



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

Dear LSIC Community,

Happy New Year! I hope you all had a bit of time to relax over the last few weeks, and that you're as excited as I am for the next year. With the successful Artemis launch last year, and the first Commercial Landing Provider Services (CLPS) missions following shortly, we're on the brink of a really thrilling new era of lunar exploration.

On the LSIC side, we have a few big things planned for the first half of this year. First, as some of you may have already heard in your focus group meetings, we are working on a community-derived white paper to articulate how the community – beyond just NASA – anticipates participating in, and helping to build toward, a sustained presence on the Moon. We are beginning by taking input provided by the community over the past few years during meetings and discussions and integrating it with publicly available timelines and milestones to provide a framework for the paper. We will be soliciting input and iterating on the white paper through the focus groups, and will ultimately provide a draft we can review and refine at the LSIC Spring Meeting in March.

The other two big items are the LSIC Spring Meeting itself, which will be held at APL from March 29 to 30, and a funding workshop, a half-day event on March 31 following the meeting. Abstracts for the former are due on Feb. 3 and can be submitted on the meeting [event page](#). The funding workshop will focus primarily on understanding and applying to NASA Space Technology Mission Directorate opportunities.

To the Moon!



Rachel Klima

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Focus Areas

Monthly Telecon Schedule

Dust Mitigation

Third Thursdays at 12PM Eastern

Excavation & Construction

Last Wednesdays at 2PM Eastern

Extreme Access

Second Thursdays at 3PM Eastern

Extreme Environments

Second Tuesdays at 3PM Eastern

In Situ Resource Utilization

Third Wednesdays at 3PM Eastern

Surface Power

Fourth Thursdays at 11AM Eastern

LSIC General Updates

LSIC Spring Meeting 2023

Call for Abstracts

The abstract portal is now open for the LSIC Spring Meeting, to be hosted from March 29 to 30 at the Johns Hopkins Applied Physics Laboratory and online via ZoomGov. Submission instructions can be found on the [event page](#). Abstracts are due Feb. 3.

The LSIC Spring Meeting will focus on NASA's plans and technology investments related to building a sustained presence on the lunar surface. Participants will present technical capabilities and needs in the six LSIC focus areas – Dust Mitigation, Excavation and Construction, Extreme Access, Extreme Environments, In Situ Resource Utilization, and Surface Power – and discuss the readiness of relative systems and components. For more information, please see the [LSIC Spring Meeting 2023 event page](#).

Focus and Working Group Updates

Dust Mitigation

The Dust Mitigation Focus Group held its last monthly meeting of 2022 on Dec. 15. The focus group meeting centered on recapping an eventful 2022, including highlights and takeaways from our monthly meetings and the LSIC Spring and Fall Meetings, and looking forward to 2023. Some items expected in 2023 include joint meetings with other focus groups, the LSIC white paper on establishing a sustained lunar ecosystem and the LSIC Dust Mitigation workshop sometime in the spring. The Dust Mitigation workshop will build on the successful 2021 Dust Mitigation workshop and bring together key stakeholders from government, industry, academia and nonprofit to understand the current state of dust mitigation across stakeholders, identify any challenges and gaps, and identify priorities, opportunities, and areas in need of future investments.

You can view the recording, slides and notes from December's meeting and previous meetings at the [Dust Mitigation Focus Group page](#).

Our first focus group meeting of 2023 will be held on Thursday, Jan. 19, at 12:00 p.m. EST. The meeting will include featured technology presentations along with a discussion session. We look forward to seeing you in 2023!

Excavation & Construction

In December, the Excavation and Construction Focus Group hosted a meeting on establishing a community-derived early infrastructure framework. We heard from Seth Pollack, Associate Principal, Geotechnical, Tunneling & Geology at Arup, and Komal Dewan, Global Leader National Governments, Senior Vice President, Buildings and Places at AECOM, regarding the master planning process. Their talks were followed by breakout discussions focused on applying these lessons learned in the context of the lunar surface.

Connect with the Excavation and Construction community anytime on Confluence through our four subgroups – [Additive Manufacturing & Raw Materials](#), [Autonomy & Site Planning](#), [Outfitting & Maintenance](#), and [Site Prep and Horizontal & Vertical Construction](#) – and the [Who's Who](#) directory. See you in 2023!

Extreme Access

December was a busy month in Extreme Access. We held the first in a series of workshops around NASA funding opportunities, where we covered the basics of NASA's Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) program, and we examined the program categories related to extreme access topic areas. We also had two speakers at our main Extreme Access meeting. John Carrico of Space Exploration Engineering gave a very well-received presentation on lunar trajectory design. Jim Schier of NASA presented on LunaNet, generating so many questions that the event ran over by 15 minutes, and he still didn't have time to answer everything. Schier answered the remaining questions via email, and his answers are posted in the [Extreme Access Confluence page](#).

January is shaping up to be equally eventful. The Extreme Access meeting will feature two speakers: Sonia Vohnout of OppsSpot will provide tips on how to write a good SBIR proposal, and Cody Kelly will discuss NASA's navigation receiver data specification format. The Position Navigation & Timing subgroup will host a two-hour workshop from John Carrico on lunar trajectory design, and we are finalizing speakers and presentations for the joint workshop on open source/open standards with the Modular Open Systems Approach (MOSA) Working Group. Hope to see you in the new year!

Extreme Environments

Thank you to everyone who participated in the Extreme Environments December meeting where we explored NASA SBIR solicitations in three breakout rooms. In January, we will continue our work in this area with more breakout rooms to explore NASA STTR solicitations. Many of our subgroups took a break in December as community members prepared for the holidays. We are currently planning to have awardees present at some of our monthly meetings in 2023, and we invite the community to recommend speakers. As always, if community members have ideas for what they would like to see or discuss, please reach out to any members of Extreme Environments leadership. We hope everyone a joyful 2023!

In Situ Resource Utilization

The ISRU Focus Group canceled its December meeting because it overlapped with the holidays, though we encouraged the group to attend the other exciting focus group, working group, and subgroup meetings in mid-December. LSIC has begun assembling a white paper to capture the community's major themes to establish a sustained lunar ecosystem, and the ISRU Focus Group is soliciting input on its [Confluence page](#); please share your thoughts! For our January meeting, we look forward to two speakers who will talk about their work in detecting and finding water ice at various depths at the South Pole. In the new year, we intend to begin some exciting focus group revamps, including a revival of subgroups and a thought experiment on where exactly we want lunar ISRU to go in 2023. We look forward to engaging you all in these discussions. Happy New Year!

Surface Power

In December, the Surface Power team attended the CLPS Survive the Night workshop virtually. There were great sessions from vertical solar array technology providers, fuel cell developers and battery unit thermal control designers, as well as sessions on space nuclear power. The latter included discussions on radioisotope power systems, and the session provoked an outstanding discussion on topics related to the launch approval process for nuclear systems. Earlier in the month on Dec. 1, the Surface Power team hosted a "Year in Review" teleconference that summarized the events of 2022. Following the review, an online survey was distributed to meeting attendees to capture the direction the community would like to take the focus group in 2023. For those who

missed the event and would like to provide feedback, the survey is still open and can be found [here](#). We really appreciate your feedback!

So far, we have 30 responses, and the APL team has begun analyzing the results and incorporating the community's feedback into planning efforts for 2023 activities. Looking at the initial results, 20% of survey respondents identified fission surface power (FSP) as the most critical technology gap – of the 13 options – in need of additional attention and investment. Similarly, 30% of the community indicated that the FSP-themed teleconference in 2022 was the most relevant to their work. We are delighted to let you know that we have organized an FSP-themed teleconference to be held at 11:00 a.m. EST on Jan. 26, 2023. The meeting will feature a panel discussion and talks from all three of NASA's FSP Phase 1 awardees. Tentative speakers include Peter McGrath, FSP Project Manager for Intuitive Machines and X-Energy; Joe Halackna, Deputy Director for Reactor Engineering at Westinghouse; Mikaela Blood, FSP Reactor Lead at Lockheed Martin; and Lee Mason, Power Division Associate Chief at NASA Glenn Research Center.

MOSA Working Group

The MOSA Working Group hosted a teleconference on Dec. 14, where Wesley Powell, NASA's Principal Technologist for Avionics in the Space Technology Mission Directorate, presented the results of a recently concluded NASA study: SpaceVPX Interoperability Assessment. The report can be viewed [here](#). Powell is looking for feedback on the findings. If you're interested in providing feedback, Powell's email address can be found on the [NASA website](#).

On Jan. 24, 2023, the MOSA Working Group is hosting a teleconference on open-source development in aerospace with Extreme Access Focus Group. The goal is to explore how open source has worked outside of aerospace and examine barriers to open-source adoption in aerospace and possible ways to overcome them. There will be several presentations and panel discussions by community leaders. We hope to see you there!

Finally, we want to thank all of you for your support of the MOSA Working Group. Interoperability will be crucial to a sustainable presence on the lunar surface, so thank you for your engagement! We are looking forward to continuing these discussions in 2023.

Lunar Simulants Working Group

We are wrapping up our report on the geotechnical data collected for lunar regolith simulants this month. This report contains measurements for five highland regolith simulants and three mare regolith simulants from five simulant providers. Measurements include particle size distribution (sieve), minimum and maximum density, specific gravity, cohesion and friction angles with comparison to data collected for lunar regolith. Our team has been fortunate to work closely with Dr. Lucas de Melo from Johns Hopkins University to collect these measurements and interpret the results. In addition, we also met with the NASA Simulant Advisory Committee and discussed expanding our efforts to include talks on lunar regolith simulant projects for the community, similar to those presented at other focus group and working group meetings. If you are interested in attending these talks or learning more about simulants, please visit the [Lunar Simulants Working Group Confluence page](#).

Feature Article

CLPS Survive the Night Workshop

NASA held the CLPS Survive the Night Workshop at Glenn Research Center from Dec. 6 to 8. The workshop was held in a hybrid format and was attended by approximately 175 in-person participants and nearly 400 virtual participants. Nine CLPS providers participated in the meeting. The workshop also included approximately 100 international participants representing 28 countries. NASA used the workshop to describe the timeline and need for technologies to survive the lunar night.

This workshop focused on maximizing networking between organizations that need technologies to survive the lunar night and organizations that can provide those technologies by 2026.

The technologies discussed in the 25 presentations focused on issues such as power, thermal, illumination and dust. Some of the CLPS providers took the opportunity to give updates on their lander, power and rover technology development plans.

The presentations and panel discussions helped attendees understand where potential technologies that can help with surviving the night are being developed for other applications. While not yet suitable for their intended use case, some low-temperature batteries capable of even just a few long recharge/discharge cycles at lunar-night temperatures could be a significant improvement over the capability of the current generation of CLPS landers. The nuclear/radioisotope power technology developers in this meeting discussed how they're looking to use their involvement with NASA as a market distinction for terrestrial business.

Another theme that emerged from the meeting was the use of a tool-kit approach that combines multiple solutions to enable capabilities to survive the night. Participants felt that the meeting was useful, and some planned to continue the discussion of the need for survive-the-night technologies and the current state of the art for the needed technologies. Participants also recommended more networking and Q&A sessions.

NASA and Community News

[The countries launching missions to the Moon and beyond in 2023](#)

12/24/2022, BBC

[Radiation Shielding 3-D Printed On-Orbit by Redwire Team](#)

12/22/2022, The Journal of Space Commerce, Tom Patton

[Peregrine EMI Testing A Success & Ahead of Schedule](#)

12/20/2022, Astrobotic

[Top Teams Advance in NASA's Break the Ice Lunar Challenge](#)

12/19/2022, NASA, Molly Porter

[NASA Welcomes Nigeria, Rwanda as Newest Artemis Accords Signatories](#)

12/13/2022, NASA, Cheryl Warner

[Canada's space technology and innovations are a crucial contribution to the Artemis missions](#)

12/12/2022, The Conversation, Gordon Osinski

[Splashdown! NASA's Orion Returns to Earth After Historic Moon Mission](#)

12/11/2022, NASA HQ, Kathryn Hambleton, Tiffany Fairley & Leah Cheshier

[Winning NASA Technologies Land Spacecraft, Share Agency Innovations](#)

12/09/2022, NASA, Sarah Frazier

[NASA Commits to Future Artemis Moon Rocket Production](#)

12/09/2022, NASA HQ & MSFC, Rachel Kraft & Corinne Edmiston

[Astrobotic lander undergoes tests ahead of launch](#)

12/08/2022, SpaceNews, Jeff Foust

[Leidos Dynetics team and Northrop Grumman to collaborate on NASA Human Landing System bid](#)

12/06/2022, Leidos

[Bezos' space company teams with Lockheed, Boeing for NASA moon lander pitch](#)

12/06/2022, Reuters, Joey Roulette

[Johns Hopkins APL to Build Science Instrument for First Canadian Lunar Rover](#)

12/02/2022, APL, Jeremy Rehm

[Montana State students deliver computer for NASA moon mission](#)

12/01/2022, MSU News Service, Marshall Swearingen

Funding Opportunities

Tech Development

- [NASA Innovation Corps Pilot](#)

Proposals Due: Ongoing through March 29, 2023

- [NASA Innovative Advanced Concepts \(NIAC\) Phase II Call for Proposals](#)

Proposals Due: Jan. 18, 2023

- [FY 2023 Phase II SBIR and STTR Solicitations](#)

The 2022 Phase II SBIR solicitation (2022 Phase I SBIR awardees only) opens on Dec. 13, 2022 and closes on Jan. 25, 2023. Post-Phase II funding opportunities are only open to small businesses with Phase I or II awards.

Proposals Due: Jan. 25, 2023

- [FY 2023 Phase I SBIR and STTR Solicitations](#)

The next Phase I opportunity is planned to open on Jan. 10, 2023 and close on March 13, 2023. The NASA Phase I SBIR and STTR solicitations are open to small businesses with 500 or fewer employees. To apply for an STTR, a small business must partner with a nonprofit research institution, such as a university or research laboratory. Phase I SBIR contracts last for six months, and Phase I STTR contracts last for 13 months, both with maximum funding of \$150,000.

Proposals Due: March 13, 2023

Requests for Information

- [2023 Request for White Papers: NASA SBIR Phase II Sequential Awards](#)

Response Deadline: Jan. 10, 2023

For more funding opportunities, please visit the [LSIC website](#).