be inspirational to the Hawaiian youth, giving them hope for a brighter future, encouraging them to higher educational and professional goals, and offers immediate local job opportunities upon graduation as well as to supporting industries.

Local jobs will be created in construction, transportation, science, technology, education, training, media, and other vocations as the ILRP analog site is developed, new educational facilities are constructed, crew and equipment is moved between locations, and activities are filmed and broadcast worldwide. In addition, tourism related jobs are increased as ILRP participants will likely bring their families during their planned activities at the site and, as other high-tech endeavors show, the ILRP will itself become a tourist draw.

Lunar and other exploration missions will benefit through reduced mission risk and cost as hardware from various nations and organizations are initially tested and integrated into a broader system of systems before ever leaving Earth.

I believe the ILRP, integrated with Bigelow Aerospace (lunar habitats) and Shackleton Energy Company (lunar ice mining and propellant production), can benefit NASA, JAXA, ESA, RSA, ISRO, and other national space agencies by becoming a stepping stone from Earth to the Moon as mankind extends its economic sphere to include all cislunar space.



Dallas Bienhoff

Dallas is a project manager at The Boeing Company focused on human exploration mission definition, in-space transportation system conceptualization, and surface systems development. The opinions expressed in this email are his own and do not reflect the position of The Boeing Company.

Dallas Bienhoff
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The Boeing Company
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Skycorp Incorporated
285B Mountain View Avenue
Mountain View, CA 94041
310-403-1346
www.skycorpinc.com
wingod@skycorpinc.com
wingod@earthlink.net

February 4, 2011

To: Jim Crisafulli, Director - Hawaii Office of Aerospace Development
From: Dennis Wingo, CEO Skycorp Incorporated
Subject: Letter in Support of PISCES and the International Lunar Research Park

Dear Jim,

I would like to express my company's support for the ideals and goals of the International Lunar Research Park (ILRP) at the Pacific International Space Center for Exploration Systems (PISCES).

Skycorp Incorporated strongly supports the ideals and vision of the ILRP:

To establish (at PISCES) the world's premiere environment for collaborative development, testing and evaluation of space systems for use on the Moon, Mars, and other extraterrestrial bodies, thereby expanding Earth's economic sphere and advancing science, education and the creation of new technologies for terrestrial application, all of which, in turn, will produce substantial benefits for the people of Hawaii.

I would first like to emphasize the terrestrial applications of the developments that will most certainly spring forth from the ILRP effort. Automation and robotics is the wave of the future. Today robotics is exploding as a discipline in a manner largely unreported in the press. Most certainly we have all seen robots welding cars in Detroit or Japan, but the robotics revolution goes far beyond these large industrial robots.

Robotics technologies are being used today for the most delicate eye surgery, and the robots doing this are controlled over the Internet. The value to Hawaii is large in that in surgeries where there is no local island expertise, lives can be saved through these remote operations. Of course, these sophisticated robots must be maintained, which in turn creates high paying technical jobs in the local economy.

An extension of robotics is 3D printing. Three-dimensional printers are devices that take raw materials and directly "print" parts. These parts can today be made from plastics, metals, wood pulp and other materials. This technology is in its nascent stage, but its value is already being proven in the world of small manufacturing. The value to the Hawaiian economy could be enormous, as the high cost of shipping impacts virtually every person on the island. Think of replacement parts that could be made locally, using local materials to replace parts in machines, appliances, cars, or other devices that otherwise would have to be shipped at great expense from distant host countries. Not

only would this help lower shipping costs for Hawaii consumers, but also help foster local cottage manufacturing industry for those who design, build, operate, and maintain such systems.

There is a resource that Hawaii has more than just about any other place in the world – volcanic rock. Work being undertaken by NASA, industry, and international partners use Hawaiian volcanic rock as a simulant for lunar rocks in developing processes to extract oxygen and metals from these rocks. These efforts could help turn the most plentiful resource in the Hawaiian Islands into feedstock for 3D printing and other industries statewide.

All of these technologies will be tested at the ILRP, and constitute only a representative sample of what lies ahead in the near future. For both NASA and international partners, the Hawaiian volcanic landscape offers a rough simulation of the environment that we expect to encounter on the Moon and Mars. It is also a centralized and desirable location for international partners to bring their equipment to Hawaii for development and testing. This in turn facilitates a brain trust of world leaders in robotics that universities in the islands can utilize for training future leaders in this effort. The best part of the equation is that Hawaii, in a manner of speaking, is conceptually similar to the economic development of the Moon – a locality logistically far from the main planetary economy that, to be maximally successful, must leverage local resources to bolster the local economy and grow more self sufficient.

Skycorp Incorporated, through its sister company Greentrail Energy Inc. is proposing a means whereby to accelerate this development.



Figure 1: GSW-7000 Providing Power and Communications in Arizona Desert 2010

Figure 1 shows the GTE GSW-7000 in operation at the NASA Desert RATS event in September of 2010. This device is a self-contained trailer that is capable of generating up to 4.4 kilowatts of power from the sun and 2.4 kilowatts of power from wind energy.

The GSW-7000 has proven itself in NASA remote operations in the desert of Arizona in providing power and communications (through our smaller GSC-1000 on the right), which provided NASA Ames Center Director Dr. Pete Worden with the opportunity to remotely pilot a NASA rover in the desert from his office at Moffett Field, California. We also would like to bring these advanced capabilities to the ILRP in Hawaii. In keeping with the Hawaiian philosophy of limiting permanent changes to the landscape of the islands, this system is fully self-contained and requires no permanent infrastructure (after removal from a site, no trace remains of its presence).

As Skycorp CEO I have mentored many students over my career, and continue to do so. We will extend this assistance to Hawaii to provide talented science and engineering students with opportunities to work, understand, and incorporate lessons learned from practical field experiences into their educational development. This will help nurture a cadre of trained engineers and scientists in the islands who will not have to leave the State in order to reach their full potential in science and technology.

In my last trip to Hawaii, I read of the last king of the islands who brought many of the world's latest advances to Hawaii for the benefit of its people. The work of your local community on the ILRP is a fine addition to that tradition of forward thinking, which ultimately can position your State and its people to be a major contributor toward improving our qualities of life around the world.

Sincerely

Dennis Wingo

Dennis Wingo

CEO

Skycorp Incorporated



January 18, 2012

Senator Will Espero, Chair
Senator Michelle N. Kidani, Vice Chair
Committee on Public Safety, Government Operations, and Military Affairs

Representative Angus L.K. McKelvey, Chair
Representative Isaac W. Choy, Vice Chair
Committee on Economic Revitalization and Business

**RE: Pacific International Space Center for Exploration Systems
(PISCES)/International Lunar Research Park on Hawaii Island**

Dear Sirs/Madams:

W. H. Shipman, Limited is a Kama'aina corporation with a history of 130 years on the Island of Hawaii. We support carefully planned economic growth of the Island and the State. Our ever-growing population has an increasing need for quality jobs in a safe and clean environment.

Long term economic well being for our islands is based on a number of factors that we all know well including a strengthening agricultural sector increasingly able to support our population's needs. It also includes a careful embrace of those industries where our unique location and culture are a particular fit.

One such industry is astronomy and sciences dealing with space and its exploration. We can expect dynamic growth in this arena as governments and industry work increasingly closely in coming years. In this State, and particularly on this Island, we have a significant location advantage over other competitors. Our location in the mid pacific near the equator residing in a dynamic and open economic environment is a combination that will provide particular efficiencies to the industry. At the same time this industry will provide high quality, well paying jobs available to a wide spectrum of our population.

In a community already moving rapidly to fill the requirements of this industry, we ask for your support for the International Lunar Research Park to be located in East Hawaii.

Sincerely,

Bill Walter

Bill Walter
President



February 6, 2012

Jim Crisafulli, Director
Office of Aerospace Development and
Hawaii Aerospace Advisory Committee Secretariat
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Aloha Jim!

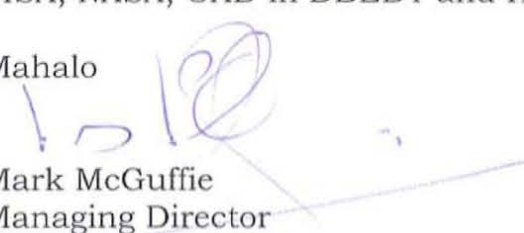
This letter serves as my enthusiastic support for the development of both PISCES and the ILRP here in Hawai'i. PISCES, has already demonstrated many aspects of critical acclaim, by discovering technologies that aid in system design, for uses here on Earth for food and energy security and for survival in places such as the Moon and Mars.

Expanding PISCES and incorporating the ILRP will attract companies engaged in clean, high-tech research and development activities in diverse areas, including aerospace, renewable energy, sustainable agriculture and robotics. There is the possibility to produce new revenue streams, generated through research and commercial development that will help grow Hawaii's knowledge-based industries.

As a member of the Hawai'i Aerospace Advisory Committee, it is an aspiration that the private sector with the collaboration of local communities, State of Hawai'i, academia and federal agencies, engage in furthering these unique opportunities for the people of our state and our country. The process to arrive at solutions is not only the technologies themselves, but about what we value and how we collaborate together – *inclusively*.

Thank you for all the work you are doing to move these initiatives forward through PISA, NASA, OAD in DBEDT and HAAC – and keeping us focused on our mission.

Mahalo


Mark McGuffie
Managing Director



U N I V E R S I T Y O F H A W A I I ' I A T M Ā N O A

Institute for Astronomy

February 6, 2012

Jim Crisafulli, Director
Office of Aerospace Development and
Hawaii Aerospace Advisory Committee Secretariat
No. 1 Capitol District Building, Suite 501
250 South Hotel Street
Honolulu, HI 96813

Dear Mr. Crisafulli

I am writing you this letter to express my support of the State of Hawaii's efforts to develop and promote the University of Hawaii-Hilo's Pacific International Space Center for Exploration Systems (PISCES) and its future Prototype remote surface analog facility supporting the evolution of an International Lunar Research Park (ILRP).

Because the PISCES/ILRP initiative combines public and private partnerships this program offers high potential to support and invigorate aerospace as well as other emerging high-tech based industries throughout the state. By attracting companies engaged in clean, high-tech research and development activities in diverse areas, including but not limited to aerospace, renewable energy and sustainable agriculture, we can generate new revenue streams through research and commercial development. This is especially important due to the loss of tax credits and other incentives for high-tech growth in Hawaii

The PISCES/ILRP initiative also promotes educational and community outreach programs in science, technology, engineering and mathematics (STEM), which aligns with President Obama's goals for America's space program and helps prepare Hawaii's students for high-paying 21st century jobs right here at home.

I applaud the hard work of the Hawaii Office of Aerospace Development and your commitment to the expansion of Hawaii's global leadership in space science and exploration. It is amazing what you accomplish with such limited resources. I strongly urge Hawaii's legislative and executive branches to fully fund your office so Hawaii may realize the potential economic diversity of initiatives like PISCES/ILRP, which are so badly needed.

Sincerely,



Michael Maberry
Assistant Director

From: mailinglist@capitol.hawaii.gov [mailto:mailinglist@capitol.hawaii.gov]
Sent: Friday, February 24, 2012 8:28 AM
To: ERBtestimony@capitol.hawaii.gov
Cc: Henley, Mark W
Subject: Testimony for HB2873 on 2/27/2012 1:00 PM

Testimony for HB2873 HD1

Conference room: 312
Testifier position: Support
Testifier will be present: No
Submitted by: Mark Henley
Organization: Individual
E-mail: Mark.W.Henley@Boeing.com
Submitted on: 2/24/2012

Comments:

Dear State Representatives,

I am writing another private note to again thank you for helping start the Pacific International Space Center for Exploration Systems, and to encourage you to help PISCES grow, including a Space Research and Technology Park. I work for Boeing Research and Technology, a major Aerospace Company which has also supported some of my own efforts to help develop PISCES, but I am writing as a private citizen and a part-time resident of Hawaii.

PISCES offers unique promise to bring together many nations of the Pacific Rim in the best place on Earth to simulate robotic and human space exploration technologies for lunar and planetary surface operation.

PISCES also offers a track to encourage education as well as future employment for the youth of Hawaii in growing high tech industries, motivated and building upon the foundation of PISCES and the associated Research and Technology Park

Please also recognize Jim Crisafulli's incredible drive to help Hawaii enter the Space Age. The State Office of Aerospace Development DBEDT is the best organization to manage PISCES at this time, while continuing strong involvement of the University of Hawaii (including both Hilo and Manoa representatives), but also increasing the involvement of space industry and commercial entrepreneurship.

Thank you again,

Mark Henley

National Aeronautics and Space Administration
Kennedy Space Center
Kennedy Space Center, FL 32899



Reply to Attn of: NE-P

March 3, 2010

TO: Dr. John Hamilton, PISCES, University of Hawaii Hilo
FROM: NE-P/ Space Resources Utilization Project Manager
SUBJECT: PISCES Support for 2010 ISRU Field Test

The 2010 International Lunar Surface Operations and In-Situ Resource Utilization (ILSO/ISRU) Field Test on Mauna Kea, Hawaii, was a resounding success. The test advanced the readiness of critical pieces of space technology and demonstrated a level of technology integration that was far greater than had previously been achieved. That success was due to the dedication of multiple organizations and their personnel, but especially the Pacific International Space Center for Exploration Systems (PISCES)

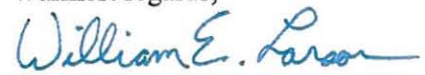
Through PISCES we were able to access a unique test area that has many characteristics of the lunar surface. This allowed us to test a prototype system to produce oxygen on the Moon because the volcanic tephra deposits at the test site were very similar to the mineralogy of the regolith found on the Moon. Not only did the test site have the needed minerals, the altitude of the test site allowed us to obtain higher levels of solar flux than we can obtain at NASA Field Centers. This boosted the oxygen yield of the system under test which uses the power of the sun to provide the energy necessary to produce oxygen.

In addition to our oxygen production system we also were able to test a prototype system that will search for water at the poles of the Moon and also the mid-latitudes on Mars. The system, named RESOLVE (Regolith and Environmental Science & Oxygen and Lunar Volatiles Extraction), will drive around on the moon and extract numerous core samples which will be analyzed by the payload's instruments to help NASA determine if we can obtain usable quantities of water to enable exploration beyond low earth orbit. Finding usable water on the Moon and Mars will fundamentally change our exploration architectures. No longer will we have to launch everything we need for a mission on our launch vehicles. Instead, we will be able to refuel our space exploration vehicles at our destination. This will save billions of dollars.

Let me close by saying that I want to express my heartfelt appreciation for the contributions that you and the PISCES team made to the 2010 field test. The spirit of cooperation and excitement shown by your team was an important element that helped us all succeed. I wish you success in your efforts to obtain continued support from the State of Hawaii so that NASA's ISRU project can return to the Big Island for future field tests as we move closer and

closer to the day when we will change the way we explore space. When that day arrives, PISCES and Hawaii will have played an important role in enabling the use of space resources.

Warmest regards,

A handwritten signature in blue ink that reads "William E. Larson". The signature is written in a cursive style with a long, sweeping underline.

William E. Larson

February 3, 2012

To Whom It May Concern:

Northern Centre for Advanced Technology Inc (NORCAT) would like to recognize the positive contributions of PISCES (the Pacific International Space Center for Exploration Systems) in promoting education, research and technology advancement on the Island of Hawai'i.

NORCAT recognizes that PISCES and its International Lunar Research Park project could be an economic development opportunity for the State of Hawaii which could attract companies engaged in clean, high-tech research and development in sustainable energy, sustainable agriculture and in recycling technologies. PISCES should be tasked with providing the nucleus of a 21st century technology research park based in Hilo. We believe this park has the potential to attract corporations which could provide and support an increased need for broadband service, to create high-tech jobs for the future and engage Hawaii's unique resources and skill-sets. It can also create new revenue streams for scientific research and commercial applications.

As such we support efforts by the State of Hawaii to increase the effectiveness of PISCES via pending legislation such as HB 2873 and HB 2145.

Yours truly,

A handwritten signature in blue ink, appearing to read 'Dale Boucher', with a long horizontal flourish extending to the right.

Dale Boucher
Senior Director, Innovation and Development

6 February 2012

Letter of Support for PISCES and
The International Lunar Research Park

To whom it may concern,

I recently had the opportunity to attend the International Lunar Research Park (ILRP) Leader's Summit at Waikoloa, Hawaii the week of November 13, 2011. The goal of the ILRP Leader's Summit was to investigate ways to move the ILRP and PISCES forward toward becoming a true multi-national, industrial-academic partnership. This was accomplished by sharing experiences in international consortiums gained by attendees from a wide variety of backgrounds, including the US State Department, the Pacific Science Association, the Japan Aerospace Exploration Agency, NASA, the University of Hawaii, and over twenty potential industrial partners.

During the course of this conference, several noteworthy announcements were made by the participants. These included a visionary dream of the Shimizu Corporation to create solar panels on the surface of the Moon to beam power to Earth, and the intent of two US companies, Moon Express and Shackleton Energy, to begin industrial operations on the Moon. These announcements present Hawaii with a unique opportunity to leap to the forefront of this wave of research, technology and industrial development. By taking the lead with the ILRP, Hawaii has the chance to generate dramatic economic growth and become the focal point of a new high-tech region similar to Silicon Valley.

As an example of this type of economic growth, let me describe my experiences with the World's leading research consortium, the Advanced Manufacturing Research Centre (AMRC) in Sheffield, England. The AMRC is the anchor tenant for the Advanced Manufacturing Park, the site of a now defunct coal mine.

After the collapse of UK Coal in 1980, Sheffield became an economically impoverished region. In 2001, with the aid of Boeing, the University of Sheffield created the AMRC, with a staff of 6 people in a vacant warehouse. By the end of 2011 (after only 10 years), the AMRC has grown to a world renowned research center, with 70 industrial partners and a staff of over 200, which is expected to double in the next 2 years. Their partners include Boeing, Rolls-Royce, BAE Systems, Messier-Dowty, ALCOA, TiMet, and Carpenter Steels. Their 200 staff members are mostly engineering graduates with PhDs and Masters Degrees, earning substantial salaries. They have won over \$300 MILLION in research grants over their 10 year existence.

The AMRC is now housed in 3 new, purpose-built buildings, with 3 more under construction, for a total under-roof area of 180,000 square feet. These include a new Knowledge Transfer Centre, and an Apprentice Training Centre, both of which are aimed at continuing to improve the Yorkshire region's competitive economic standing. In addition, more than a dozen companies have moved onto the AMP. Rolls-Royce has recently announced plans to build 2 new factories on the AMP, with plans to employ over 300 people at this site.

The AMRC has also had a tremendous effect on the University of Sheffield. Always known for its fine cutting tools, the University's faculty now ranks NUMBER 2 in the UK, ahead of such prestigious institutions as Oxford and Cambridge. The AMRC brings over \$25 Million of research funds to the University, and in 2009 was awarded the Queen's Anniversary Prize, which led to Her Majesty's recent visit to the AMRC (only the second time a Monarch has visited Sheffield).

With the AMRC as its guide, the International Lunar Research Park could likewise vault Hawaii and the University of Hawaii to the forefront of a variety of technological fields, including tele-operated robotics, remote site material processing, telecommunications, low cost sustainable solar energy, astronaut & crew training and a variety of science and mathematics disciplines. The potential for job creation in these high tech fields, as well as construction and infrastructure support is extremely large. Transportation and entertainment sectors will likewise benefit, as a host of international partners' employees and representatives make Hawaii their preferred vacation spot. Image the impact if, after ten years, the ILRP and PISCES are able to bring \$100 Million to the State of Hawaii.

I believe the ILRP and PISCES are crucial to the economic development of a high-technology sector in Hawaii, as well as for the development of Lunar Commerce. This Lunar Commerce has the potential to create massive economic benefit to the world, and could provide a clean, continuous source of Space Based Solar Power (the only truly green energy source).

Finally, with the vision of Mālama Hawai'i (caring for and protecting Hawai'i) and Mālama Honua (for the Earth), the Hawaiian people can again navigate the stars by leading the way back to the Moon.

Mahalo nui loa!

David Heck

David Heck

David Heck is an Associate Technical Fellow at The Boeing Company on the Manufacturing Technology Team and works with several domestic and international research consortiums to develop new manufacturing technology for the aerospace industry.

The opinions expressed in this document are his own and do not reflect the position of The Boeing Company

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The South African Space Resources Association
www.sasra.co.za
Email: president@sasra.co.za
Phone: +27 74 117 4494

19 January 2012

To whom it may concern

SASRA supports the PISCES International Lunar Research Park

The South African Space Resources Association (SASRA) finds much merit in the PISCES International Lunar Research Park (ILRP) concept. It will serve as a vessel for the development of existing and new technologies enabling energy and space mining techniques, with potential for significant Earth-based benefits.

Despite being geographically distanced from South Africa, PISCES have demonstrated they are capable of fostering collaboration with our country. Having partaken in one of the PISCES teleoperations demonstrations, SASRA is reassured we can contribute remote experiments to the ILRP.

South Africa has a long and successful history of mining and associated technologies and engineering, while growing its participation in space activities. These will certainly be assets for future involvement in the ILRP.

We support the planning and build-out of such a commercial research and development park as the first important step in incorporating the moon into the Earth's economic sphere.

Yours truly

2012/01/19

X 

Michael Neale
SASRA President
Signed by: Michael Neale

With support of the SASRA executive committee:
Johan Kruger
JJ Mare
Miguel Coelho
Theo Ireton
Bernhardt Garlipp

HONEYBEE ROBOTICS
Spacecraft Mechanisms Corporation



John Hamilton
Deputy Director, PISCES

6 February 2012

Dear John,

Over the past few year PISCES has proven itself to be instrumental to the success of the Lunar-focused field campaigns and in promoting of the space exploration. I strongly support the work PISCES has done in the past, and in addition I strongly support its further activities as well as establishing of the exciting new venture: the International Lunar Research Park (ILRP).

Kris Zacny, PhD

PISCES Advisory Board member.

Kris Zacny, PhD
Vice President
Director, Exploration Technology Group

Honeybee Robotics Spacecraft Mechanisms Corporation
398 W Washington Blvd., Suite 200, Pasadena, CA 91103
mob: 510-207-4555 / blackberry: 646-508-9807 / fax: 626-689-4823
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1-877-274-6288,

Tel: 519 662 4000

Fax: 519 662 2421

www.ARGOutv.com

E-mail: sales@ARGOutv.com

Corporate E-mail Signature

February, 2011

Dear Mr. Hamilton,

I would like to formally offer our thanks for the support you and your team provided during the analog deployment missions in November 2008 and January 2010. The test site that PISCES facilitated was an ideal location for us to test and develop our rovers. The natural terrain that we found at the work site is an important contribution to our work in developing lunar mobility platforms. Additionally, the logistical support made our lives much easier and enabled us to complete all of our test objectives.

It was also great to learn so much about Hawaii. Both Christian and you gave us a much deeper insight into Hawaiian culture and history than we would have received without such great ambassadors.

We look forward to working with your organization in the future.

Aloha,

Peter Visscher

Space/Robotics Program Manager



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Fax: (519) 662-2421
E-mail: pbarros@argoutv.com

www.argoutv.com

Extreme Off-Road Performance

February 3, 2012

Representative Calvin K. Y. Say
Representative Angus L. K. McKelvey
Representative Jerry L. Chang
Representative Cindy Evans
Representative Mark M. Nakashima
Representative Cliff Tsuji

Aloha,

My name is Rodrigo Romo, I have been living in Hilo for almost 6 years now. Shortly after my family and I moved here, we had the honor to meet some of the people involved with The Pacific International Space Center for Exploration Systems (PISCES). Having worked for five years at the Biosphere 2 project in Arizona, and being a member of the second crew that resided inside, I see PISCES as an unparalleled opportunity to promote education, research and technology advancement on the Island of Hawai'i.

I strongly believe that PISCES and its International Lunar Research Park project will be an economic development opportunity for the County of Hawai'i and State that could attract companies engaged in clean, high-tech research and development in sustainable energy, sustainable agriculture and in recycling technologies. It is ventures like this what the Big Island needs to further diversify its employment potential. PISCES has worked closely with local High Schools in teaching the local youth the opportunities that exist in high tech careers, this project would set a leading project in Hawai'i's own back yard.

I strongly endorse and support the efforts by the State of Hawaii to increase the effectiveness of PISCES via pending legislation such as HB 2873 and HB 2145.

Sincerely,

Rodrigo F.V. Romo, Ch.E., MBA
Vice President Engineering
Zeta Corporation
1445 Waianuenue Ave
Hilo HI

February 3, 2012

Representative Calvin K. Y. Say
Representative Angus L. K. McKelvey
Representative Jerry L. Chang
Representative Cindy Evans
Representative Mark M. Nakashima
Representative Clift Tsuji

Aloha,

My name is Charlotte Romo, my husband and I decided to move to Hilo six years ago. We both participated in the Biosphere 2 project in Arizona. I am a Science High School teacher now at Hilo High. We met people from the Pacific International Space Center for Exploration Systems (PISCES) a few years ago and we have shared many positive experiences with them. As a High School teacher I see PISCES as an unparalleled opportunity to promote education, research and technology advancement on the Island of Hawai'i. Members of PISCES have come to my classroom to talk to my students about the opportunities available to them right here in space exploration, they allowed my students to experiment with a remote controlled NASA rover. These unique opportunities would not have been available to my students if it weren't for PISCES.

I strongly believe that PISCES and its International Lunar Research Park project will be an economic development and educational opportunity for the County of Hawai'i and State that could attract companies engaged in clean, high-tech research and development in sustainable energy, sustainable agriculture and in recycling technologies.

I strongly endorse and support the efforts by the State of Hawaii to increase the effectiveness of PISCES via pending legislation such as HB 2873 and HB 2145.

Sincerely,

Charlotte Romo
High School Science Teacher
Hilo High School
1445 Waianuenue Ave
Hilo HI

February 5, 2012

Hello Mr Bland and Mr Todome, and thank you very much for your interesting emails about PISCES, ILRP and JAMMS.

Regarding PISCES and I have been discussing this within our team and I can report back to you that we are most definitely interested to look further into the opportunity of making use of that facility. We have heard in the past that it is a very good lunar analog site and it's also in a relatively convenient location for our Japanese team, which is responsible for our rover developments. Our team's long term strategy is to conduct the final qualification testing of our lunar surface elements (i.e. lander + rover) at such an analog site. If all goes well with our technology developments and fund-raising, we would be in a position to undertake such tests some time in late 2013 I think.

The chances are high that we will have at least one attendee at the GLEX since it will take place directly before the GLXP Team Summit which we plan to attend. That might be a good opportunity to explore the PISCES cooperation further.

Regarding ILRP too, I would certainly be willing to discuss how we could support your vision in the European aerospace community.

Finally, I was very happy to receive the contact from Mr Todome from JAMMS. As you might know, in Japan we are currently working hard to raise the profile of White Label Space, as well as lunar exploration and science in general. We would be quite interested to explore what type of cooperation would be possible with JAMMS in these areas.

Best regards,
Andrew

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