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Human Exploration of the Moon and Cislunar Space (1)

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ADAPTABLE ARTEMIS ARCHITECTURE CONCEPTS FOR LUNAR AND MARS EXPLORATION
GOALS

Abstract

As part of the Artemis era of space exploration, space agencies will be working together with their industry partners to establish systems and infrastructure that enable sustained lunar missions and develop capabilities for Mars. The planning for this next phase is possible now that Orion and the Space Launch System are about to perform their initial missions together, the initial Gateway elements are in design and production, and the set of regular lunar robotic landing missions from a diversity of countries and companies has begun. Each mission to the lunar surface, both crewed and robotic, offers the opportunity to demonstrate new technologies and operations. These new technologies and operations enhance exploration and scientific discovery, mature those same capabilities for Mars, and build upon previous missions.

This paper will discuss a conceptual exploration architecture that builds capability over time for sustained infrastructure for lunar and Mars exploration. Because this infrastructure is a key aspect in supporting sustained science operations and a budding in-space economy, the focus of the architecture development will be on key systems, technologies, and solutions that can enable the Artemis missions, provide the basis for a lunar economy, and build capability for crewed Mars missions within the next two decades. The paper will discuss a conceptual lunar architecture that can be developed to adapt from supporting the initial phase of the Artemis program that emphasizes science and mobility to a phase of the Artemis program that emphasizes sustained presence and Mars mission support. The transition to a Mars architecture will be explored, and how these systems developed for the Moon will be key for the Mars architecture. The paper will also provide an update to the Mars Base Camp mission concept for crewed orbital and surface exploration of Mars.