

22nd IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and
Development (1)

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DEFINING MARS-FORWARD CAPABILITIES OF THE LUNAR GATEWAY SPACE STATION

Abstract

The lunar Gateway is a critical element of deep space infrastructure that provides a long-duration multi-purpose cislunar platform. One of the International Space University Space Studies Program 2024 team projects focuses on identifying potential Mars-forward utilization and technology development of the lunar Gateway space station. Building on an analysis of NASA's Moon to Mars Program objectives, architecture documentation, and Gateway's existing capabilities and requirements, this paper will recommend future missions, operational concepts, and hardware to fill gaps in enabling future human Mars exploration. Areas of assessment include space and human health research needs for Mars missions, ethical and legal considerations for the cislunar environment, sustainability of lunar operations, and commercial opportunities around the Moon. This interdisciplinary team project aims to define Gateway's role in advancing capabilities for sustainable lunar exploration and serving as a springboard for future missions to Mars. The results of this study will inform recommendations to NASA's Gateway Program on leveraging the lunar outpost for Mars and beyond.