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Systems and Infrastructures to Implement Future Building Blocks in Space Exploration and Development (2)

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O'MOON: SYSTEM- AND PROGRAMME-LEVEL FEASIBILITY ANALYSIS FOR A MODULAR POWER INFRASTRUCTURE ON THE MOON

Abstract

While no manned missions have gone beyond Low Earth Orbit since the end of the Apollo program, recent years have seen a renewed interest in manned exploration, and in permanent settlements in space. Companies and space agencies from around the world are now trying to reach the Moon again, with the aim of establishing a permanent presence. Notable examples include ESA's Moon Village proposal and the numerous private teams competing in the Google Lunar X Prize.

A permanent lunar presence through a Moon base would face challenges unlike those faced by current missions. One key challenge will be its power requirements, higher than those of any previous mission.

The O'Moon project aims to enable the production of electrical power needed for such a base. It aims to provide one of the building blocks needed for lunar colonization by designing a deployable autonomous solar module. These modules will be used to rapidly build an electrical infrastructure on the lunar surface to provide the power for future missions, bases and colonists. These modules are based on a deployment system which makes them compact when folded and, once on the lunar surface, allows them to fold and unfold their solar panels autonomously and at will. They are equipped with batteries, which allows them to operate during night periods and to store electricity to power the base, vehicles or robotic probes. They can also be interconnected to create a smart micro-grid which increases the power generated and the reliability of the network by introducing high levels of redundancy.

This paper provides a feasibility analysis of the electrical infrastructure proposed by O'Moon. It includes considerations of the engineering, business and legal aspects of this project. In doing so, this paper proposes a systems engineering design of the O'Moon generator as well as a vision of their use within a wider program by considering their applications, their sources of funding and revenues, and the legal context surrounding them.

Ultimately, this paper aims to assess the feasibility of the O'Moon concept but also to propose solutions to the key challenges it faces. It aims to enable further work to be conducted on this concept towards the

construction of this lunar electrical infrastructure. This paper is supported by a series of more extensive, detailed and technically-focused studies centered on some of the key aspects of the project.