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17th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Technologies (2B)

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MULTIPURPOSE CASSEGRAIN SYSTEM

Abstract

Ejecta and dust caused during lander plume interactions with the regolith can harm crew, equipment, and the lander. Stabilizing the large landing surface areas required for human-scale missions suggests the use of indigenous resources rather than hauling construction materials from Earth. Solar power offers the largest most prevalent energy source on the Lunar surface, which could be focused by a Cassegrain solar concentrator for sintering lunar regolith into a hardened continguous stabilized surface. Our Cassegrain solar concentrator design can serve multiple functions across several mission phases including during Lunar nights. The multiple role applications considered for Cassegrain concentrator are (1) Solar sintering for pads, aisles, and berms; (2) Harvesting gaseous molecules: H2O, OH, O2, H2, and He-3; (3) Space antenna for telemetry and telecommunication during nominal operations; and (4) Space telescope with 20-meter aperture during darkness. A key emphasis is placed on the NASA Langley-developed boron nitride nanotube (BNNT) nanocomposite technology which is ideal for the segmented primary mirror structure of Cassegrain system because it promises a very low coefficient of thermal expansion (CTE) and negligible Poisson ratio. Also, BNNT nanocomposites offer great benefits, such as light weight, radiation shielding capability, and mechanical strength for structural applications. We envision a directed RD project with participation by some industry partners.