TEXAS SPACE GRANT CONSORTIUM
DESIGN CHALLENGE

TOPIC # - TDC - 97 - S24

LUNAR DUST MITIGATION SOLUTIONS

BACKGROUND

As we return to the surface of the Moon, the lunar dust that covers the surface is going to be a challenge. The lunar dust, also called lunar regolith, has been produced by meteorite impacts since the formation of a solid lunar surface billions of years ago. The regolith, while promising as a future building material for lunar construction, also poses a hazard to hardware operating on the surface. Since there is no air on the Moon and a reduced gravity, mechanisms to remove the dust after it is disturbed essentially do not work, causing dust accumulation from landings and other induced environments such as roving or walking. The Apollo missions alerted us to the significant challenges or lunar dust, which will be amplified for longer duration missions. Lunar dust creates a number of hazards to lunar operations including effects on human health, degradation of life support systems, wear to mechanical systems, and loss of efficiency of solar arrays and radiators. The document "Lunar Dust Mitigation: A Guide and Reference", found here https://ntrs.nasa.gov/api/citations/20220018746/downloads/TP-20220018746.pdf, is a great starting point for understanding the state of dust mitigation and what it entails.

PROBLEM DESCRIPTION

Time to dust off your ideas! Our challenge to your team is to come up with ideas for dust mitigation that involve no (or very limited) technology development. For instance, are there items that we will already be flying to the Moon that could help with dust mitigation? Are there low mass items that already exist today that we could bring with to help mitigate dust? Are there operational actions we could take that could help limit dust exposure? Dust mitigation is necessary for all systems that will go to the lunar surface, including external systems (e.g. rovers, habitats, mechanisms, payloads) and internal systems inside habitats and pressurized volumes. Another challenge with dust mitigation is how to measure the amount of dust that has been accumulated on a surface, or how to measure the amount of dust that has been brought inside a habitat.

DELIVERABLES: Proof-of-concept for selected solution(s). Test plan to validate proposed solution(s). Prototype(s) if applicable.

DESIGN TEAM PROFILE

NASA MENTOR:	Kristen John
LEVEL:	All levels
MAJOR / DISCIPLINES:	All majors
TEAMS:	Mentor may accept more than one team
DURATION:	Two-Semester Project