

20th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Human Exploration of the Moon and Cislunar Space (1)

Author: Ms. Kathleen Coderre
Lockheed Martin Corporation, United States

Mr. William Pratt
Lockheed Martin Space Systems Company, United States

Mr. Timothy Cichan
Lockheed Martin Corporation, United States

Ms. Danielle Richey
Lockheed Martin (Space Systems Company), United States

INTERNATIONAL, SCIENTIFIC, AND COMMERCIAL OPPORTUNITIES ENABLED BY A
CISLUNAR SPACE PORTAL

Abstract

NASA's stated exploration goal is to land humans on the surface of Mars. Using cislunar space as a testbed to develop technologies and operational knowledge is a critical stepping stone on the path to Mars. NASA and the international community are developing the next generation of advanced habitation systems which will be tested in cislunar space, allowing astronauts to work in deep space for prolonged periods of time and gain the experience necessary to endure long duration trips to Mars. While the primary objective of the cislunar space portal is to support the development of deep space habitation technologies and the construction of a Mars transit vehicle, this asset could also be available to support a variety of secondary missions, including those involving lunar surface operations. The space portal is evolvable, flexible, and modular and can be used in both an autonomous uncrewed and a crewed mode. There are several classes of cislunar orbits and the mission type will dictate the desired orbit required for the portal. Equipped with solar electric propulsion, the portal would be able to re-position itself within cislunar space to meet the mission requirements. In a supporting role, the portal can provide critical functionality for endeavors such as the European Space Agency's proposed Lunar Village or even commercial mining operations. Because it will possess the ability to host different types of visiting vehicles, the portal can act as a node, or transportation hub, for spacecraft traveling to and from the lunar surface. This also allows it to support the testing of necessary Mars landing technologies (those not requiring atmospheric entry), such as autonomous landing and hazard avoidance. It can also assist with the selection of ground sites for surface and science expeditions, and behave as a communications hub between the Earth or other lunar assets. Depending on its orbit the portal can facilitate communication to assets on the Lunar farside. The portal will be an orbiting laboratory, assisting in the retrieval and curation of lunar samples for later return to Earth for analysis. This complements a Mars forward approach and can be used to test out a human-assisted Martian sample return con-ops, such as those proposed in Lockheed Martin's Mars Base Camp. This paper will focus on these and other operational scenarios to show how a lunar space portal can play a critical role in advancing the exploration objectives of a wide user base.