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Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Technologies (2B)

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BEYOND EARTH: A MULTIDISCIPLINARY APPROACH TO DEVELOPING SUSTAINABLE LUNAR OUTPOSTS WITH THE MOSS PROJECT

Abstract

The MOSS Project, developed by students from Alta Scuola Politecnica, represents a groundbreaking

multidisciplinary research initiative aimed at sketching an advanced moon outpost concept. Central to this endeavour is the emphasis on minimizing Earth's dependence through the innovative use of In-Situ Resource Utilization (ISRU), particularly focusing on the comprehensive utilization of lunar regolith. This project brings together aerospace and materials engineers, interior designers and architects to delve into the potential of lunar materials, developing an infrastructure that is sustainable, resilient, and scalable for satellite colonization. The research has yielded a technological roadmap highlighting processes that leverage ISRU without resorting to energy-intensive techniques, thereby filling a significant gap in the current literature regarding lunar logistical structures and spaceport manufacturing and operations. The team conducted an extensive geomorphological survey of the selected site and performed an in-depth material analysis of the lunar regolith to assess its integration with smart technologies, aiming to enhance the Technology Readiness Level (TRL) of ISRU techniques. This comprehensive approach has led to the architectural conceptualization of the moon infrastructure, encompassing self-locking landing pads, shielding walls and protective regolith shells designed to safeguard against radiation. By advancing these innovative methodologies and architectural designs, the MOSS Project aims to establish a blueprint and set criteria for future spaceports beyond Earth, thereby significantly contributing to the field of aerospace engineering and the broader quest for sustainable human presence on the Moon.