



# Lunar Surface Innovation

C O N S O R T I U M

## LSIC Excavation and Construction Workshop

<http://lsic.jhuapl.edu/>

**December 1, 2021**

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# Friendly Reminders

- Recordings will be posted on our website.  
(<http://lsic.jhuapl.edu/Focus-Areas/Excavation-and-Construction.php>)
- Please post your questions in **'chat'** .
- Mute yourself if you are not speaking.

# NASA Break the Ice Challenge

- NASA is seeking additional inputs to the Break the Ice Lunar Challenge rules and questions for Phase 2 of the Challenge, proposed to start in March 2022
  - Link to the RFI:  
<https://sam.gov/opp/3015959e2d0742fe9fa8ccb8bf2356e9/view>
  - Responses are due by Dec 20th 11:59 PM Eastern



The Lunar Surface Innovation Consortium (LSIC) Fall Meeting, held at Bowie State University, in Bowie, MD, provided a forum for NASA and the space technology community to discuss technology development for establishing a sustained presence on the lunar surface, focusing in particular on investments, needs, and concerns associated with autonomy and robotics.

Over 400 attendees representing more than 125 institutions joined the meeting over the course of two days. 39% of those registered for the meeting had not previously attended an LSIC meeting.

### • Featured presentations

- Welcome addresses: Hon. Angela Alsobrooks, Prince George’s County Executive; Dr. Aminta Breaux, Bowie State President; Dr. Pamela Melroy, Deputy Administrator NASA
- Jim Reuter, NASA Associate Administrator for Space Technology
- Bowie State University & SAIC: Partnering to Expand Opportunities at an HBCU

### • Moderated panel discussions

- Technology Investors (VC): Future Space Economy
- Fostering Innovation in Industry and Academia
- Robotic Flight Demonstrations
- Robotics and Autonomy – The Big Picture

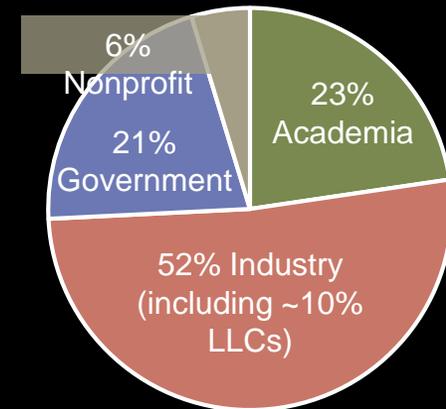
### • Invited technical presentations

- Autonomous Operations on Earth: Trustworthy AI and Autonomy, Dr. Cara LaPointe, JHU
- NASA Autonomous Systems & Robotics: Roadmap and Investments, Dr. Terry Fong, NASA

### • Key findings common among breakout sessions

- Some of the most critical technology gaps for autonomous operations on a Lunar base are free space optical communications and radiation hardened computer hardware. *Government needs to prioritize investment in communications and position, navigation, and timing (PNT) as well as ensuring standards for these are developed.*
- An understanding of the resources available and their extractability is critical, and currently lacking. *A resource prospecting campaign is fundamental to any real efforts to build towards a sustained presence on the Moon.*

Videos of the event can be accessed at <https://lsic.jhuapl.edu/Events/Agenda/index.php?id=148>



Institutional Breakdown

# AGENDA

~10 minute presentation:

- **Stephanie Brij-Raj:** Findings of previous month's workshop on *maintenance and repair for long term stay*.

~30 minute presentation:

- **Roberto de Moraes and Giuseppe Gaspari from AECOM**
  - Geotechnical Monitoring and Instrumentation used on tunneling and building construction.
  - Launch/Landing Pads ideas - ground support and stabilization.
- Roberto is the Director of Tunnels, based in Vancouver. Giuseppe is leading tunnel practices across Canada, based in Toronto.
- AECOM is the world's trusted infrastructure consulting firm.

# LSIC E&C October 2021 Monthly Meeting

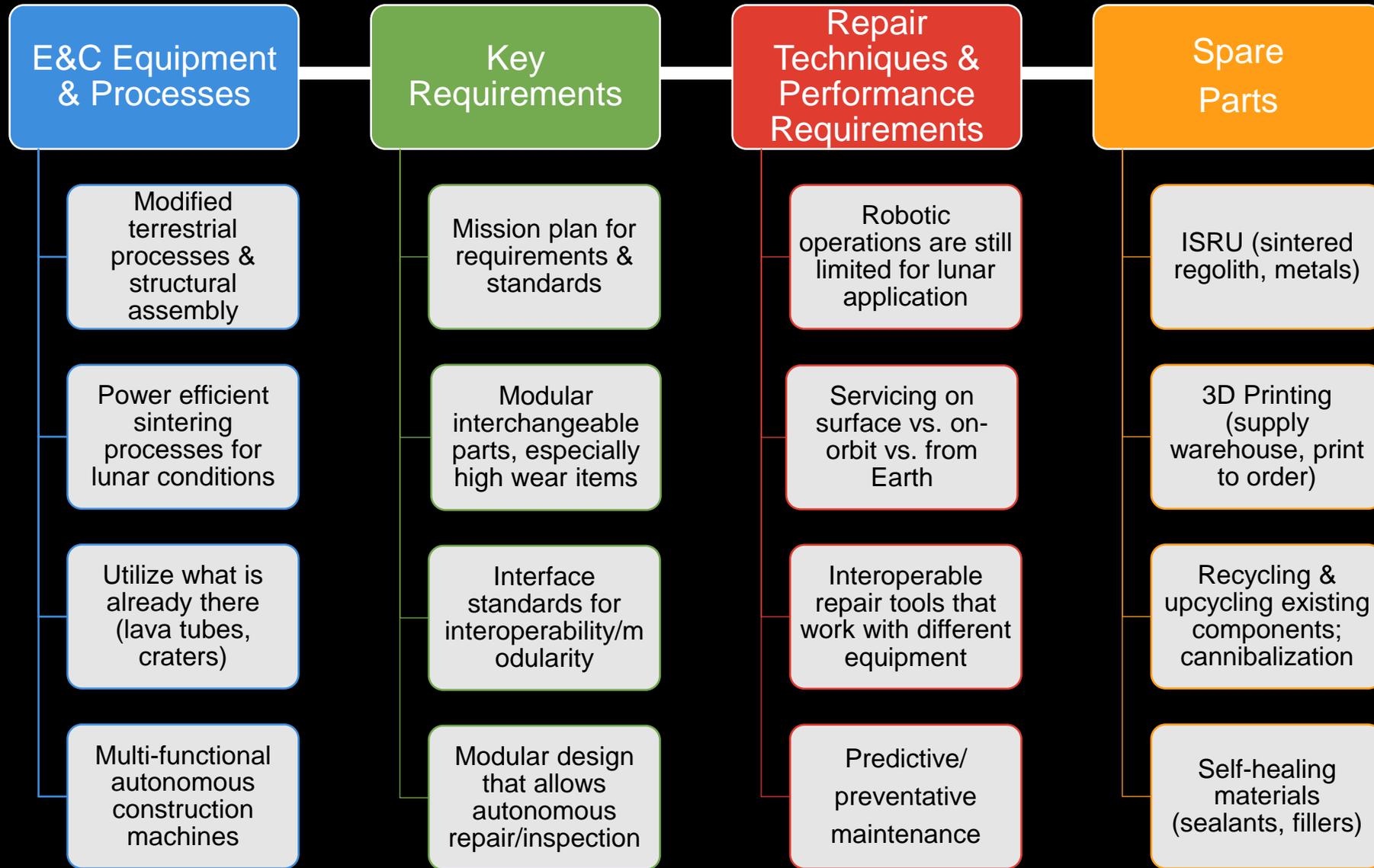
## Breakout Room Findings

Claudia Knez  
Stephanie Brij-Raj

# October 2021 E&C Monthly Meeting: Overview

- Held on 27 October 2021
- ~ 60 participants
- 1-hour virtual meeting, 45-minute breakout session
- Introduced sub-groups
  - Currently reviewing candidates for the sub-group leads
- Breakout Topic: Maintenance & Repair for the Long-Term Stay
  - Necessary excavation and construction equipment and processes
  - Key requirements for designing for repair and maintenance
  - Kinds of repair techniques and performance requirements
  - Spare parts

# Maintenance & Repair for Long-Term Stay Breakout Room Findings



# Backup

# October 2021 E&C Monthly Meeting: Conclusion

- Summary
  - The community wants more guidance on mission plans to inform requirements and standardization
  - Major topics of interest:
    - Robotic operations
    - ISRU for materials, spare parts
    - Interoperability/modularity
    - Site planning/prep
    - More investment/developing to increase TRL
- Moving Forward
  - The E&C Team is in the process of standing up subgroups to highlight areas that need more attention
    - Autonomy, Maintenance, Site Planning & Site Prep
    - Additive Manufacturing and Raw Materials
    - Horizontal and Vertical Construction
    - Outfitting
  - The E&C Team hopes to have more breakout style monthly meetings to get input from the community

# LSII System Integrator - APL

*A key tenet of LSII is to implement a multitude of novel collaborations across industry, academia, and government in order to successfully develop the transformative capabilities for lunar surface exploration.*

## Origin of the APL Task

- NASA was investigating using a University Affiliated Research Center (UARC) to bring efficiencies to development
- LSII initiated a tasked APL, to assess system integration role for the Lunar Surface Innovation Initiative
- APL established a Lunar Surface Consortium with academia and industry representatives, as well as NASA experts, that span a broad range of capabilities to execute timely studies, tasks, and/or acquisitions

## The Consortium will assist NASA in

- Identifying lunar surface technology needs and assessing the readiness of relative systems and components
- Making recommendations for a cohesive, executable strategy for development and deployment of the technologies required for successful lunar surface exploration
- Providing a central resource for gathering information, analytical integration of lunar surface technology demonstration interfaces, and sharing of results

