

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Lift Off - Secondary Space Education (2)

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LUNAR DUST MITIGATION ON SPACECRAFT IN A LOW GRAVITY FREEFALL ENVIRONMENT

Abstract

The Wolverine CubeSat Development Team (WCDDT) program remains the only middle school nationwide to develop, build, test, and launch a cube-sized satellite (also known as a CubeSat), and develop a plethora of other missions. Aside from satellites, the WCDDT program is also focused on future lunar exploration, and is developing the AMARIS Lunar Rover. The goal of the AMARIS mission is to evaluate techniques for reducing the negative impacts of dust accumulation on rover solar panels and frames. This dust adhesion problem was widely reported during the Apollo era missions.

Students on this competition team are submitting their work to BLUE ORIGIN for a suborbital flight opportunity. The students have designed and built a vacuum 'dust-box' composed of 5 mm thick Lexan sheets in which flight-grade photovoltaic panels and anodized aluminum chassis components will be subjected to lunar regolith simulant in various low-G environments. Selection through the Blue Origin competition allows for the testing during a suborbital mission aboard their New Shepard capsule.

"Lunar dust is the number one environmental problem on the moon and can cause unexpected difficulties and hazards for both robots and humans operating on the dust-covered lunar surface," stated Brian O'Brien, the principal investigator for the Dust Detector Experiment on several Apollo lunar landing missions. When melted soil freezes again, almost instantaneously, it now becomes razor sharp and extremely fine. These glassy fragments are called agglutinates, believed to have toxic properties.

In an environment without oxygen and humidity, but exposed to large amounts of radiation, scientists believe that effects caused by lunar dust toxicity may possibly be significantly greater than what is currently expected based on current simulants. Not only does lunar dust pose threats to the health of astronauts because of its toxicity and its ability to become a major respiratory irritant, the dust has been shown by NASA to repeatedly cause hardware failures. Overall, this proposal is submitted to further advance student understanding of the lunar environment as well as prepare the future aerospace workforce.