

21st IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Human Exploration of the Moon and Cislunar Space (1)

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DEMONSTRATING CAPABILITIES FOR MARS EXPLORATION ON THE MOON

Abstract

The U.S. Space Policy Directive of 2017 calls for the United States to lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars. To achieve these goals, NASA is working with commercial and international partners to develop systems and operational approaches that could be tested on the Moon to prepare for Mars missions. NASA's human exploration strategy progresses in phases from the ISS in low-Earth orbit, to a sustained presence in cislunar space and on the Moon, to humans in Mars orbit, and finally humans on Mars. There is a huge jump in the capabilities required between the last two phases: humans in Mars orbit and humans on the surface. These include landing large payloads, surface habitation, extra-vehicular activity and crew mobility systems, in-situ resource utilization, and ascent from Mars to return the crew to Earth. Many of these needed capabilities can be tested first on the Moon to reduce the risk for Mars missions. There are a few challenges, however, in extrapolating from capability demonstrations on the Moon to enabling Mars missions such as greater remoteness, the Mars atmosphere, different gravity levels, and planetary protection. Key technologies, concepts for early demonstration of the required capabilities on the Moon, and potential areas for commercial and international partnerships will be discussed.