PISCES HAWAII'S PORTAL TO SPACE

NEWSLETTER

www.pacificspacecenter.com

May 2020 - Issue 5 Volume 8

STEM Community Rallies to Address PPE Shortage as COVID-19 Continues

Above: PISCES program director Rodrigo Romo (left) delivers 3D-printed mask tension relief straps to Hilo Medical Center. On right, Elena Cabatu, director of public affairs at HMC.

Together with STEM organizations, community members and students, PISCES has been actively working to address the COVID-19 outbreak on Hawaii island by producing personal protective equipment (PPE) for healthcare workers and first responders.

PISCES' efforts are part of a coalition of organizations and individuals called Hawaii STEM Community Care. The group includes volunteers and leaders from Hawaii Science and Technology Museum (HSTM), NexTech, Canada-France-Hawaii Telescope, Big Island Community Coronavirus Response Initiative, Hawaii Space Flight Laboratory and East Asian Observatory. Students are also involved.

Working in a coordinated effort to pool resources, skills and knowledge, the group is making protective face shields, face mask comfort bands, door openers and UV sterilizers—items needed by front-line workers to protect against infection.

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Letter from the Director

Rodrigo Romo

Aloha kākou,

In response to the continuing COVID-19 outbreak in our community, we have been working as part of a grassroots nonprofit called Hawaii STEM Community Care. This coalition was started by members of the STEM communities in East and North Hawaii. Together, we are combining resources and knowledge to provide much needed personal protection equipment to healthcare workers, first responders and community service providers on Hawaii Island who are working to keep our community healthy and safe from Coronavirus.

Since the group began, we have produced and delivered face mask comfort bands (aka "ear savers"), face shields and door openers. We are also testing a UV mask sterilizer prototype for distribution to Hawaii fire departments.

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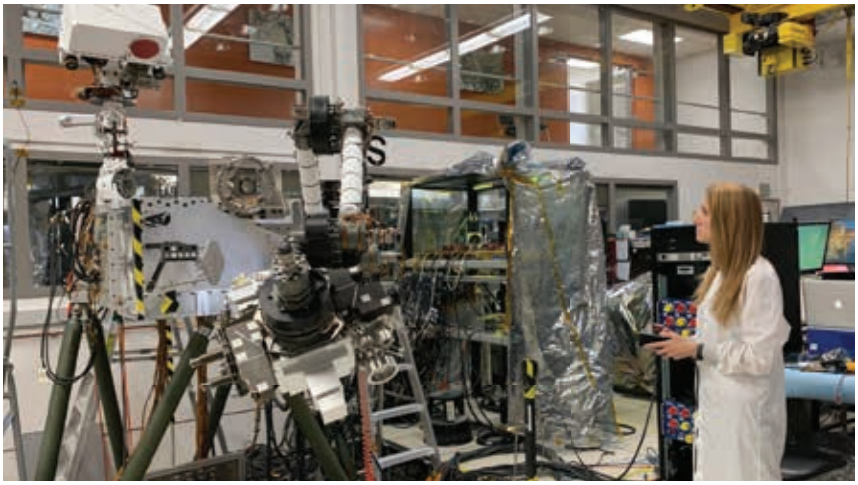
Time for Perseverance: Next Mars Rover to Launch in July



By: Heather Bottom, Launch Systems Engineer at NASA-JPL

Above: *Heather Bottom with Perserverance, NASA's new Mars rover scheduled for launch in July. Courtesy photo.*

Perseverance—now a proper noun as the name of the next Mars rover—means "persistence in doing something despite difficulty or delay in achieving success" (Oxford). In a world struggling with the COVID-19 pandemic, it goes without saying that there is difficulty in preparing for a launch in July. But "delay in achieving success" is not an option for the Mars 2020 team—a crew spanning space industry partners from United Launch Alliance (ULA) to Kennedy Space Center (KSC), academic universities to, of course, the Jet Propulsion Laboratory (JPL). If the spacecraft does not launch within the optimal window of mid-July to late August, it will need to wait another two years until the next Earth-to-Mars alignment arrives. Amidst difficult times, Perseverance is pushing towards that launch window, relying on a backbone of preparation and testing while proceeding with unwavering diligence and caution.

In the final months (even final days) before the launch window opens, the engineers begin to resemble creative artists or performers preparing for the opening curtain to rise—rehearsing for all known and unknown possibilities while dressing up the rover for its grand entrance into the vacuum of space. As the finishing integrations are performed at Cape Canaveral, the team of operators rehearse different scenarios that could occur on launch day. How would you handle a failure in autonomous maneuvering? What would happen if the launch vehicle (ULA's Atlas V) failed to reach a high enough orbital insertion? What if the batteries could not handle the high-power draw from heaters while inside Earth's shadow in the launch trajectory? The launch team needs to be prepared for any anomalies that could occur prior to confirming the spacecraft has reached a stable and safe trajectory to Mars.

> *"In a world struggling with the COVID-19 pandemic, it goes without saying that there is difficulty in preparing for a launch in July. But 'delay in achieving success' is not an option for the Mars 2020 team ..."*

Those nominal and off-nominal scenarios are not foreign to the launch systems engineering team. Prior to the vehicle being shipped to Florida, day-in-the-life testing is a common and necessary occurrence using flight hardware and flight software.

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STEM Community Rallies to Address PPE Shortage

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"Working as a first responder, I know the critical need for PPE in our community," said Christian Wong, executive director of HSTM and a local fire fighter. "Connecting the needs of our first responders with our Big Island STEM community allows Hawaii STEM Community Care to design and produce PPE that fits the specific needs of our health care community."

So far, the group has manufactured and delivered more than 1,300 mask comfort bands to healthcare facilities across the island. More than 500 face shields and aluminum door openers have been assembled and will be distributed soon. Additionally, a prototype UV sterilizer for face masks is undergoing tests at the University of Hawaii at Hilo to confirm its effectiveness.

"I appreciate the speed of these efforts," said Dr. Craig Burger, a consultant for the group. "Iterating directly with local PPE designers and manufacturers allows us to meet an ever-changing need. Any reduction in anxiety or an increase in comfort we can provide is so crucial for the physical health and mental well-being of our front-line providers."

Hawaii STEM Community Care recently received a $5,000 grant from Hawaii Community Foundation to continue producing and distributing PPE donations.

"There are a lot of people who are passionate about the problem," said Kean Wong, co-coordinator of Big Island Community Coronavirus Response Initiative. "We're finding as we're able to coordinate with people and provide them resources they may not have, we're able to help out and have a larger impact than any single individual can."

Courtesy photo.

Next Mars Rover to Launch in July

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JPL spends weeks performing systems-level testing to make sure the rover's hardware and software can handle any nominal or anomalous occurrences spanning the entire mission—from launch and landing to surface operations. And without a doubt, important issues are always found. Optimism is not an option when it comes to making sure the vehicle and its operators are ready for flight.

As the team prepares for the July launch window, upcoming operation tests include a week-long anomalous scenario and final dress rehearsals with ULA, KSC and JPL. The most notable grand finale in preparation will come just days before launch with the installation of the multi-mission radioisotope thermoelectric generator (MMRTG). The MMRTG will power the rover on the surface of Mars for the duration of the mission—at least one Martian year (or 687 Earth days).

The team perseveres amidst unusual circumstances, preparing for launch and a six-month journey to Mars. Act II is scheduled for Feb. 18, 2021, which will involve entry, descent and landing.

Want to learn more? Get more details about the scenario testing and Perserverance mission online.

The Voyage Ahead: Hawaii's Economic Opportunities

By: Hawaii State Senator Glenn S. Wakai

Tourism is hemorrhaging. It was a great eight-year run of increased arrivals and visitor spending—until it fell apart in March. Up until this year, there was little pressure to diversify Hawaii's economy, so we decided not to. Today, we are witnessing the shortcomings of that decision. We are suffering the highest unemployment per capita in the U.S. due to our over-dependence on tourism. Now is the opportune time for Hawaii to create a more resilient economy. COVID-19 is not a devastating end. It's a new beginning.

Beyond 2021, what does Hawaii's economy look like? I believe we should focus on sectors where Hawaii can become a global leader, and where the workforce cannot migrate out of state. Here is my triple "A" economic plan for innovation.

AEROSPACE

Hawaii has several opportunities in the aerospace sector for economic growth. Hawaii Island's proximity to the equator makes it the best location in the U.S. to launch satellites into space, requiring less fuel to send a projectile into orbit. Due to a limited number of launch sites, 20,000 satellites are currently awaiting launch into the stratosphere—small sats ranging in size from a Rubik's cube to a washing machine.

"Now is the opportune time for Hawaii to create a more resilient economy. COVID-19 is not a devastating end. It's a new beginning."

Drones also hold great potential. Hawaii is one of the few states with FAA licensing for drone research. Goods, services and even people will be delivered through this technology in the near future. Hawaii needs a strategic plan to grow capacity and capture all the intellectual property resulting from these tests.

Sen. Glenn Wakai. Courtesy photo.

Hawaii can also serve as a hub for space communications. NASA is developing the Laser Communications Relay Demonstration (LCRD) program which will allow data transfers to and from satellites at rates never achieved before. As part of this program, they are planning to establish a ground station on Maui's Haleakala volcano. There is also commercial interest in establishing a second station on the slopes of Mauna Loa. Perhaps NELHA's HOST Park in Kailua-Kona could host a data center for this operation, using its cool water resources to keep the computer equipment functioning properly.

Lastly, when humans eventually colonize the moon and other planetary bodies, research and prep work should be done on the Big Island.

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PISCES Geologist Featured in TV Episode of CBS' *Mission Unstoppable*

Above: *PISCES geologist Kyla Edison discusses the composition of a piece of volcanic basalt with Mission Unstoppable co-host Danni Washington at a quarry in East Hawaii. Photo: CBS Mission Unstoppable.*

Planetary geology research that could benefit the State of Hawaii and future space exploration missions was among the highlights of a weekly CBS TV show last month. *Mission Unstoppable*, an educational show for teens that highlights and celebrates women working in STEM careers, featured PISCES geology technician Kyla Edison discussing her work in Hawaiian basalt research.

Show co-host Danni Washington met Kyla at an East Hawaii quarry to discovery how she samples, breaks down and analyzes basalt rock used in sintering (or melting) for in-situ resource applications. The episode aired Saturday, April 27, and is viewable online at CBS All Access.

Kyla's basalt research at PISCES provides a conceptual solution for constructing settlements beyond Earth using native resources while also developing a durable building material that could benefit Hawaii's local economy.

Letter from the Director

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Additionally, we will continue exploring other products and solutions that help the many brave men and women who work on the frontlines of the battle.

COVID-19 continues to wreak havoc on our local economy, and economies around the world. It is difficult to foresee what the near-, mid- and long-term future will look like. One thing is clear: now, more than ever, the diversification of our local economy is crucial. Being highly dependent on a single industry has shown the damage that a global pandemic can bring, and it is time to find new ways to maintain our economic prosperity. Undoubtedly, tourism will continue to play a key role in Hawaii's economy in the years to come. But other sectors have significant potential to diversify jobs and provide other sources of employment and revenue that benefit our communities.

At PISCES, our main role as a state-funded agency is to promote Aerospace Industry projects and opportunities in Hawaii. Now, this directive has become even more important. We are continuing to work closely with local lawmakers, academics and researchers around the world to find ways to expand Hawaii's engagement in this key industry.

Working together, I believe we have the strength and capability to overcome the challenges mounted by this pandemic.

A hui hou,

R.Romo

Rodrigo Romo
PISCES Program Director

The Voyage Ahead: Hawaii's Economic Opportunities

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It's lunar-like landscapes make it the ideal environment for conducting training exercises and testing, especially in light of NASA's new Artemis Program aimed at putting humans back on the moon within four years.

ALTERNATIVE ENERGY

Alternative energy sources will power our entire state by 2045. Our mix of clean energy sources is unmatched elsewhere. Although, the construction and maintenance of renewables doesn't create a multitude of jobs, the golden egg is in the data collection and analysis. There is a complex assortment of parts—from grid management and tax credits, to efficiency and permitting. All of this information has great value and should be monetized by a local company. Hawaii will save $9 billion by not having to purchase fossil fuels, but the job creator is in intellectual property. In addition to this, having a clean, reliable and affordable source of energy that does not depend on the fluctuation of the global price of oil will allow new industries to be established in Hawaii.

AQUACULTURE

We import a startling 70% of the fish consumed in Hawaii. Instead, we should make a concerted effort to grow aquaculture and be a fish and crustacean exporter. With limited terrestrial space, agriculture has inherent land use conflicts. In addition, tapping water sources and delivering that water to fields is wrought with problems. Let's focus on an untapped resource. The ocean provides us with infinite possibilities for food sustainability. We should be growing protein as well as vegetables off-shore. The State Department of Agriculture has only one person in this division and no budget. We can also fund aquaculture accelerators at NELHA and fine-tune the Dept. of Land and Natural Resource's off-shore leasing process.

Many businesses will never recover from COVID-19. In the aftermath, will we allow this pandemic to be a devastating blow to our economy, or view it as an immense chance to rewrite Hawaii's future? 2020 allows us to focus on greater prospects, think strategically, leverage partnerships, diversify our economy and strengthen our community.

Below: Apollo astronauts conduct geological training at "Apollo Valley" on the Big Island in December 1970. Credit: NASA.