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Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development (1)

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COST AND RISK ANALYSIS OF A EARLY LUNAR BASE CONCEPT BASED ON DIANA INFRASTRUCTURE

Abstract

The Dedicated Infrastructure and Architecture for Near-Earth Astronautics (DIANA) is an autonomously deployable lunar base concept for a long-duration crewed mission on the lunar surface.

DIANA focuses on sustainable use of lunar resources for the development of early and cost-effective lunar infrastructure at the South Pole using In-Situ Resource Utilization (ISRU) technologies. However, the development of a lunar infrastructure is associated with challenges as well as risks, which require international cooperation. The paper presents an evaluation of the feasibility of establishing a permanent human presence on the moon by examining the economic, technical, and safety challenges involved in such a project. The study considers various factors such as the construction of the base, transportation costs, human resource requirements, and the potential risks of operating a lunar base. The research employs a combination of quantitative and qualitative methods to evaluate the costs and risks of the lunar base concept. The results suggest that while a lunar base is feasible, it would require significant investment and long-term commitment. The risks associated with such a project include technological challenges, human factors, and environmental factors. Additionally, the paper considers the various risks associated with the mission, such as radiation exposure, equipment failure, and the isolation of the lunar environment.

Overall, using the DIANA concept as an example, the study provides a comprehensive view of cost and risk analysis involved in planning, construction and operations to bring humans back to the lunar surface for long term exploration, which could be valuable for policymakers and stakeholders considering future space exploration initiatives. Furthermore, this paper will show synergies with infrastructures already in design phase by space agencies and private companies, which could contribute to the realization in the near future.