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Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and
Development (1)

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NASA'S LUNAR SURFACE INNOVATION INITIATIVE: ENDURING BENEFITS OF A COHESIVE,
EXECUTABLE STRATEGY FOR TECHNOLOGY DEVELOPMENT FOR SUSTAINED LUNAR
EXPLORATION

Abstract

NASA's Lunar Surface Innovation Initiative (LSII) was established in 2019 to serve as a pivotal asset for the agency, fostering technology development and mitigating risks in lunar surface system development. Evolving to align with NASA's Moon to Mars (M2M) Strategy and Objectives and a key tenant of NASA Artemis, LSII strategically implements across in-house activities, competitive programs, and public-private partnerships, ensuring alignment and collaborative efforts to accelerate technology capabilities for lunar surface infrastructure and enable sustained human presence on the Moon. Simultaneously, it provides invaluable insights and preparations into the foundations necessary to spur a robust lunar economy, generating new industries, products, and services with enduring benefits to last.

A cornerstone of LSII is the Lunar Surface Innovation Consortium (LSIC), a collaborative effort spanning U.S. industry, academia, and government to effectively cultivate transformative capabilities. LSIC serves as a platform for NASA to articulate technological requirements, needs, and opportunities, while providing a space for the community to share existing capabilities and pinpoint crucial gaps in NASA's plans. With over 900 organizations involved domestically and across more than 65 countries worldwide, LSIC has been instrumental in informing technologies and systems essential to a thriving cislunar economy. This consortium enables NASA to leverage collective knowledge and expertise, facilitating advancements that fuel both technological and economic growth. Additionally, LSIC plays a vital role in informing NASA's strategic investments in critical technologies by promoting networking, partnering, and collaborations to amplify the impact of external technology development efforts. The consortium serves as a central community resource, fostering information sharing and analytical integration thereby bridging the gap between government-funded space exploration and emerging commercial-led services in space.

This paper will expand upon the advancements and achievements of the LSII model used to develop a technology pipeline for the building blocks of a robust lunar infrastructure and which aims to retire the primary technology hurdles of six crucial capability areas: in-situ resource utilization (ISRU), surface power, excavation and construction, dust mitigation, extreme environments, and extreme access.