

# Notes from Extreme Environments Monthly Meeting

October 2020

## Notes From Discussion

### Introduction of new NASA Point of Contact, Kevin Somervill (Technical Integration Manager for Extreme Environments at STMD)

#### Subgroup Updates

- Introduction of lead for Regolith and Surface Interaction subgroup, Don Barker
- Definition of supporter versus participant for subgroups: Supporter can actively put in effort to generate material and output. Participants mostly participate passively, though they can be involved in active engagement

#### Discussion of Fall Meeting ::refer to slides::

#### Brainstorming Session ::refer to Confluence space: <https://lsic-wiki.jhuapl.edu/x/IYI9::>

#### *How the lunar environment affects a sustainable human presence*

- Lawrence Heilbronn stated there's no way to completely avoid a dose of radiation for astronauts on the lunar surface, so focus utilizing basic chilling technology to reduce the potential dose to lengthen the stay on the Moon - use local regolith as shielding
  - Lawrence also brought up the issue of warning astronauts about solar particle events with enough lead time to allow them to get to safety
  - Michael Poston asked what the timescales involved were, and Lawrence responded that the range was from one to four hours
- Tim Anderson stated that landing exclusion zones could be identified, space traffic management could be employed to mitigate dust issues and protect infrastructure
- Suggestion that close proximity to lava tubes could be non-polar PSR source
  - No lava tubes have been identified near the poles yet
  - Evidence shows that lava tubes trap warmth
- Consider 'sub-lunarian' habitat architecture
  - Could reduce dust related environmental impact
  - No profile would mean no shadow to mitigate / plan around
- Marcela Lizcano wondered how UV radiation of dust / blanket of charged particles up to 2 km from the surface would affect human habitation
  - Michael Poston answered that there were some APL folks who could comment on that, and that Bill Ferril (sp?) at Goddard was also interested

- Michael Poston asked a question about how to mitigate effects of impact fluxes (referred to DISD, NASA design specification document)
- John Cristoph said that low energy ionizing radiation was probably not going to be a big concern, because if there is already shielding for higher energy ranges (like cosmic rays) that would be effective against low energy as well
- Gonçalo Esteves asked about making modifications to astronauts (such as genes) to mitigate risks

#### *How a sustained human presence affects the lunar environment*

- Settlements could be a source of light and electromagnetic pollution
- Are there concerns about radiation from a reactor?
- Creating exosphere elements (leaked volatiles from ISRU)
- Michael Poston wondered how that would compare with temporary exosphere from landing / takeoff events

#### **Shielding Material**

- Lawrence Heilbronn brought up that there are opportunities for research relevant to shielding development of structurally sound composite materials that are superior / cost effective / low mass / easily deployed shielding materials
  - Jim Keravala asked whether astronaut based surface operations for long duration habitation on the surface was viable as increasing evidence points that the amount of radiation shielding needed is more than surface architecture could provide
  - Lawrence responded that when you reach the risk limits that NASA imposes on crew members you're looking at long durations on the order of three years for radiation exposure
  - Maricela Lizcano asked what the saturation limit of the radiation shield is
  - Lawrence responded that there would be some destruction of atoms in the shielding material but overall the total number is very small, so structural integrity should hold for a three year mission
  - Maricela responded to ask whether boron carbide was being considered
  - Lawrence responded boron carbide is great for shielding neutrons, and great if more hydrogen could be added as well
  - John Cristoph agreed the material loss should not be constraining

## Notes From Chat

To get access to Confluence, contact Andrea Harman at [ams573@alumni.psu.edu](mailto:ams573@alumni.psu.edu)

Extreme Environments home on Confluence here: <https://lsic-wiki.jhuapl.edu/x/TYAZ>

Discussion boards for today's conversation on Confluence here: <https://lsic-wiki.jhuapl.edu/x/IYI9>

Questions for Don Barker can be sent to [donald.c.barker@att.net](mailto:donald.c.barker@att.net)