

17th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND  
DEVELOPMENT (D3)

Space Technology and System Management Practices and Tools (4)

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TECHNOLOGY CONCEPTS EVALUATION AND CONSIDERATIONS FOR FUTURE LUNAR AND  
CISLUNAR MISSION PLANNING: THE LUNAR GATEWAY CASE**Abstract**

After humans last stepped on the Moon, a great part of the efforts put into space exploration changed their focus into bringing humankind to other celestial bodies that had never been visited before; however, with the recent focus on going back to the Moon by some of the most relevant actors in the space community, it has become necessary to evaluate the current technological needs to achieve such an ambitious goal. One of the proposed solutions is the Lunar Gateway, which aims at serving as a permanent base to resupply future Lunar and Cislunar missions, as well as long-distance missions that will potentially reach Mars.

Similarly to what the International Space Station (ISS) has been offering to date, the Lunar Gateway has been conceived as a permanent spacecraft that would orbit the Moon to offer services to other human and robotic missions, and with the ISS's end of life coming in a near future, it is timely to elaborate on potential areas of focus that could become critical for the Lunar Gateway's operation, as well as unexplored concepts that could enhance or improve the services it aims to provide.

This study aims at providing a comprehensive analysis of lessons learned and future opportunities for Lunar and Cislunar missions design. Taking into consideration concepts such as robot operation and maintenance, Lunar exploration, astronaut activities, safety emergencies, in-orbit servicing, amongst others. The first section of this paper identifies and categorizes potential high value technological and non-technological concepts and ideas for future lunar and cislunar missions, and assigns a level of feasibility to each of them. The following section lists a select number of the most promising concepts and ideas for further research, and formulates an outline, aims, and objectives for a subsequent research phase. Finally, a set of recommendations of potential value to the Lunar Gateway and other future Lunar and Cislunar missions is outlined.