



LSIC

Newsletter

The Lunar Surface Innovation Consortium is administered by the Johns Hopkins Applied Physics Laboratory, and operates in collaboration with the NASA Space Technology Mission Directorate under the Lunar Surface Innovation Initiative. Its purpose is to harness the creativity, energy, and resources of the nation to help NASA keep the United States at the forefront of lunar exploration. To find out more, sign up to participate, or access past additions of this newsletter, please visit lsic.jhuapl.edu.

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Director's Update

It's hard to believe we're a month out from our Fall Meeting!

We are honored to be hosted by the University of Texas at El Paso (UTEP). I had the opportunity to visit and tour some of the labs last month, and the technical work the students are conducting is incredibly impressive. For those who are able to attend in person, I am sure you'll enjoy meeting them and seeing some of the facilities. Registration is open through October 18th (<https://lsic.jhuapl.edu/Events/Agenda/index.php?id=350>).

This year, we will highlight some of the exciting work going on in Excavation and Construction, as well as discuss key issues including proving grounds for testing different aspects of systems on Earth, early infrastructure, and lunar resources. We will also have updates from NASA, awardees, the community, and more.

For those who have attended our Fall Meetings before, you will know that our Fall breakouts center around concerns and strategy for developing a sustained presence on the Moon. This year, we will be talking about the community's envisioned future in more depth, examining how it aligns with the envisioned futures that NASA has presented and looking critically at whether there are any specific technologies or elements that are pivotal that might not yet be among those that NASA has included in their presented plans.

Unlike past meetings, where we have captured discussions and provided formal findings to NASA primarily through meeting reports (available on the LSIC webpage), we also intend to feed these findings into a white paper that communicates a coherent vision from the technology community's perspective. This will not have the same scope as the LEAG lunar exploration roadmap (<https://www.lpi.usra.edu/leag/roadmap/>) or the Scientific Context for Exploration of the Moon report (<https://nap.nationalacademies.org/catalog/11954/the-scientific-context-for-exploration-of-the-moon>), but will be intended to complement those by approaching this from the standpoint of the technology community, including communicating visions for a lunar economy and where members see their place in it. So, please think about this in advance, if you can, and come ready to share your visions with us at the meeting.

We look forward to seeing you all soon!



Rachel Klima

Director, Lunar Surface Innovation Consortium

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Focus Areas

Monthly Telecon Schedule

Dust Mitigation (DM)

Third Thursdays at 12PM Eastern

Extreme Access (EA)

Second Thursdays at 3PM Eastern

In Situ Resource Utilization (ISRU)

Third Wednesdays at 3PM Eastern

Excavation & Construction (E&C)

Fourth Wednesdays at 2PM Eastern

Extreme Environments (EE)

Second Tuesdays at 3PM Eastern

Surface Power (SP)

Fourth Thursdays at 11AM Eastern

LSIC General Updates

As a reminder, If you don't have access to LSIC's Confluence wiki, please email Andrea Harman at ams573@alumni.psu.edu to get signed up.

LSIC Fall Meeting Registration Open Through 18 October

The Lunar Surface Innovation Consortium (LSIC) fall meeting will be held on Nov 2nd-3rd, 2022, at the University of Texas at El Paso and online. The event will feature interrelationships between the six focus areas identified by the Consortium, with a specific focus on how they relate to excavation and construction.

The 2022 Fall Meeting will feature individual invited talks, group and panel discussions, as well as poster sessions, breakout groups, and networking opportunities. A timeblock agenda is provided below to help with planning. You will be given access to a password-protected event page with additional logistical details such as available hotels after you register. Registration is open through 18 October, and is available on the event page here: <https://lsic.jhuapl.edu/Events/Agenda/index.php?id=350>

There will be several tours, both on campus and in the wider El Paso area, throughout the event. On Tuesday 01 November, the day before the event begins, a tour of the White Sands Test Facility will also be offered, with a shuttle departing from the University of Texas at El Paso campus around 11AM MT. Other tours include several tours of the UTEP facilities as well as a tour to visit ICON's 3D printed barracks at Fort Bliss. Please indicate when registering that you are interested in this event, and we will follow up with additional details.

The Aerospace Center at the University of Texas at El Paso has expanded beyond its initial research focus when it was founded in 2009 as the Center for Space Exploration Technology Research. In partnership with NASA, the Department of Defense, the Department of Energy, and many industry partners, this premiere, minority-serving research center explores new technologies and challenges in space, aeronautics, defense, and energy using digital tools and skills that are transforming the way we design, build and test. The Aerospace Center has grown from a 3,000 square foot lab employing 30 students as research assistants to over 35,000 square feet in laboratory space and 8,000 acres of test facilities employing 200 students today and still growing. The Aerospace Center's mission is to educate and prepare a diverse, future-ready workforce for high-paying, in-demand careers through project-based learning in applied, cutting-edge research in aerospace, defense, and energy.

CLPS Survive the Night Workshop (06-08 December 2022)

NASA's Science Mission Directorate (SMD) and the Space Technology Mission Directorate (STMD) are pleased to announce a workshop to facilitate collaboration between lander and rover providers and technology developers to share technologies that can enable survival through the lunar night. The Commercial Lunar Payload Services Survive the Night Technology Workshop is scheduled for December 6-8, 2022, at NASA's Glenn Research Center in Cleveland, Ohio, with an opportunity for virtual participation. General event information is available here: <https://www.hou.usra.edu/meetings/clps2022/>

Important: To be added to the mailing list to receive additional information about this conference, submit an indication of interest here: https://www.hou.usra.edu/meeting_portal/iofi/?mtg=clps2022

Launch of Pilot LSIC Mentor Program

After lots of planning, LSIC is excited to offer signup surveys for Mentors and Mentees looking to enrich their professional lives! The goal of the Mentoring Program is to provide a path for individuals (from academia, industry, nonprofits, and government) to partner between those looking to grow professionally and those looking to help build their own experience by giving others access to their insight. Our hope is to foster networking, provide business and career growth opportunities, and build the ‘next generation’ of professionals who will make an impact on lunar surface development.

If you are interested in giving or receiving mentorship, please fill out the appropriate survey below. We will give three weeks for everyone to express their interest, and then will spend one week pairing mentors and mentees. You will receive a notification of who you have been paired with by early October. Your input surveys, along with supporting material that will be made available to you by LSIC, will help guide your conversations and build a productive relationship. Please note that this is a pilot program with limited space - we’ll do our best to accommodate as many participants as possible, but be aware that we may not be able to take all applicants.

We appreciate your interest and look forward to continuing to build this program based on feedback from this initial round of mentors and mentees. Feedback will be requested throughout the program to help us continue to create a forum where professionals can share experience and grow together

Mentor Signup Survey: https://docs.google.com/forms/d/e/1FAIpQLSdfqzEur42a28w1NgPRAudtyQnjoOnlzgmlKpuGRNHypf8TCA/viewform?usp=sf_link

Mentee Signup Survey: https://docs.google.com/forms/d/e/1FAIpQLScnlnDsaYQoK9Kkn0tUz_QOe8VNMds_hP3CgkhfjnYNy7TuA/viewform?usp=sf_link

Focus Group Updates

Dust Mitigation

The Dust Mitigation (DM) Focus Group held its monthly focus group meeting on September 15th. The focus group meeting centered on the topic of “Dust Testing Facilities” and featured technology presentations by Dr. Hossein Zare-Behtash and Andrea Cammarano from the University of Glasgow on “Facility for Dust Mitigation Studies at the University of Glasgow” and Dr. Erin Hayward from NASA Marshall Space Flight Center (MSFC) on “Planetary, Lunar, and Asteroid Natural Environment Testbed & Other Dirty Facilities at NASA MSFC.” In addition, Dr. Josh Cahill, LSIC Deputy Director presented on the “LSIC Facilities Directory.” LSIC has been creating and populating a searchable interface on the LSIC Confluence Wiki that lists a wide variety of testing facilities relevant for lunar exploration that may be available for use by the community. A call to the larger LSIC community for additional commercial, academic, government, and non-profit facilities that can be listed on the LSIC Facilities Directory can be found at the questionnaire on the LSIC website: <https://forms.gle/MronYz72WeWbAqdx6>.

The presentations were followed by a discussion on challenges and types of needs for testing facilities. You can view the recording, slides, and notes from September’s FG meeting and previous meetings at our LSIC Dust Mitigation Focus Group page on the LSIC website: <https://lsic.jhuapl.edu/Focus-Areas/index.php?fg=Dust-Mitigation>.

Our next focus group meeting will be held on Thursday, October 20th at 12:00 pm Eastern Time. The meeting will include featured technology presentations along with a discussion session. We look forward to seeing you then!

Excavation & Construction

In September, the Excavation and Construction (E&C) Focus Group hosted a guest speaker: Frank Koch, Founder and CEO of Orbit Recycling (Berlin, Germany). Frank gave a presentation titled, "[Turning Waste into Value: Recycling Space Debris to Build Lunar Infrastructure](#)" in which he proposed a grand objective for lunar activities: the recycling of space debris to build a lunar infrastructure. The ambitious project shall be demonstrated and validated within the next 3 years.

Immediately following the speaker hour, the four E&C Subgroups ([Autonomy & Site Planning](#), [Additive Manufacturing & Raw Materials](#), [Site Prep, Horizontal & Vertical Construction](#), and [Outfitting & Maintenance](#)) jumped into breakout sessions. Each Subgroup has its own dedicated page on Confluence in which meeting summaries, resource-sharing, and thought-provoking conversations are taking place. We encourage the community to check out these resources and keep these discussions going – linked [here](#) for your convenience! Additionally, you can click "Watch" in the top-right corner of specific Confluence pages to receive an email notification when new content is posted.

Extreme Access

September was a busy month in Extreme Access. At the IAC conference, Rachel Klima presented a paper written by members of the EA team titled "An Examination of Different Models for Providing Lunar PNT Services." We also began discussions with the MOSA team about sponsoring a joint telecon on open source and open standards for extreme access technologies. Several members of the EA community attended NASA's September 14 Industry Day on Delay Tolerant Networking (DTN). At that meeting, NASA announced the IOAG voted on September 13 2022 to establish a committee to study international governance for LunaNet standards. NASA also released draft 4 of the LunaNet Interoperability Standards, and the PNT subgroup will be discussing that draft in more detail in October.

In October, we'll be continuing discussions with ISRU and EC about doing joint telecons, reviewing draft 4 of the LunaNet Interoperability standards with the community and gathering feedback, and starting up a lunar PNT reading group.

Extreme Environments

Extreme Environments is gearing up for an exciting end of year. From the Fall Meeting coming up (REGISTRATION IS OPEN) to a new EE agenda coming out in December, we have some exciting things coming to the community. In September, we had Dr. Lubos Brieda highlight an ongoing project to numerically investigate attachment and transport of charged lunar regolith simulant grains interacting with spacesuit sample. In October, we will hear an overview from our subgroup leads covering what work they have been up to the last few months as well as an introduction of our new Space Weather and Plasma subgroup lead and the new subgroup "Extreme Hazards". We will not hold a monthly meeting in November since it's so close to the Fall Meeting. As always, if community members have ideas for what they would like to see or discuss, please reach out to any member of EE leadership.

ISRU

Our September monthly meeting occurred later than usual on the 28th, and featured a talk from Amourette McDonagh of Black Moon Space Technology on welding in space, a recap of Surface Power's Low-Temperature Power and Energy Storage Workshop, and a discussion on takeaways from the IAC meeting. Instead of our usual breakout groups, we held a post-meeting informal "Coffee and Donuts" discussion on Earth-based testing capabilities and needs for ISRU technologies. Members of the ISRU focus group leadership team were involved in the development of several successful presentations at IAC, including our systems integration study for oxygen extraction, the progress of the LSIC MOSA working group, and findings from the Regolith2Rebar Workshop that we held jointly with Excavation & Construction back in February. For our October meeting, we are planning to have Dr. Karl Hibbitts of APL providing a debrief on the ISRU technical review that occurred in mid-August, as well as Dr. Paul Burke of APL on modeling of molten regolith bubbles for electrolysis. We are currently working on transitioning the LSIC ISRU Lead to Dr. Jodi Berdis from Drs. Karl Hibbitts and Kirby Runyon, both of whom will remain active and involved in the Consortium.

Surface Power

In September, the surface power group partnered with the MOSA working group to host NASA electrical engineers David Sadey and Nicolas Carbone as speakers for a joint-monthly telecon. David and Nicolas were intimately involved in the generation and recent revision of the International Space Power System Interoperability Standards (ISPSIS). This joint agreement between NASA, ESA, CSA, JAXA and Roscosmos represents a collection of collaboratively prepared regulations that ensure interoperability of power systems and are meant to guide the earliest phases of the spacecraft design process. The NASA team presented the community with an in-depth technical overview of the standards, and participated in an extensive question and answer session that addressed topics such as low-voltage standards, failure modes, international and industry cooperation, as well as lessons learned from previous standards utilized during the construction of the ISS. Additionally, the telecon dedicated time to highlight upcoming solicitation closings (e.g., The Break the Ice Challenge), and provided the community with a brief summary of notable takeaways from the Advanced Power Systems for Deep Space (APS4DS) conference held August 30- September 2. In October, the Surface Power group telecon will cover power system integration and testing of modern spacecraft, and begin the conversation on how this will generalize to lunar surface power systems. We will hear from APL systems engineer Annette Dolbow on spacecraft I&T and from Lee Mason and Jeff Csank of NASA GRC on "A Notional Concept for Testing Distributed Lunar Power Systems."

Working Group – Modular Open Systems Approach (MOSA)

The MOSA WG hosted its fourth monthly telecon, a joint session with the Surface Power Focus Group, on September 22nd 2022 at 11 AM ET. Nicolas Carbone and David Sadey, NASA Power Systems Engineers for Gateway L2, gave an overview of the history and upcoming revision of the International Space Power System Interoperability Standards (ISPSIS). Watch for the revised standard to be published on the International Deep Space Standards website (<https://www.internationaldeepspacestandards.com/>).

Interoperability has been a major topic this month. At IAC 2022, NASA released its Moon to Mars Objectives and NASA leadership highlighted the importance of Interoperability. NASA's Moon to Mars has a recurring tenet that calls for "Interoperability: Enable interoperability and commonality

(technical, operations and process standards) among systems, elements, and crews throughout the campaign.”

If you weren't able to attend a prior telecon or if you want to rewatch one, you now can! Our content, including the telecon recordings, went live on the LSIC website, <https://lsic.jhuapl.edu/Resources/MOSA.php>. If you are interested in joining the MOSA WG or need a Confluence account, please email Andrea Harman at ams573@alumni.psu.edu.

Working Group – Simulants

In early September, Dr. Karen Stockstill-Cahill submitted an e-poster and a manuscript for the 73rd International Astronautical Congress (IAC); that work was presented by co-author Dr. Rachel Klima at the conference in Paris in mid-September. In addition, the APL-LSII Lunar Simulants team has continued to work on geotechnical tests on the eight lunar regolith simulants during September at Johns Hopkins University under the direction of Dr. Lucas de Melo. These tests include a range of geotechnical characteristics important to advancing technology that uses or interacts with regolith such as relative density, shear strength, and specific gravity. September brought a pause to our final measurements due to instrument repairs needed to complete the shear strength measurements. Repairs will be accomplished in the first week of October and we will complete measurements as soon as possible and incorporate all the data into our 2022 assessment.

Feature Article

Designing for the Extremes Workshop Summary

The Designing for the Extremes workshop held 05 August by the Extreme Access and Extreme Environments subgroup explored the many environmental factors that need to be considered in order to successfully access and maneuver around polar ISRU sites on the Moon. This includes engineering and hardware testing. The event consisted of an overview of the Robotics Lunar Surface Operations 2 (RLSO2) study, a panel on environmental effects and technology needed to access sites, and breakout sessions. The presentations and videos from the workshop are posted on the event page here: <https://lsic.jhuapl.edu/Events/Agenda/index.php?id=232>

These key themes were identified from the discussions during the event:

- There are many open questions around material properties and performance at cryogenic temperatures and how these conditions affect engineering design
- Knowledge of surface properties on the Moon (in polar regions) is vital for design and testing
- Geotechnical properties of lunar regolith affected by gravity can't easily be measured on Earth
- In-situ testing is needed to validate the simulation tools and provide an avenue to accurate terrestrial based testing

RLSO2 Study Overview

Alex Austin of JPL provided an overview of the RLSO2 study, whose goal was to understand the architecture of a sustainable lunar base with ISRU for production of propellant, and quantitatively compare architecture options. They assumed a South Pole location with ISRU based on collection of water ice, a support crew of 4 for at least 30-day stays 4 times per year, using the Lunar Gateway as a cislunar staging point for base construction and operations, and a focus first on establishing ISRU capability followed by science and exploration activities. Their key findings reemphasized critical architectural and design principles for future lunar bases and showcased new lunar base element designs. They also demonstrated the importance of quantitative systems modeling.

Extreme Environments Panel

The Extreme Environments panel featured Todd Schneider of NASA MSFC, Erin Rezich of NASA GRC, and Charles Buhler of NASA KSC. Todd started off with an overview discussion on vacuum testing. He presented a brief overview of Apollo 14 vacuum measurements during surface operations by the astronauts. Vacuum pressure levels were near 10^{-8} Torr, but there were changes in pressure from the release of gases. Todd gave an overview of the basics of vacuum which included sources for gases in the Moon's atmosphere, flow regimes and vacuum classifications, mean free path, molecular flow, outgassing, etc.

Erin brought the audience up to speed on lunar regolith. She covered the gardening, mixing, and fragmentation process of the lunar surface due to impacts, and how this affects regolith shapes (significantly different than on Earth). Regolith and dust are known to be abrasive to spacesuits, illustrated visually to great effect. She further explained that equipment in lunar gravity will not behave as it does on Earth as we leverage it in our Excavation and Construction equipment, but we

will not have that luxury on the Moon. Earth-based validation tests need to carefully consider this during analysis. Lastly, simulants were covered briefly since many new companies are still unsure what to use and how to decide.

Our last presenter, Charles, covered electrostatics, an often overlooked issue in engineering design and exacerbated by high vacuum. Tribocharging is a major problem on the Moon given the expected activity from rovers, astronauts, etc. and stored energy may be much higher than on Earth. Electrically grounding things on the Moon is difficult and may require grounding via plasma. The importance of dust charging and its effect on spacesuits, mechanisms, and a vast array of additional components was explained thoroughly. This panel segment closed with an overview of the Electrodynamic Dust Shielding (EDS).

Extreme Access Panel

Issa Nesnas of NASA JPL, Dimitrios Apostolopoulos of ProtoInnovations LLC, Kris Zacny of Honeybee Robotics, and Terry Fong of NASA ARC participated in the Extreme Access panel. Issa covered Robotic System Design and how understanding the environment, terrain, distance, and media are key. Surface mobility considerations including but not limited to distance, speed, up/down slope, rock traversal, and ground clearance. Cost is sometimes a tradeoff for design robustness and complexity. This presentation primarily focused on wheeled vehicles.

Dimi's talk focused on site access for regolith excavation and transport. Mobility, controls, and manipulation are essential to many systems on the Moon. Over years of research and development, there have been critical lessons learned about mobility design, including high intrinsic terrain ability, effective actuation, kinematic simplicity, integrated sensing, and environmental and task robustness. Vital controls include high-mobility, manipulation, and adaptability. Manipulation elements incorporate forceful interaction, degrees of freedom in units, and an organized collection of primitive actions.

Autonomy considerations were covered by Terry. This requires operation independent from external control to achieve self-directedness and self-sufficiency. For autonomy, we need situation- and self-awareness, reasoning and acting, collaboration and interaction, and engineering integrity. Environmental factors like terrain, illumination, radiation, thermal, etc. can cause complications with vehicle health and capabilities, malfunction, and/or failure of sensors. Terry closed with brief overview of VIPER.

To finish the Extreme Access Panel, Kris covered regolith excavation and volatiles extraction. Testing of excavation forces shows challenges with scooping icy soil if not loosely mixed with regolith. Percussion reduces the amount of excavation forces needed. It's difficult to capture volatiles like water without heating, but this unfortunately causes 50% loss of the initial volatile.

Breakout Sessions

During the breakout sessions, community members shared common themes on what they learned from the workshop that they were not familiar with before. Triboelectric charging, grounding mechanisms, and the underappreciation of plasma in relationship to these items was the top knowledge takeaway. This subject is not widely studied or understood by a majority of technologists new to the lunar market. Interested parties need to understand the design implications of this effect for appropriate material selection and testing. Accompanying this concern is dust accumulation and

management, from removal techniques to material properties and electrostatics. Attendees seemed to agree that this knowledge gap is particularly challenging and may require in situ lunar testing.

Material properties, maintenance methods, and lifetime of mechanisms were items brought up separately but have direct ties to each other. Concerns including testing these items, failure and fatigue rates, manufacturing techniques, etc. were prevalent during this session. Cryogenic dirty vacuum and long-term testing is limited terrestrially. How can translation between simulated and real-life environments be done appropriately with available simulants? It's difficult to raise the TRL of designs when questions remain about environment fidelity, relevance, and general requirements. A lack of references, requirements, and technical standards were expressed as frustrations.

Member Spotlight

Aegis Aerospace

Aegis Aerospace is a pioneer of Space Testing as a Service (STaaS™). STaaS enables Aegis' customers to completely focus on their science and technology, while the company provides turn-key services for arranging and successfully completing the customer's desired space-based test program or experiment. This includes integrating the customer's flight hardware or experiment in one of the Aegis' test platforms, flight certifying the experiment hardware, coordinating the launch, and performing the space operations and data collection necessary to make the mission a success. In some cases, customers also ask Aegis to assist with the design and development of their flight articles. Commercial space testing services are currently available for low Earth orbit (LEO) using Aegis' Multi-purpose ISS Experiment (MISSE) platform, and for the lunar surface using its Regolith Adherence Characterization (RAC) platform as well as its lunar surface Space Science Test and Evaluation Facility (SSTEF).

STaaS is the primary line of business for Aegis' Commercial Space Services organization, which is led by Mark Shumbera. Mark has been in the space business for over 20 years. He started with Lockheed at NASA's Johnson Space Center (JSC) in 1987 and has seen the industry change dramatically with lunar exploration starting again and the commercial space sector going strong. After working as an integration and safety engineer at Lockheed, Mark progressed through several management positions at MEI Technologies, a company focused on government services contracting, spaceflight services, as well as spaceflight hardware design, development, test and evaluation. In 2006, MEI Technologies spun off a startup biotech company that Mark led as President until its sale in 2019, when he transitioned into the commercial space market as the director of business development for Alpha Space Test and Research Alliance. Alpha Space focused on providing external orbital testing for customers using the MISSE platform that the company designed and built.

In August of 2021, Alpha Space and MEI Technologies merged and became Aegis Aerospace. Both companies were owned by Stephanie Murphy, who remains the owner of Aegis. This brought together the commercial space capabilities of Alpha Space and the robust spaceflight experiment integration expertise as well as the engineering design, development, test and evaluation (DDT&E) capabilities MEI provides to NASA and the DoD. With the rich legacies that both entities bring to Aegis Aerospace, the company is well positioned for the future with a combined capacity for both supporting government programs while also providing commercial space services. Its goal is to provide turn-key commercial space services, spaceflight product development, and engineering services for civil and commercial space, as well as the defense industry. To date, Aegis Aerospace has flown 135 space missions, including 35 free flying satellites and 606 payloads. They're nearing three million payload operations hours, and have 72 payloads and experiments in orbit at this very moment.

"Almost anyone who has any kind of material, sensor, experiment or new technology that they want to test or use to study the Moon is a potential customer for our Space Testing as a Service using either our RAC or SSTEF platform," shared Shumbera. RAC is focused on enabling our customers to study the interaction of regolith with their material samples. The first RAC has 15 new material samples from NASA, academia and commercial entities and will be turned over within weeks for

flight on the CLPS 19D mission. The RAC platform will gather and downlink data on the interaction of regolith with the customer-provided material samples. SSTEf is more capable than RAC with power, commanding and data downlink available for customer-provided hardware. Its primary focus is on technology demonstrations and active experimentation on the lunar surface. The first SSTEf, which is already fully booked with seven experiments is nearing its critical design review (CDR). SSTEf's customer-provided experiments include new solar cell technologies and a new protective coating for them, a video processing unit, an RF antenna and additively manufactured materials. Shumbera stated "Aegis commercially purchased from Intuitive Machines the transit and landing on the Moon for the first SSTEf mission in 2025 using funding from a NASA Tipping Point solicitation award. Additional commercial missions are in work, so anyone in the LSIC community who is interested in being included on RAC or SSTEf for one of our future lunar surface missions should contact Aegis".

Aegis Aerospace engages with LSIC to stay involved in the community, and to keep abreast of the needs of the community to help to extend lunar exploration and eventually develop habitats. While Shumbera and the whole Aegis Aerospace team respect the unknowns (and they acknowledge that there are many) about the Moon and its harsh environments, they're dedicated to providing commercial access and reliable services cost effectively. They are excited that there's finally a clear path back to lunar exploration, and that the plan is for humans to stay. "We're planning to continue our work and commercially help to enable NASA, our customers, and our nation build on exploration to accomplish something tangible on the lunar surface. It's exciting to be at the very start of something that will be permanently on the Moon," shared Shumbera.

For more information about Aegis Aerospace, visit their website here: <https://aegisaero.com/>

NASA and Community News

Online Workshop 14 October: “Choosing A Sampling System For Your PRISM Proposal” Hosted By Honeybee Robotics

Submitted by Hunter Williams, Honeybee Robotics

Honeybee Robotics is hosting an online workshop for “Choosing a Sampling System for Your PRISM Proposal” on October 14th at 12PM Pacific / 3PM Eastern. Honeybee is the provider for almost all of the CLPS/PRISM mission sampling systems, sample handling systems, and subsurface instrument emplacement systems. The workshop will cover a variety of excavator and sample handling system options, and Honeybee technology developers will discuss practical considerations for system design in preparation for PRISM 3 proposals. The event is free, but sign up is required. Go to the following link to get tickets: <https://www.eventbrite.com/e/choosing-a-sampling-system-for-your-prism-proposal-tickets-410152967567>

NASA Awards Contracts in Support of Entry, Descent, Landing Technology

NASA News \ 29 September 2022

<https://www.nasa.gov/press-release/nasa-awards-contracts-in-support-of-entry-descent-landing-technology>

Lunar Logistics Services and Astrobotic Awarded to Fly ESA Payload to the Moon

Astrobotic \ 22 September 2022

<https://www.astrobotic.com/lunar-logistics-services-and-astrobotic-awarded-to-fly-esa-payload-to-the-moon/>

NASA’s Stakeholder Collaborations Help Inform Moon to Mars Planning

NASA News \ 20 September 2022

<https://www.nasa.gov/press-release/nasa-s-stakeholder-collaborations-help-inform-moon-to-mars-planning>

Astrobotic announces plans for lunar power service

SpaceNews \ 19 September 2022 \ Jeff Foust

<https://spacenews.com/astrobotic-announces-plans-for-lunar-power-service/>

In a bid to expand its Moon business, Intuitive Machines will go public

Ars Technica \ 16 September 2022 \ Eric Berger

<https://arstechnica.com/science/2022/09/in-a-bid-to-expand-its-moon-business-intuitive-machines-will-go-public/>

Space Exploration Startup Intuitive Machines Reaches \$1 Billion SPAC Merger

Wall Street Journal \ 16 September 2022 \ Amrith Ramkumar

<https://www.wsj.com/articles/space-exploration-startup-intuitive-machines-nears-1-billion-spac-merger-11663291537?mod=e2li>

NASA Pursues Astronaut Lunar Landers for Future Artemis Moon Missions

NASA News \ 16 September 2022

<https://www.nasa.gov/press-release/nasa-pursues-astronaut-lunar-landers-for-future-artemis-moon-missions>

NASA Funds Projects to Study Orbital Debris, Space Sustainability

NASA News \ 13 September 2022

<https://www.nasa.gov/press-release/nasa-funds-projects-to-study-orbital-debris-space-sustainability>

Court approves sale of Masten assets to Astrobotic

SpaceNews \ 11 September 2022 \ Jeff Foust

<https://spacenews.com/court-approves-sale-of-masten-assets-to-astrobotic/>

NASA Hosts National Space Council Meeting, Vice President Chairs Event

NASA News \ 09 September 2022

<https://www.nasa.gov/press-release/nasa-hosts-national-space-council-meeting-vice-president-chairs-event>

NASA Taps Axiom Space for First Artemis Moonwalking Spacesuits

NASA News \ 07 September 2022

<https://www.nasa.gov/press-release/nasa-taps-axiom-space-for-first-artemis-moonwalking-spacesuits>

South Korean lunar orbiter succeeds in critical trajectory correction maneuver

SpaceNews \ 06 September 2022 \ Park Si-soo

<https://spacenews.com/south-korean-lunar-orbiter-succeeds-in-critical-trajectory-correction-maneuver/>

Funding Opportunities

Tech Development

- Space Technology Research Institutes (STRI) Solicitation
<https://nspires.nasaprs.com/external/solicitations/summary!init.do?solId=%7b000FAF75-9F37-814C-AC23-A21022A96037%7d&path=open>
Preliminary Proposals Due: 03 August 2022 - Invited Full Proposals Due 03 November 2022
- Break the Ice Lunar Challenge Phase 2
https://www.nasa.gov/solve/break_the_ice_lunar_challenge_phase_2
Proposals Due: 04 November 2022
- NASA Innovation Corps Pilot
<https://nspires.nasaprs.com/external/solicitations/summary.do?solId=%7b1B42E782-61BB-9834-F20F-44CBEF13C0A6%7d&path=&method=init>
Proposals may be submitted at any time through March 29, 2023, but applications will be reviewed in intervals on the following dates: July 22, 2022; Sept. 16, 2022; Nov. 17, 2022; and Jan 20, 2023

Student Opportunities

- NASA Space Technology Graduate Research Opportunities
<https://nspires.nasaprs.com/external/solicitations/summary.do?solId=%7b4C4796B7-1D86-C986-49E5-A76ABB0A9EAE%7d&path=&method=init>
Proposals Due: 02 November 2022

Requests for Information

- STMD EXPLORE and LAND RFI
STMD has released the third and final Request for Information (RFI), this time for the EXPLORE and LAND thrusts, in our series of STAR RFI's that are intended to help us learn from the space community what they think of our technology development priorities.
<https://nspires.nasaprs.com/external/solicitations/summary.do?solId=%7b1B6EF822-99AE-AECA-6440-6F68C4A3FD31%7d&path=&method=init>
Responses due: 06 October 2022

For more funding opportunities, please visit LSIC's website here: <http://lsic.jhuapl.edu/Resources/Funding-Opportunities.php>