

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 2 (2B)

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LUNAR RESOURCE EXTRACTION AND EXPLOITATION FOR SUSTAINABLE SPACE  
EXPLORATION

**Abstract**

In an age where more and more organisations venture large investments into sustainable utilisation and exploration of celestial objects, this paper proposes a thorough design for a lunar resource harvest and processing mission for human space exploration, commercialisation and long term lunar resource economy. It uses the most recent developments in systems engineering and mission design to demonstrate a profitable and sustainable lunar resource utilisation model.

The international business enterprise includes all necessary components to support a cadre of contractors tasked with supervising the autonomous extraction of profitable lunar resources like titanium, silicon, aluminium and water.

Areas of interest explored in this concept include landing site determination, mission analysis, requirements and systems engineering considerations, in situ resource utilisation techniques, autonomous operations and life support systems. The methodology incorporated uses the principles of model-based systems engineering, single source of truth, performance analysis, and requirement flow down structures within a concurrent engineering approach.

In the analyses presented, the mission proposal evaluates parameters such as economic feasibility, mission design, and identifies risks while also presenting findings on the interfacing needs, constraints, technology readiness assessments, market trends and the motivation for future markets to explore such a mission concept.