

# PISCES NEWSLETTER

PACIFIC INTERNATIONAL SPACE CENTER FOR EXPLORATION SYSTEMS \* HILO, HAWAII

OCTOBER, 2015

VOL #3 ISSUE #10



## PISCES WELCOMES OUR NEW LONG-TERM INTERN!



The Pacific International Space Center for Exploration Systems is proud to welcome our new long-term intern Ethan Paguirigan to the team.

Ethan comes to us from the University of Hawaii at Hilo where he is currently a sophomore majoring in physics.

“With a physics major I hope to accomplish my goal of completing the degree so I can transfer over to Manoa or CALTECH to get an engineering degree in mechanical engineering,” he said.

Currently Ethan is involved in the Space Robotics team at the university, where he and his peers recently built the school’s first planetary mining rover from scratch!

The Hawaii Island native is also a graduate from nearby Keauau High School, and said he was interested in the PISCES’ internship position for the opportunity to get hands-on experience.

“I’m excited because I get real world experience in the field of engineering. I’m getting the chance to learn everything about what goes into it, from planning, testing, and recording data, to building a finished project,” he said.

Ethan will be working with us periodically during the next two years.

Welcome to the team Ethan!

## MESSAGE FROM THE EXECUTIVE DIRECTOR

### Is Hawaii a “contender” or “pretender” in growing the aerospace sector within the State?

I recently finished reading a fascinating book: “The Wright Brothers” by David McCullough. It portrays the pivotal event in history of humans flying in the first motorized airplane. One of the key observations I made from the book relates to what turned out to be only international interest (versus U.S.) in the Wright brothers’ airplane. While American ingenuity, found in the American inventors Orville and Wilbur Wright, led the way into the era of powered flight, we tend to forget that the United States squandered its opportunity for initial leadership in aviation. The U. S. government failed to understand the incredible importance of the invention of the aeroplane. This lack of vision was not found in Europe as the European nations fostered significant advantage in the subsequent development of strategically important aviation systems within the first 10 years after the Wright brothers’ invention. The consequence of America’s lack of vision in the strategic use of aerospace resulted in the air war of World War I being fought by German, English and French aircraft...not American.

During the last few years, the State legislature in Hawaii has indicated a desire to add other economic development sectors to the State’s portfolio...beyond the traditional industries of tourism, service industry, and military that tend to dominate the State’s economy. Aerospace, beyond traditional civil-aviation, has been identified by the legislature as one of those possible new economic development sectors to help expand and diversify the State’s economy.

For more than 50 years, Hawaii has had the beginnings of an aerospace presence statewide. Our strategic mid-Pacific, near equatorial location and Moon/Mars like terrain has provided some initial seeds of opportunity. Hawaii’s Pacific Missile Range Facility (PMRF), the Maui Space Surveillance System, training of astronauts on lava fields in Hawaii, a NASA command/tracking station used until recently for manned space missions, the University of Hawaii Space Flight Laboratory, the Pacific International Space Center for Exploration Systems (PISCES), and the world-class telescopes on Mauna Kea are clear examples of areas in which Hawaii is playing a global leadership role. *See pg. 2*

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Rob Kelso, PISCES Executive Director

# PISCES KICKS OFF INTERNATIONAL OBSERVE THE MOON NIGHT IN HILO, HAWAII!

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## INTERNATIONAL OBSERVE THE MOON NIGHT: A BIG HIT FOR STUDENTS AND MORE!!



PISCES' test logistics manager John Hamilton spearheaded the annual International Observe the Moon Night at the University of Hawaii at Hilo on Sept. 19.

About 30 people attended the forum and had a chance to learn about a wide-range of topics, including Moon phases and the latest in space exploration technology. There were also multiple guest speakers present that evening discussing various space-related topics.

John said the event drew "positive comments from people" and he was even surprised to hear that one family drove over an hour just to attend!

International Observe the Moon Night (InOMN) is an annual worldwide public event that encourages observation, appreciation, and understanding of our Moon and its connection to NASA planetary science and exploration. Anyone can host or attend an InOMN event each year.



The Moon.  
Image Credit: NASA

## WILL HAWAII PREVAIL? DIRECTOR'S MESSAGE CONTINUED

In addition, new aerospace industries are also emerging that will provide dynamic new opportunities for Hawaii. These include suborbital tourism out of the Kona airport, small satellite launch capability (both air-launch and fixed pad launch), testing/operations of complex unmanned aerial systems (UAS), and laser optical communications, to name a few.

But to-date, the state's vision, strategy and commitment for aerospace has been unclear. There is an urgent need to have a clear strategic plan (for the next 5-10 years) that both provides a very clear position going forward that can support aerospace development statewide, including financial and other economic incentives legislatively supported by the State to help grow and diversify Hawaii's aerospace sector. This will also serve as a signal to the federal, private sector and international community that Hawaii is indeed serious about growing this industry (as well as the dynamic public-private partnerships this will enable).

Ironically, states such as Colorado, Georgia, Alabama, Florida, Nevada and New Mexico are aggressively developing and implementing state aerospace strategies and plans. Yet none of these states come close to affording the unique assets Hawaii offers concerning geographic location, lack of range safety issues, geological assets, and other factors critical to aerospace development. If the state is truly interested in creating high technology jobs, new pathways for a trained workforce, and an on-ramp of new aerospace industries for Hawaii, State support and direction will be critical to achieving this goal.

As former governor George Ariyoshi recently noted, Hawaii's unique geographic locations, geological assets, and international connectivity are strategic assets and capabilities that that can never be taken away and will provide new opportunities for technology investment statewide that can create new high technology jobs and industries. Opportunities are continuing to emerge for creating a vibrant aerospace economy... "but space is ours to lose."

While early history shows the U.S. squandering the opportunity to realize the importance of the Wright brothers' invention, we hope that the State of Hawaii will recognize the important value of emerging aerospace sectors to this State and find a way to incorporate these opportunities into our economic development strategy.

**Upper left:** Students listen to a presentation about the Hawaiian moon calendar during the International Observe the Moon Night held at the University of Hawaii at Hilo. The event gathered a crowd of about 30 curious students and guests on Sept. 19. **Right:** A local librarian is seen here showing samples of NASA lunar and meteorite discs to InOMN attendees.



# PISCES MAKES HEADLINES WITH NEW LUNAR LANDING PAD TEST SITE!!!

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Tribune Herald



INTERSTELLAR INFRASTRUCTURE  
PISCES, NASA team up for landing pad project

By TOM CALLES  
The 100-square-foot pad will be made of crushed basalt, which is similar to the Hawaiian Islands and found commonly on the island of Hawaii. The project is being led by PISCES, which operates under the state Department of Business, Economic Development and Tourism, in partnership with NASA on the Big Island of Hawaii.



## PISCES COMPLETES MAJOR MILESTONE IN THE VERTICAL TAKE-OFF/ VERTICAL LANDING PAD PROJECT IN HAWAII

Last month was exceptionally busy for us at the Pacific International Space Center for Exploration Systems.

We recently announced the signing of a non-reimbursable Space Act Agreement with NASA's Kennedy Space Center (KSC), formally establishing a partnership for the development of our lunar landing pad test site on the Big Island of Hawaii!

With the site being a first-of-its-kind in the State, news about our project spread throughout Hawaii and around the world! In case you missed it, here's what we're up to...

The development of the site is part of the Additive Construction for Mobile Emplacement (ACME) project, which aims to robotically build a vertical take-off and landing pad using basalt found on the island.

Our scientists will be using indigenous Hawaiian basalt crushed rock material mined from a quarry near Hilo, Hawaii for the project. The basalt found here is nearly identical to the regolith found on the Moon and Mars.

The initiative will help develop a method of effectively building in space. Landing pads offer a flat, stable surface to prevent damages that occur when spacecrafts take off or land on other planetary objects.

PISCES recently accomplished a milestone in the project, completing grading and leveling work at the site using our robotic rover named "Helelani." We also built a simulated lunar surface, complete with Moon-like craters and all.

Additionally, PISCES will help NASA to remotely teleoperate the leveling blade and potentially the rover from the Kennedy Space Center in Florida.

We are very excited to start this project and would like to offer a warm mahalo to all of our supporters, especially the Hawaii County Department of Research and Development!

**Upper:** The following image shows a FRONT PAGE story about our lunar landing pad project in the local Hawaii Tribune-Herald newspaper! **Center:** PISCES' rover "Helelani" is seen here performing some work at the new lunar landing pad site. **Lower:** The PISCES' drone wasn't working one day so a couple of our staff members used their creativity to fly our GoPro over the site using balloons!



**PISCES Executive Director, Rob Kelso, travelled to Japan in early September for aerospace business development discussions for Hawaii.**

Mr. Kelso was recently invited to meet with senior managers of Japan's national space program, JAXA, to discuss joint program opportunities for flight testing technology on the Moon's surface. JAXA also expressed interest in exploring research opportunities in ISRU (in-situ resource utilization) for the Moon and Mars.

JAXA had been under the impression that PISCES was still as it was 4-5 years ago when we were limited to providing test site facilitation. They were most impressed to hear of the vast growth in applied research achieved by PISCES during the last 3 years. Attending the meeting was Dr. Takashi Kubota, Program Director of the Institute of Space and Astronautical Science (ISAS) within JAXA, and Tatsuaki Hashimoto, Project Manager for JAXA's SELENE-RP lunar lander program.

Mr. Kelso also presented two invited keynote addresses at the 6th International Symposium on Physical Sciences in Space (ISPS-6) conference in Kyoto. He also met with Prof. Osamu Odawara, Dean of the Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology. Discussions centered around recent research in Japan on combustion synthesis and its application to bonding and joining basalt pavers for lunar and Mars landing pads. Mr. Kelso and Dr. Odawara explored an opportunity to work together on a joint test program using this technology in Hawaii.



**WE ARE LIVE!!!**

Check Out PISCES on the Web!



[PISCES.HAWAII.GOV](http://PISCES.HAWAII.GOV)

***PISCES IS ONLINE!!! Visit our website for the latest information about PISCES and other space-related news at [www.pacificspacecenter.com](http://www.pacificspacecenter.com)***

**ABOUT US**

PISCES is a Hawaii State Government Aerospace Agency located in beautiful Hilo, Hawaii. The research and education/training center is part of the State Department of Business, Economic Development, and Tourism (DBEDT), and conducts environmentally safe field demonstrations to test and validate innovative space technologies on Hawaii's volcanic terrain under the jurisdiction of the Hawaii State Department of Land and Natural Resources (DLNR).

**PISCES' KILN FOR BASALT EXPERIMENTATION**

The kiln featured on the right-hand side of this page is currently being used to bake basalt rock dust into useable pavers.

This specialized furnace can reach the high temperatures needed to bake the basalt (greater than 2,100 degrees Fahrenheit) and has the capacity to produce multiple pavers at once.

The pavers will be used at the NASA- PISCES landing/launch pad site near Hilo, Hawaii. The pavers will be robotically emplaced by PISCES' rover, Helelani.

