

# LSIC Surface Power Focus Group

February 25, 2021

Begins at 11:03



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**Confluence Discussion:**

<https://lsic-wiki.jhuapl.edu/display/SP/25+February+2021+SP+Telecon>



# Break the Ice Lunar Challenge (NASA Centennial Challenge)

***Excavate icy regolith and deliver acquired resources in extreme lunar conditions***

<https://breaktheicechallenge.com/>

**Webinar on Thursday, February 25, 2021 at 11:00 am – 12:00 pm CST** to learn about this challenge and the latest technologies for excavation in extreme environments on the Moon and Earth.

Registration link : [https://zoom.us/webinar/register/WN\\_oyXzvaPcRLeXSTCRe66QaA](https://zoom.us/webinar/register/WN_oyXzvaPcRLeXSTCRe66QaA)

At the webinar, you'll hear from:

- Monsi Roman, Program Manager, NASA Centennial Challenges Program
- Don Thomas, Former NASA Astronaut
- Pete Carrato, Fellow Emeritus, Bechtel Corporation
- Kris Zacny, VP & Director, Exploration Technology, Honeybee Robotics
- Judson Kauffman, Co-CEO, Terradepth

# Overview

- LSIC community updates
  - LSIC Semi-annual meeting:
    - 2-day, virtual. End of April/early May.
  - Updates on other FG activities
    - Dust Mitigation workshop
    - TRN workshop: **Deadline for registration is tomorrow!**
  - Funding opportunities
  
- Discussion
  - Annual goal
  - Subgroups
  - Next steps



# ISRU – February

- The “ISRU Library and Resources” page on Confluence IRSU section is active and being populated with resources. We post ISRU tech resources you want to provide to the community, including NASA reports, .pptx presentations, as well as links to peer-reviewed literature. Check out “Who’s Who in ISRU” for finding specific partners to collaborate with. Let the ISRU group know if you are looking for a connection that is not currently there.
- Setting Year 1 goals. Penultimate version – and topic for discussion at next meeting. How this goal can enable you. <https://lsic-wiki.jhuapl.edu/display/ISRU/ISRU+YEAR+1+Goals>
  - "There is a need for several 10s to a few 100s of metric tons of O<sub>2</sub> per year for propellant use by the 2030 timeframe (S&D workshop, 2020). The first annual goal of the ISRU focus group is to **provide specific input to NASA** with respect to **technology needs for systems-level end to end ISRU processes** based upon prioritized needs identified by the ISRU FG thematic groups"
- Upcoming meetings and deadlines:
  - Space Resources Week. Apr 19-22. Virtual, no registration fee. Abstracts due March 1.
- Technology Showcase 25 min. <https://lsic-wiki.jhuapl.edu/pages/viewpage.action?pageId=6260347>
  - Voyager Space Holdings. Ty Baumbaugh. Executive Vice President, Operations. Global Head of Portfolio Ops & Integration
  - A holding company that purchases majority share in promising space technology companies.
- Topical ISRU Discussions 25 min. <https://lsic-wiki.jhuapl.edu/pages/viewpage.action?pageId=6260347>
  - HST Serving Missions, lessons learned for sustained ISRU operations – Dr. Jill McGuire. Head of the Exploration and In-Space Services Division, GSFC
  - ISRU technology will need servicing. Thus the technology deployed needs to be designed from the beginning to make servicing as effective as possible. HST was designed with this in mind, enabling its great success.

# Extreme Environments – Feb 21

*Currently kicking off an activity: Identifying and Classifying Specific Challenging Lunar Environments*

- What are specific lunar environment (or sites) that present significant technical challenges to survive and operate on the lunar surface or subsurface?
  - LSIC-EE has five active subgroups focused on different aspects of the lunar environment that will evaluate each nominated environment / site
    - Lots of information on Confluence! <https://lsic-wiki.jhuapl.edu/display/EE/>
- How do specific lunar environment differ from descriptions of the general lunar environment?
  - Compare to NASA Cross-Program Design Specification for Natural Environments (DSNE) Revision H
    - <https://ntrs.nasa.gov/citations/20205007447>
- Suggest environments or sites via 1 minute survey here: [http://bit.ly/LSIC\\_Env\\_Survey](http://bit.ly/LSIC_Env_Survey)

*LSIC-EE Focus Group Meets 2<sup>nd</sup> Tuesday of the month at 3:05 pm*

# Dust Mitigation Focus Group

Contact: [Facilitator\\_DustMitigation@jhuapl.edu](mailto:Facilitator_DustMitigation@jhuapl.edu)

## • Workshop Objectives:

- Bring together key stake holders:
  - Government, Industry, Academia, and Non-profit
  - Architecture developers, dust mitigation technology developers, scientists, and others interested in dust mitigation
- Identify what technologies are already available
- Identify what are the current challenges and gaps in Dust Mitigation
- Identify areas in need of investment and future opportunities

## • Format:

- Invited presentations from NASA, academia, and industry (9)
- Contributed lightning talks from NASA, academia, industry, and non-profit (19)
- Breakout discussion sessions (5)

## • Breakout Session Focus Areas:

- Ascent/Descent, Dust Plumes, and Surface Modification
- EVA, Spacesuits, and Habitats
- Surface Mobility and Operations
- Instruments, Tools, and Mechanisms
- ISRU and Surface Power

## LSIC Dust Mitigation Workshop



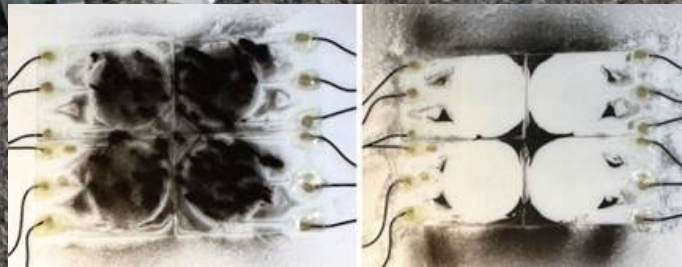
[LSIC Dust Mitigation Workshop Website](#)

- Held Thursday, February 4th
- **Over 340 attendees across US**
- **Over 140 participants in breakout discussion groups**
- Presentations and recordings will be posted on workshop website



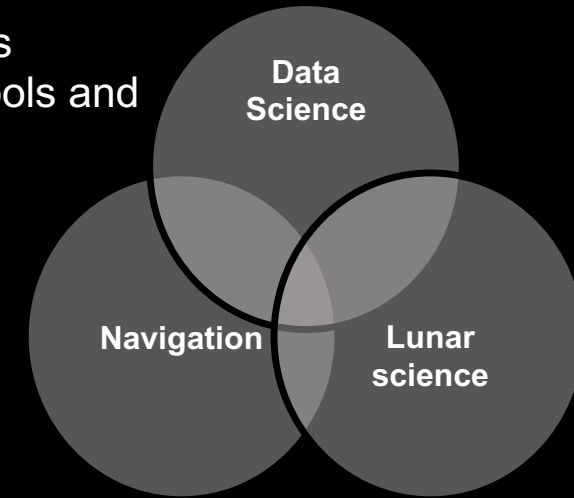
# LSII | Dust Mitigation Technology Areas

- *Optical Systems* – Viewports, camera lenses, solar panels, space suit visors, mass spectrometers, other sensitive optical instruments
- *Thermal Surfaces* – Thermal radiators, thermal painted surfaces, thermal connections
- *Fabrics* – Space suit fabrics, soft wall habitats, mechanism covers
- *Mechanisms* – Linear actuators, bearings, rotary joints, hinges, quick disconnects, valves, linkages
- *Seals and Soft Goods* – Space suit interfaces, hatches, connectors, hoses
- *Gaseous Filtration* – Atmosphere revitalization, ISRU processes
- *Lunar Surface Modification* – Lunar landing pads, dust free zones and workspaces





- Upcoming event: Workshop on Lunar Mapping for Precision Landing, March 2-4
  - Bring together as a community lunar scientists, data scientists, and navigation engineers that work on TRN systems for lunar landing
  - Provide insight in the map data and map building process, an overview of map requirements needed to achieve TRN, determine how the community can help NASA catalogue current tools and discuss best practices
- New Subgroup formation to discuss Lunar Sheds/Wadis
  - Requirements, use cases, etc.
- Working to define annual goal. Some questions of note:
  - What are known technology gaps, engineering challenges, and mission needs for extreme locations (e.g., lunar pits, south pole, PSRs)?
  - What are specific use cases and science pull for current STMD technology investments?
- Telecons: Second Thursday of each month, 3 pm ET



<https://jhuapl.zoomgov.com/j/1613074157?pwd=RkpWWklwMGV3a0RnL1FKcHB5TE1BZz09>

Contact: [Facilitator\\_ExtremeAccess@jhuapl.edu](mailto:Facilitator_ExtremeAccess@jhuapl.edu)



## LSIC Workshop on Lunar Mapping for Precision Landing

Tuesday, March 2, 2021 - Thursday, March 4, 2021

Venue: *Virtual*



**Registration Deadline 26 February 2021**

### Goals

The goal of this workshop is to bring together Lunar geologists, data scientists, and navigation engineers that work on Terrain Relative Navigation (TRN) Systems for Lunar Missions to provide participants with an overview of the Lunar orbital imagery data, a description of the Lunar Digital Elevation Maps (DEMs) currently available, including surface properties, albedo, and inherent data and modeling errors, and the considerations for using the data in the development and testing of TRN systems. The workshop objective is to provide lunar scientists and data scientists with an understanding of the map requirements needed to achieve navigation solutions for Lunar TRN while providing navigation engineers with a deeper insight into the map data and the map building processes that produce the maps used to calculate spacecraft positions during flight. The team seeks inputs from data scientists and users to determine how the community can help NASA catalog existing tools, methods and approaches for building DEMs, for accurate rendering of the Lunar surface, and for Validation and Verification of TRN systems that can fill technology gaps for future Lunar landing missions. A final report detailing the workshop findings will be made public.

### EVENT DETAILS

**Date:** Tuesday, March 2, 2021 - Thursday, March 4, 2021

**Time:**

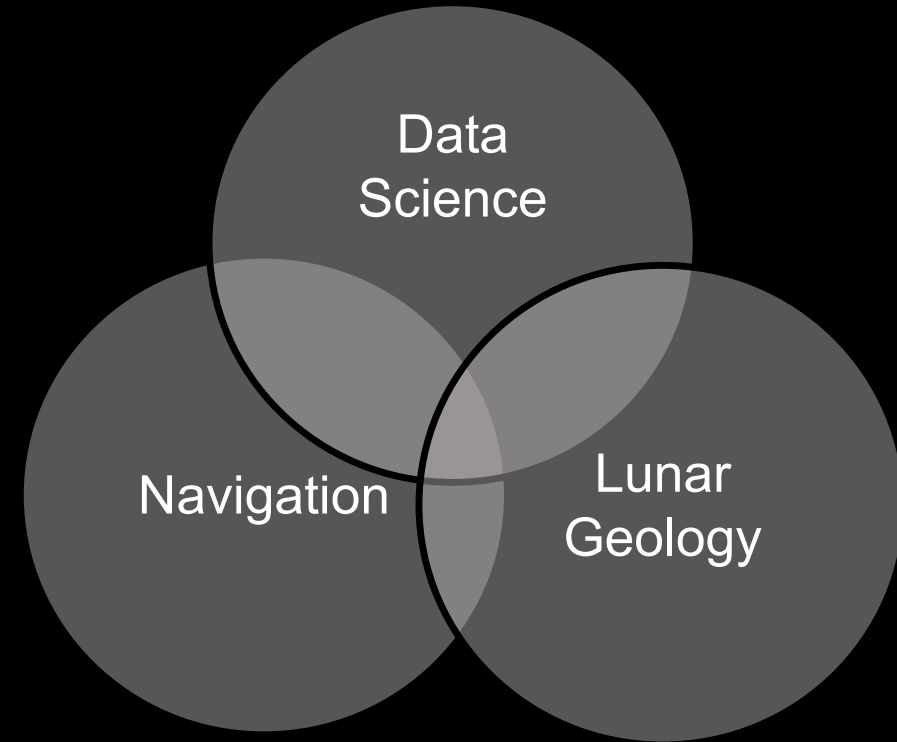
**Location:** Virtual

[Register Now](#)

Abstracts are not being accepted at this time.

# Workshop on Lunar Mapping for Precision Landing

- March 2-4, 2021
  - 12-4 ET each day
  - <http://lsic.jhuapl.edu/Events/Agenda/index.php?id=120>
- Objective: Develop a mutual understanding of map requirements to achieve lunar TRN solutions and provide better insight into the map data and map building processes
- Seeking input from the community to help NASA catalog existing tools, methods and approaches for building DEMs, accurate rendering of the surface, V&V of TRN systems
- Day 1: Terrain Relative Navigation (TRN) and Digital Elevation Map (DEM) Basics, including an overview of currently available data, best practices, and overviews of TRN systems in use on OSIRIS-REx and Mars 2020.
- Day 2: DEM building methods and tools
- Day 3: Modeling lunar surface features and terrain rendering tools, including a poster session focused on descriptions of current terrain rendering tools.
- Registration Closes February 26.





# LSIC | Current Funding Opportunities

## Watts on the Moon

*Phase 1 Registration and Submission Deadline: 25 March 2021, up to \$5M*

Energy distribution, management, and/or storage that address NASA technology gaps and can progress toward flight readiness and future operation on the lunar surface.

<https://www.herox.com/WattsOnTheMoon>

## Other opportunities:

<https://www.nasa.gov/directorates/spacetech/solicitations>

Nuclear Thermal Propulsion Reactor Preliminary Design (DoE)

Proposals due: April 30, 2021

CASIS (ISS payloads)

<https://www.issnationallab.org/research-on-the-iss/solicitations/nlra2021-4/>

An informational webinar regarding NLRA 2021-4 will be held on March 2, 2021 at 1:00 p.m. EST. A Q&A session will follow the presentation.



# LSIC | CASIS (Center for the Advancement of Science in Space)

An informational webinar regarding NLRA 2021-4 will be held on March 2, 2021 at 1:00 p.m. EST.

**The purpose of this ISS National Lab Research Announcement (NLRA)** is to solicit applications for programs, products, and public-private partnerships focused on educational objectives related to the ISS National Lab. This announcement is open to U.S.-based entities (academic, government, commercial, not-for-profit institutions) seeking to establish or expand programs and products in the fields of science, technology, engineering, and mathematics (STEM) education for students of all ages.

Concepts submitted in response to this announcement must specifically state how proposed initiatives will target and reach underrepresented demographics—and must also address at least one of the following goals:

- Expanding ISS National Lab programs and offerings to increase participation in and/or digital engagement with existing or new partner programs.
- Creating higher-education initiatives that enable students to explore education, background, pathways, and career opportunities associated with space-based research and development or the commercialization of low Earth orbit.
- Digitizing space-themed K-12 or higher-education programming.



# LSIC | Surface Power Focus Group annual goal

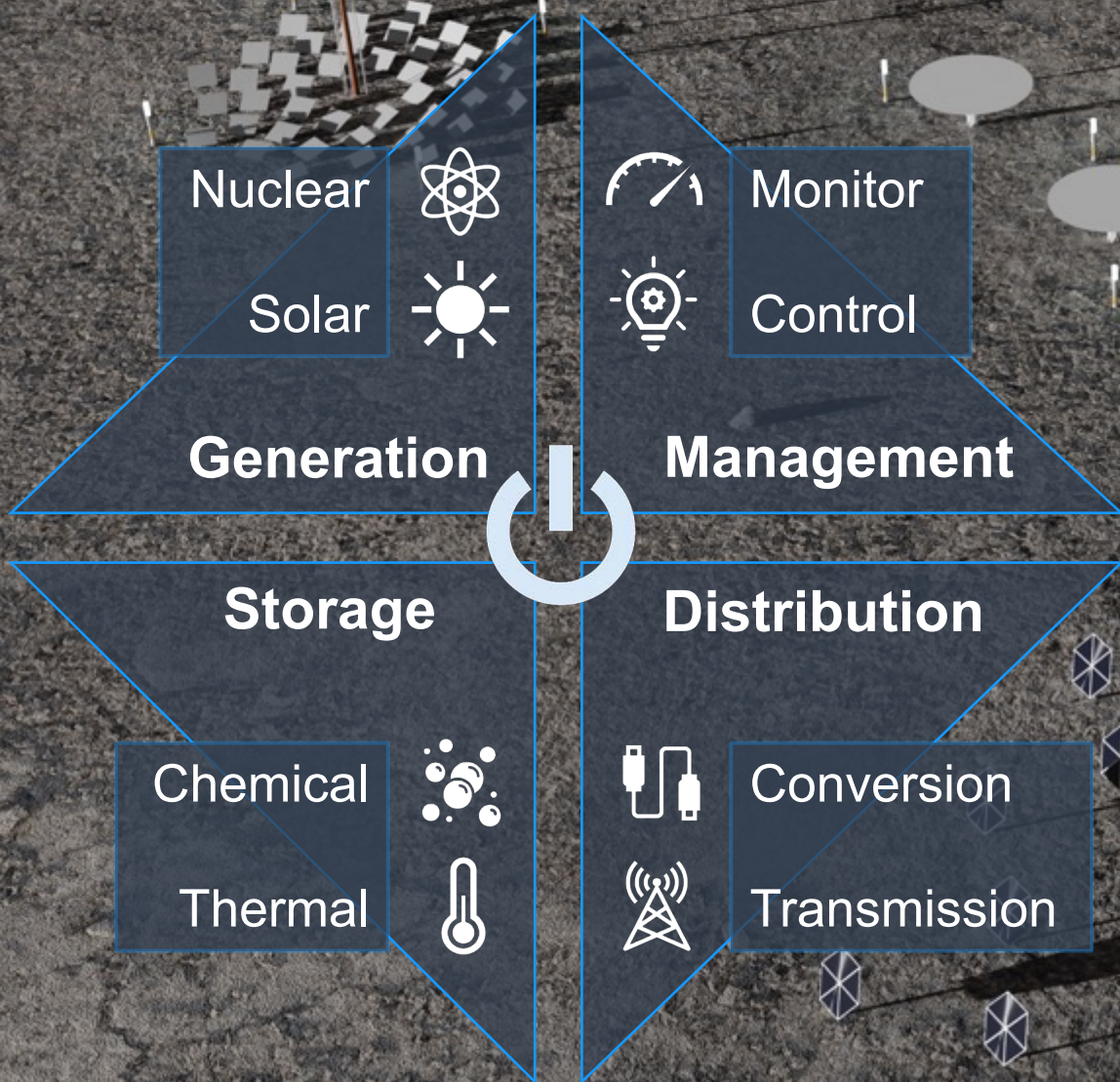
An aerial view of a lunar surface. In the upper right, there is a circular hatch or vent with a yellow and blue interior. Below it, a rover is visible, emitting a plume of dust. In the lower right, a large array of solar panels is deployed in a grid pattern. The surface is dark and textured with small rocks and craters.

*NASA needs power systems which can survive the lunar night and enable exploration. The over-arching goal of the surface power focus group is to provide specific recommendations to NASA for rapidly achieving appropriate-scale power-related technologies needed to enable sustained presence and exploration.*

To work towards this, we will focus on connecting power experts to their potential user base, framed by the economic and institutional drivers that set the scale of power demand. This will enable us to identify near-term needs for immediate prioritization and long-term goals that impact early architectural decisions.



# LSIC | Surface Power Subgroups: Continuous



- **Telecons/workshops**
  - Suggestions for themes
  - Organization, participation
  - Input on the most critical topics to cover
- **Provide content for LSIC**
  - Latest developments in each domain
  - Critical information for those outside of the field
- **Raise issues that need engagement/broader efforts**
  - Especially topics that span across FGs



# LSII | Subgroups: Tiger-teams/Deep Dives

- **Targeted activities dictated by needs**
  - Around specific events, e.g.
    - Collective discussion/feedback session on STP report (~ June)
  - Advancing specific aspects of the annual goal, e.g.
    - Power scaling roadmap/report
    - Workshop planning/brainstorming
  - Expand our knowledge/coordination across the consortium, e.g.,
    - Conduct a survey/analysis of power users and their needs
    - Partner with Dust Mitigation experts for specific tech needs
    - Systems-level autonomy and power-systems
    - Understand specific use cases and science pull for current STMD technology investments





# LSIC | Open Discussion

Discussion captured on Confluence:  
<https://lsic-wiki.jhuapl.edu/display/SP/25+February+2021+SP+Telecon>







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