



Lunar Surface Innovation

C O N S O R T I U M

Extreme Access Focus Group Telecon

April 14, 2022

We'll start around 3:03-3:05

Dr. Angela Stickle
Senior Research Scientist
JHU Applied Physics Laboratory

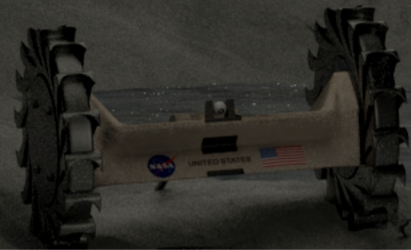
Facilitator_ExtremeAccess@jhuapl.edu



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Today's Agenda

- LSIC Updates
- Upcoming Meetings/Opportunities
- MOSA discussion
- Technology Spotlights
- Open floor





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14 April 2022

Created by Angela Stickle, last modified on Apr 11, 2022

Agenda:

[LSIC Updates](#)

[MOSA Brainstorming](#)

[Technology Spotlight](#): Dr. Evan Anzalone (NASA): Lunar Node 1 navigation beacon system

[Technology Spotlight](#): Dr. Robert Tjoelker (JPL) : Deep Space Atomic Clock

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Confluence is an important resource to provide asynchronous discussion opportunities

Write a comment...

and a record of conversations

<https://lsic-wiki.jhuapl.edu/x/jp8xAg>

1. Add a comment to sign in
2. Select an agenda topic and comment your thoughts
3. Follow-up after the telecon to continue to discussion!

LSIC Updates

Funding Opportunities

- **Nighttime Precision Landing Challenge #1**
 - NASA Tech Leap challenge: develop sensing systems that can detect terrain hazards in the dark
 - <https://www.precisionlanding1.nasatechleap.org>
 - Register by May 5
- **NASA STMD Tipping Point**
 - Mini Proposals were due April 8.
 - Invite-only full proposals due July 28, 2022
 - <https://nspires.nasaprs.com/external/solicitations/summary.do?solId={9987D88F-0A12-5203-FC25-423773FAF134}&path=&method=init>
- **Watts on the Moon Challenge Phase 2**
 - https://www.nasa.gov/directorates/spacetech/centennial_challenges/second-phase-open-of-5-million-lunar-power-prize-competition.html
 - Register to compete by June 15, 2022
- **Please visit LSIC website for full list**
 - <http://lsic.jhuapl.edu/Resources/Funding-Opportunities.php>



Upcoming Meetings

- Focus Group Telecons (2nd Thursday each month, 3-4 pm EST)
 - April 14, 2022
 - May 12, 2022 (one week after Spring Meeting. Do we want to cancel?)
- LSIC's Spring Meeting
 - Event Date: May 4-5, 2022 (hybrid)
 - <https://lsic.jhuapl.edu/Events/Agenda/index.php?id=200>
 - Registration for in-person is closed, but you can still register to attend virtually!

There will be a joint EE/EA workshop June 7.
Save the date! And stay tuned for more information!



LSIC Spring Meeting

Keynote Speaker



Robert D. Cabana

NASA Associate Administrator

- Day 1:
 - Keynote speaker
 - SpaceTech Update
 - LSIC Update
 - Panel: Law and Tech – Policy for the Moon
 - Panel: Executive Committee
 - Panel: Modular Open Systems Approach (MOSA)
 - Lighting talks
 - Poster session
- Day 2:
 - NASA High-level roadmapping vision discussion
 - Envisioned Future: Power
 - Envisioned Future: ISRU
 - Envisioned Future: Thermal
 - Envisioned Future: Excavation, Outfitting, Construction
 - LSIC FG Updates
 - LuSTR Opportunities
 - Value Network Updates
 - Breakout Rooms



LSIC Spring Meeting Breakout Discussions

Breakout rooms will be hybrid discussions

- Regolith to Rebar: Next Steps
- Funding Opportunities: LuSTR and More
- Envisioned Futures: Initial Roadmap Discussions
- Space Law, MOSA, and the Big-Picture

- SSERVI European Lunar Symposium
 - Virtual, May 24-26, 2022
 - <https://sservi.nasa.gov/els2022/>
 - “Science of the Moon”, “Science on the Moon”, “Science from the Moon”, “Science enabling lunar in-situ resource utilisation (ISRU)” and “Future Missions”
- COSPAR 2022
 - July 16-24, Athens Greece
 - <https://www.cosparathens2022.org>
- NASA SSERVI Exploration Science Forum
 - July 19-21 (hybrid)
 - In-person: Boulder, CO
 - Focus on basic and applied scientific questions fundamental to understanding the Moon
 - <https://sservi.nasa.gov/nesf2022>
- AIAA Intelligent Systems Workshop
 - July 26-27, Texas A&M
 - Technical sessions covering autonomy and human-machine teaming
 - https://aiaa-istc.github.io/2022_IS_Workshop.html
- International Astronautical Congress
 - September 18-22, Paris France
 - <https://iac2022.org>
- AIAA ASCEND Conference
 - October 24-26, 2022 in Las Vegas, NV
 - <https://www.ascend.events/call-for-content/>

LSIC EA Subgroups

Subgroup Meetings


- PNT Subgroup meeting: April 21, 2022 (3pm ET)
- Comms: April 20, 2022 (1 pm PT/4 pm ET)
- Mobility: April 28, 2022
- TRN: stay tuned!

We'd like to have a discussion of subgroups, and what you are finding most useful (or would like to see included/changed) in the next few months... please take a few minutes to think about the groups!

We'll be putting out a survey for finishing up year 2 soon and want your feedback!

STMD RFI released: “GO” thrust

- The following information is requested :
 - Are the Envisioned Futures charts inclusive of space community needs? Please provided specific recommendations for improving the provided Envisioned Future charts.
 - Are the State-of-the-Art summaries complete and accurate or are there technologies that exist that we may not be aware of that satisfy these needs?
 - Are the technology gaps stated in the Envisioned Futures charts inclusive of the work needed to reach these Envisioned Futures? What technology advances are not included that would be necessary to reach these goals?
- **NASA is hosting a virtual Industry Day on Wednesday, April 27, 2022 at 12:30 p.m. ET.**
- **Responses to this RFI are due May 20, 2022 at 5:00 p.m. ET.** Responses to this RFI must be submitted electronically using NSPIRES at <https://nspires.nasaprs.com/>.
- Any questions to this RFI may be submitted to HQ-STMD-STAR-RFI@nasaprs.com at any time before the due date for responses.

Thrusts	Outcomes	Primary Capabilities
 <p>Go Rapid, Safe, and Efficient Space Transportation</p>	<ul style="list-style-type: none"> • Develop nuclear technologies enabling fast in-space transits. • Develop cryogenic storage, transport, and fluid management technologies for surface and in-space applications. • Develop advanced propulsion technologies that enable future science/exploration missions. 	<ul style="list-style-type: none"> • Nuclear Systems • Cryogenic Fluid Management • Advanced Propulsion

<https://techport.nasa.gov/framework>

Reminder: LSIC | MOSA Working Group

- **LSIC Modular Open System Approach (MOSA) Working Group**

- Goal:
 - Document community feedback on recommended lunar MOSA activities
 - Compile existing efforts and identify overlap
 - List systems that could benefit from MOSA
 - Perform system decompositions to find critical interfaces & what requirements are needed to ensure interoperability
- Plan
 - Each LSIC focus group is participating and has a POC
 - Cross focus group participation is encouraged
- Points of Contact
 - Lead/Coordinator: James Mastandrea
 - System Engineer: Kristin Jaburek
 - Dust Mitigation: Jorge Núñez
 - Excavation & Construction: Claudia Knez
 - In Situ Resource Utilization : Jodi Berdis
 - Surface Power: Samantha Andrade
 - Extreme Environment: Jamie Porter
 - Extreme Access: Angela Stickle



Remember we have a
Confluence page to facilitate
discussions
[https://lsic-
wiki.jhuapl.edu/x/sIMxAg](https://lsic-wiki.jhuapl.edu/x/sIMxAg)

MOSA Brainstorming



Please add comments to the Confluence page for today's telecon:
<https://lsic-wiki.jhuapl.edu/x/kJ8xAg>

Pages / ... / 14 April 2022

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Watching

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MOSA Brainstorming for EA

Created by Angela Stickle, last modified on Apr 11, 2022

Please click on the links below to add your comments to the discussion:

1. [What are the existing efforts on standards and interoperability in your technology area? Are they applicable to the moon?](#)
2. [Within your technology area, what would you designate as a critical interface? What is the boundary that interfaces with the larger system?](#)
3. [What do you want to get out of the MOSA working group? Are there any interoperability barriers to your technology development?](#)

The MOSA working group was introduced at the February 2022 telecon, and we've already had some initial discussion within the group. Please check [here](#) to contribute to those.



Annual Goal: Where are we?

- Identify areas and/or environments of interest (**We've done this**)
- Pick 1-2 (**We've done this**)
- Identify specific technology needed to enable exploration of these areas. What are the environments like? What are the needs for mobility, PNT, comms, autonomy?
- Evaluate current technology availability, compare to what is needed for (3). This will likely involve standing up several smaller subgroups.

↑
We are here

Identify gaps, prioritize which are more important to close first

Roadmap, determine recommendations for specific tech development and/or demos

- Throughout: keep in mind where will need input or tech crossover from other focus groups. Where does technology development require multiple inputs?
- Write a report of some sort



Looking Forward

- Subgroups are the easiest place for us to build community and to have more detailed conversations
 - Conversations over the past year have ranged in topic, but address themes related to the annual goal
 - We will be collecting feedback from the subgroups in the next few months
 - This feedback and recommendations will be provided to the community and to STMD
 - Feedback can be “white paper” style or more informal
- Joint EE/EA workshop will focus on deep PSRs

Subgroups submit feedback



February

March

April

May

June

Subgroup Discussions

Compiling
Feedback

LSIC Spring
Meeting

EE/EA
Workshop

Technology Spotlight

Dr. Robert Tjoelker (JPL) : Deep Space Atomic Clock

Technology Spotlight

Dr. Evan Anzalone (NASA): Lunar Node 1 navigation beacon system



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LSIC EA Annual Goal Reminder

- Identify mission/system elements needed to explore challenging lunar environments, including identifying specific technology needs and gaps, **prioritizing development timelines**, and providing a general roadmap and recommendations for needed technology, testing, and demonstrations.
 - *Permanently Shadowed Regions (PSR) and lunar pits/lava tubes were chosen as high priority environments*
 - *We will work with the EE group to identify environment requirements and challenges*
 - *Conduct at least one targeted Technical Interchange Meeting (TIM)*
- Build a community and develop collaborative relationships among members
 - Inclusive monthly telecons with member technology spotlights and invited technical talks
 - Provide networking opportunities at large LSIC meetings, mentoring through LSIC channels
 - Community-led subgroups for in depth discussions and networking

- Confluence is our record of discussions and a good repository
 - Confluence is free to you and available to all registered LSIC members
 - We will be using Confluence to document discussions and provide resources to LSIC members. All focus groups have a separate page so it's a good collaboration space.
 - To request an account, please email Andrea Harman: ams573@alumni.psu.edu
- Technology Spotlights/Lightning Talks at monthly telecons
 - Anyone can volunteer to give a lightning talk (10-20 mins)
 - Email Angela or Sarah, or comment on Confluence, to sign up!
- Updates to the webpage - <http://lsic.jhuapl.edu/Focus-Areas/Extreme-Access.php>
 - Notes, slides, recordings from telecons posted here

Follow the Code of Conduct for all Focus Group communications

Contact information

LSIC Director: Rachel Klima, SES-LSIC-Director@jhuapl.edu
<http://lsic.jhuapl.edu>

Focus Group Area	Listserv address	Facilitator
In-Situ Resource Utilization	LSIC_ISRU@listserv.jhuapl.edu	Karl Hibbitts
Surface Power	LSIC_Power@listserv.jhuapl.edu	Wes Fuhrman
Extreme Environments	LSIC_ExtremeEnvironment@listserv.jhuapl.edu	Jamie Porter
Extreme Access	LSIC_ExtremeAccess@listserv.jhuapl.edu	Angela Stickle
Excavation and Construction	LSIC_ExcavationConstruction@listserv.jhuapl.edu	Athonu Chatterjee
Dust Mitigation	LSIC_DustMitigation@listserv.jhuapl.edu	Jorge Núñez

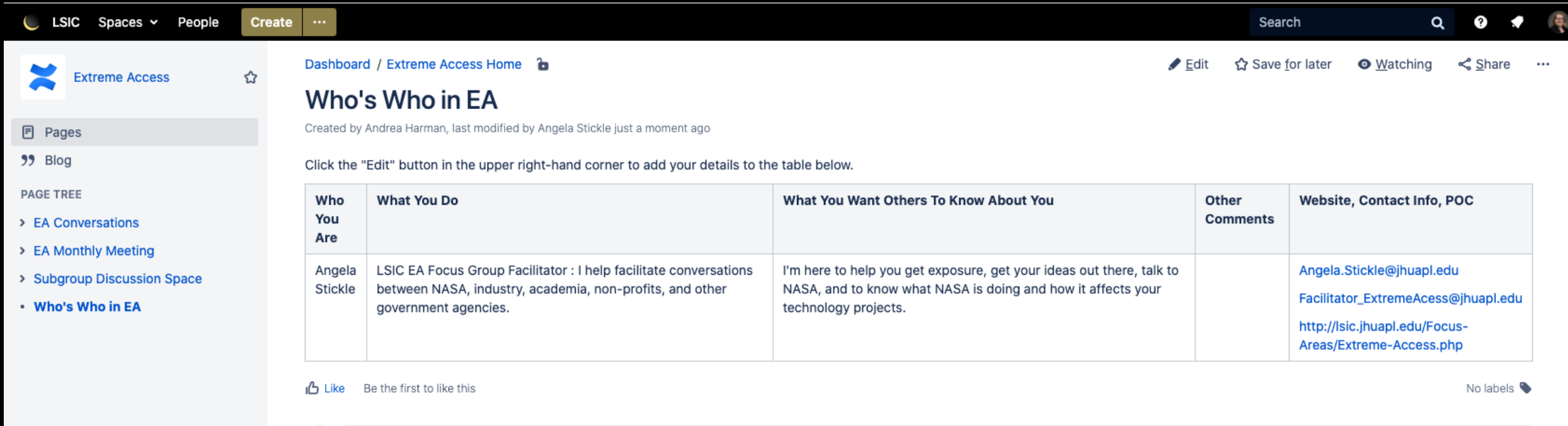


LSIC Meeting Cadence

- **Bi-Annual Meetings (Spring and Fall)**
- **Monthly Focus Group Meetings**
 - 2nd Tuesday of the Month 3:00-4:00 pm – Extreme Environment
 - 2nd Thursday of the Month 3:00-4:00 pm – Extreme Access
 - 3rd Wednesday of the Month 3:00-4:00 pm – ISRU
 - 3rd Thursday of the Month 12:00-1:00 pm – Dust Mitigation
 - 4th Thursday of the Month 11:00 am-12:00 pm – Surface Power
 - 4th Wednesday of the Month 2:00-3:00 – Excavation and Construction
- **Thematic Workshops (as identified by FGs and NASA POCs)**
 - Workshops In development Funding, CLPS Provider

Get to know the community

<https://lsic-wiki.jhuapl.edu/x/0IVf>



LSIC Spaces People Create ... Search

Extreme Access

Dashboard / Extreme Access Home

Who's Who in EA

Created by Andrea Harman, last modified by Angela Stickle just a moment ago

Click the "Edit" button in the upper right-hand corner to add your details to the table below.

Who You Are	What You Do	What You Want Others To Know About You	Other Comments	Website, Contact Info, POC
Angela Stickle	LSIC EA Focus Group Facilitator : I help facilitate conversations between NASA, industry, academia, non-profits, and other government agencies.	I'm here to help you get exposure, get your ideas out there, talk to NASA, and to know what NASA is doing and how it affects your technology projects.		Angela.Stickle@jhuapl.edu Facilitator_ExtremeAccess@jhuapl.edu http://lsic.jhuapl.edu/Focus-Areas/Extreme-Access.php

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Who's Who in ISRU: <https://lsic-wiki.jhuapl.edu/display/ISRU/Who%27s+Who+in+ISRU>

Who's Who in Surface Power: <https://lsic-wiki.jhuapl.edu/display/SP/Who%27s+Who+in+LSIC-Surface+Power>

Who's Who in E&C: <https://lsic-wiki.jhuapl.edu/pages/viewpage.action?pageId=6260179>

Who's Who in EE: <https://lsic-wiki.jhuapl.edu/display/EE/Who%27s+Who+in+LSIC-EE>