



# Lunar Surface Innovation

C O N S O R T I U M

## LSIC Excavation and Construction Focus Group

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

**July 30, 2021**

**Athonu Chatterjee  
& E&C Team**

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# Friendly Reminders

- Slides, chat and recording will be posted in our website in 2-3 days.  
(<http://lsic.jhuapl.edu/Focus-Areas/Excavation-and-Construction.php>)
- Feel free to post your questions/suggestions in 'chat'.
  - We can move the discussion to Confluence.
- Mute yourself if you are not speaking.

*Contact me if you want to present in this meeting.*

# Agenda

- Focus group and updates.
- ~10-minute presentation:
  - Paul Blase (Space Initiatives Inc.): *Extruded Lunar Concrete for Truss Structures.*
- ~25-minute presentation:
  - Prof. Jamal Rostami (Colorado School of Mines): *Challenges and Opportunities for Using Tunnel Boring Machines (TBM) to Develop Underground Structures on the Moon.*

# New LSIC E&C APL Team Member

- Stephanie Brij-Raj
  - New APL staff
  - Space Sector
  
- Sebastian Cabrejos
  - Circuit Intern
  - Undergraduate in Johns Hopkins University

*Welcome!*

- **Save the date : August 20<sup>th</sup>, 2 PM Eastern, ~ 2 hours**
- Workshop Theme: **E&C Roadmap and High-TRL Technologies for Initial Infrastructure Development.**
- Tentative Agenda:
  - NASA's Roadmap for Excavation and Construction
  - Break out session (E&C Roadmap, High TRL technologies, Power Needs)
  - Presentation on Simulants
  - Discussion on launch and landing pads.

Registration link: : <http://lsic.jhuapl.edu/News-and-Events/Agenda/index.php?id=139>

***Your inputs will help shape these activities.***

# LuSTR Solicitation Topics

- Lunar Surface Technology Research (LuSTR) solicitation topics released :  
<https://tinyurl.com/LuSTR21>
- Two E&C topics :
  - Autonomous Systems for Excavation and Site Preparation
  - Lunar Regolith Mineral Beneficiation

## Key Dates:

Release Date:	July 22, 2021
Notices of Intent Due:	August 20, 2021
Proposals Due:	September 17, 2021
Selection Notification:	February 2022 (target)
Award Date:	May 2022 (target)

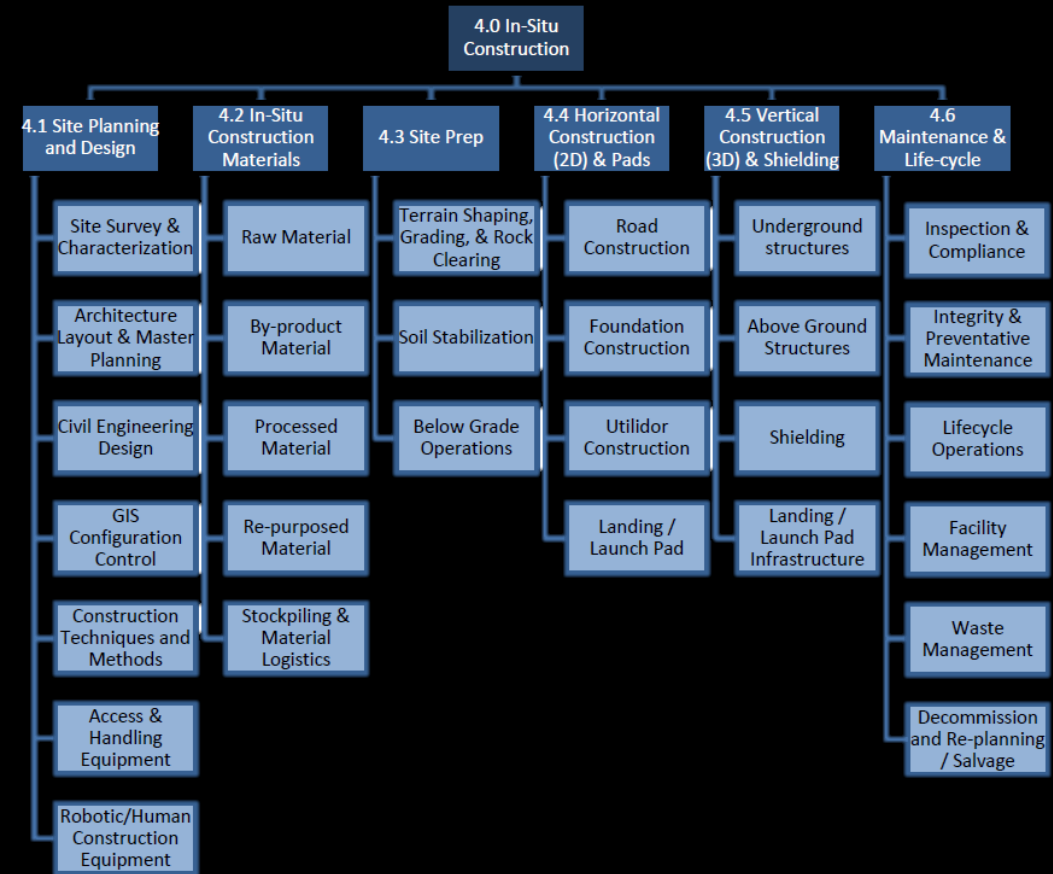
**Technology Readiness Level (TRL):** TRL 2 to TRL 4 at the beginning of the effort.

## Award Details:

Anticipated Total Number of Awards:	4
Award Duration:	Maximum of two years
Award Amount:	\$1M to \$2M total per award

## The Confluence site will be used to extend our monthly FG conversations

- Email Andrea Harman for Access (<https://lsic-wiki.jhuapl.edu/pages/viewpage.action?pageid=1671257>)
- “Watch Pages” of Interest for subtopics
- We will take some conversations that have gained traction and continue them on the confluence
- The site employs subtopics consistent with terrestrial E&C WBS
- Please provide feedback – The page is a work in progress
- Add your name to “Who’s Who”





# Today's Talks

**(1) Paul Blase (Space Initiatives Inc.): *Extruded Lunar Concrete for Truss Structures.***

**(2) Prof. Jamal Rostami (Colorado School of Mines): *Challenges and Opportunities for Using Tunnel Boring Machines (TBM) to Develop Underground Structures on the Moon.***





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<b>Habitat construction in lunar conditions. (Inflatable habitat, underground habitat, radiation shielding, multi-functional materials/structures)</b>	<b>70.5%</b>
Manufacturing processes for lunar construction. (Additive manufacturing, sintering, regolith fiber pulling)	63.6%
Excavation technology for hard regolith/icy material. (Drilling, mining, lightweight construction equipment)	61.4%
Autonomous vehicles and robots for E&C on lunar surface.	59.1%
Lunar surface structure development. (Landing pads, berms, roads)	54.5%
Increased autonomy of operations.	34.1%
Virtual lunar terrain simulation.	29.5%
Beyond additive technology.	22.7%
Long duration robust , easily maintainable robot design for industrial scale use (not science)	2.3%
Subsurface and interior imaging and composition analysis	2.3%
Compressed, sifted regolith as a building material	2.3%
Spacecraft refueling station development	2.3%

# 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

