

IAF SPACE OPERATIONS SYMPOSIUM (B6)
Mission Operations, Validation, Simulation and Training (3)

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MISSION OPERATIONS TO THE MOON, CHALLENGES OF COST EFFECTIVE LUNAR MISSION
OPERATIONS.

Abstract

Space explorations is witnessing a radical change from the recent past. Budget reductions on national organizations and growing interests of private organizations result in a space program with increasing interest on commercial opportunities. Self-sustainability and profitability are now keywords in the space business. In this direction the Lunar In Situ Resources Utilization (ISRU) is rising interest among agencies. The ISRU program allows the reduction of mass transportation and storage costs, by extracting and manipulating the resources directly in situ, and the Moon represents the closest opportunity to establish a scientific outpost that will later make way to permanent and self-sufficient settlements. ESA called for a Commercial ISRU Mission Preparation Phase A/B1 Study and for technologies demonstrations needed to establish ISRU outposts on the Moon by 2025. Space Applications Services is actively involved in this opportunity, on one side as payload developer and on the other side to perform a study for defining a cost effective lunar mission operations concept. The study is planned to provide its final outcome by the end of 2019, and it is the subject of this paper. Revenue and cost reduction are the key components of the profitability of a project. ISRU missions attract new type of customers that were not looking at space opportunities before. Mining, energy and material manipulation companies are now looking at space opportunities, together with a renewed interest from academic and research organizations. At the same time, new technologies, synergy and re-utilization, and in-house systems take a key role in reducing the costs of mission operations. Today technology allows more automation and the use of Artificial Intelligence. Re-utilization includes the use of Open-Source software, Commercial Off The Shelf (COTS) elements and the synergy with other missions, such as sharing Operations Centre and experienced operators. After a brief introduction to the overall concept of ISRU and the study, the paper will present the outcome of the analysis to achieve a cost-effective operations concept describing the various aspects, including the applicability to smaller and staged missions. It will also address the more general operations challenges and typical cost drivers.