Joint E&C – Dust Mitigation Monthly Meeting
http://lsic.jhuapl.edu/

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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 Q&A (not chat).

• Mute yourself if you are not speaking.
Today’s Agenda

• Focus group updates.
  - E&C
  - Dust Mitigation

• Kristin Jaburek - Modular Open Systems Approach (MOSA) questions.

**Featured Talks**

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<th>Dust-Tolerant Mechanisms</th>
<th>15 min</th>
<th>Vincent Vendiola</th>
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Theme: Designing Dust Tolerant Systems for E&C

• How does dust affect design and performance of E&C systems?
  - Lunar surface demonstrations?

• How to design machines and mechanisms for wear and abrasion?
  - Learning from terrestrial experience.

• How are repair and maintenance considerations shaped by dust?
E&C Confluence Page: Who’s Who

https://lsic-wiki.jhuapl.edu/pages/viewpage.action?pageId=6260179
Integrated Dust Mitigation Strategy
Dust Mitigation FG Subgroups

• **Materials and Surface Coatings:**
  - *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

• **Seals, Soft Goods, and Fabrics:**
  - *Fabrics* – Space suit fabrics, soft wall habitats, mechanism covers
  - *Seals and Soft Goods* – Space suit interfaces, hatches, connectors, hoses

• **Mechanisms:**
  - *Mechanisms* – Linear actuators, bearings, rotary joints, hinges, quick disconnects, valves, linkages

• **Monitoring and Filtration:**
  - *Gaseous Filtration* – Atmosphere revitalization, ISRU processes
  - *Dust monitoring* – Cabin and external dust monitoring

• **Modeling:** – *Dust plume modeling*

• **Lunar Surface Modification** – Lunar landing pads, dust free zones and workspaces

• **Isolation Technologies** – Technologies that keep dust out
Lunar Dust & Impact on E&C

• “The Moon’s dust is made up of ultra-tiny grains — formed by millions of years of meteorite impacts that repeatedly crushed and melted rocks, creating tiny shards of glass and mineral fragments.

• Not only can they travel at hurricane-like speeds, but they also cling to all types of surfaces, not only because of their jagged edges, but also because of their electrostatic charge.” [Source: NASA]

There are many possible impacts of Dust on E&C. Systems and subsystems affected:

• Optical Systems – Solar panels, windows, other sensitive optical surfaces
• Thermal Surfaces – Thermal radiators, thermal painted surfaces, thermal connections
• Fabrics – Covers (mechanisms, thermal, connectors) and external fabric coatings
• Mechanisms – Linear actuators, bearings, rotary joints, hinges, quick disconnects, valves, linkages
• Seals and Soft Goods – Connectors, hoses, power cables
• Tools – Cleaning tools
• Lunar Surface Modification – Dust free zones and workspaces
Dust Mitigation Approaches

- **Architectural and Operational**
  - Stowage of solar arrays or covering of optically sensitive surfaces during redeployment
  - Deployment on dust free zones
  - Slower movements to reduce uplifting of dust

- **Passive Technologies**
  - Materials – Dust repelling materials/surfaces (charged and/or patterned)
  - Coatings/Paints – Opaque and clear dust repelling surface coatings
  - Fabrics – Dust tolerant covers
  - Seals and Soft Goods – Dust tolerant connectors, hoses, power cables

- **Mechanisms**
  - Dust tolerant actuators, bearings, rotary joints, hinges, quick disconnects, valves, linkages

- **Active Technologies**
  - Electrostatic and plasma ion beams
  - Electrodynamical Dust Shield (EDS)
  - Wireless power transfer
  - Cleaning tools such as jets and brushes
LSIC Activities

Recent and Upcoming LSIC Meetings and Workshops ([https://lsic.jhuapl.edu/Events/](https://lsic.jhuapl.edu/Events/))

- **LSIC Spring Meeting (05/04-05/05)** – Virtual & In-Person
  - Agenda Available Here: [https://lsic.jhuapl.edu/Events/Agenda/index.php?id=200](https://lsic.jhuapl.edu/Events/Agenda/index.php?id=200)
  - LSIC Focus Group Reports @ 1:50pm EST on Thursday, 4/5

- **Dust Mitigation FG Meeting (05/18)**

Other Recent and Upcoming Dust Mitigation Related Workshop and Meetings

- **LSIC Extreme Access (EA) and Extreme Environments (EE): Designing for the Extremes Workshop** (Virtual – Monday, 6/6)
  - Half-day virtual workshop to talk through the many challenges associated with regolith excavation and transport.
  - [https://lsic.jhuapl.edu/Events/Agenda/index.php?id=232](https://lsic.jhuapl.edu/Events/Agenda/index.php?id=232)

- **Space Resources Roundtable XXII Meeting** (Colorado School of Mines in Golden, CO, USA – Tuesday 6/7 – Friday 6/10)
  - The 22nd SRR meeting will present innovative approaches in space resource identification, technology development, utilization, public and private partnerships, and capability and regulatory regimes.
  - [https://lsic.jhuapl.edu/Events/Agenda/index.php?id=199](https://lsic.jhuapl.edu/Events/Agenda/index.php?id=199)
Keep up-to-date about Dust Mitigation!

- **Sign-up to Receive LSIC and Dust Mitigation FG Updates:**
  - Fill out the LSIC Survey and indicate interest in Dust Mitigation to receive news and event invitations: https://lsic.jhuapl.edu/News/Sign-Up.php

- **Help us improve the Dust Mitigation Focus Group!**
  - Feedback survey:
    https://docs.google.com/forms/d/e/1FAIpQLSdjuTIK_TLMnCM4_aSMLAzLS762qtzbqmcOd2fgizICsab6KQ/viewform

- **Join one of the Dust Mitigation Subgroups!**
  - Dust Mitigation Subgroup Membership/Leaders survey:
    https://docs.google.com/forms/d/e/1FAIpQLScB6iT2fqpqj2zlaP0srwQDQ04TPfgVyiC5zn0AQPAT5CZA/viewform

- **Interested in Teaming/Collaborating with Others?**
  - Add yourself to our Who’s Who page: https://lsic-wiki.jhuapl.edu/display/DM/Who%27s+Who%3?+In+Dust+Mitigation

- **Looking for info on lunar dust or dust mitigation resources?**
  - Checkout our resources page on the Dust Mitigation Wiki page on Confluence: https://lsic-wiki.jhuapl.edu/x/94RF
Today’s MOSA Questions

- Within this capability area, what would you designate as a critical interface?
  - What is the boundary that interfaces with the larger system?

- What are the existing efforts on standards/interoperability in this area? Are they applicable to the Moon?

- What do you want to get out of the MOSA working group?
## Featured Talks

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|                         |        | *Moonrise Mining Inc.* |
| Q&A + Discussion        | 15 min | Vincent & Brad       |