

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Advanced Systems, Technologies, and Innovations for Human Spaceflight (7)

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CAPABILITY GAPS AND OPPORTUNITIES FOR FUTURE COLLABORATION

Abstract

In preparation for humanity's return to the Moon, it is important to advance technologies and capabilities that will allow for sustainability on the lunar surface and prepare for human missions to Mars. NASA's deep space exploration plans are part of a continuum of activities utilizing platforms in low Earth orbit (LEO), cislunar space, and the lunar surface to demonstrate advanced technologies, advance operations concepts, and develop countermeasures to lessen the impacts of the space environment and long duration exposure on crews working in space. NASA identifies critical gaps to be addressed to reduce risk as the agency builds towards eventual human missions to the surface of Mars. Teams of discipline experts from across NASA identify capability gaps between the current state of the art and the needs of proposed exploration missions and develop integrated strategies and roadmaps for filling those gaps. These gap identification activities include assessment of platform needs for demonstration and testing of new capabilities. Annual data calls enable to team to iterate on and refine the list of gaps, particularly responding to incremental definition of the Moon to Mars architecture. NASA's partnerships are critical to the continued success of the agency's human exploration plans for deep space. As Artemis missions increase in complexity and frequency, and as a thriving lunar economy evolves in cislunar space and on the lunar surface, the opportunities for international collaboration are increasing rapidly. Through review of the capability gap data and examination of areas with a high number of anticipated gaps, nations, agencies, and entities that wish to collaborate with NASA may be able to identify fruitful areas for future work. This paper will provide an overview of the goals and methodology of the capability gap list development process; outline the most recent list of capability areas in which gaps have been identified; and provide some additional detail around examples of critical capability areas. It will also discuss how potential external partners can stay aware of capability gap data to consider when proposing NASA collaboration.