

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 1 (2A)

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OFFWORLD'S CESLESTIAL AND TERRESTRIAL SWARM ROBOTIC AND ISRU SYSTEM

**Abstract**

Introduction: OffWorld is building millions of smart robots working on the human supervision on earth and in space, turning the solar system into a habitable place for life and civilization.

Mission: In order to sustain expansion we need to be able to manufacture basic structures and solar cells so that we can produce unlimited power. Ultimately, these systems will need to replicate themselves for rapid and economic expansion. In order to do this, we need to emulate the entire infrastructure value chain from mining, processing, fabrication, assembly and construction. However, we cannot just export current Earth-based practices and technology. We must reinvent how we undertake these processes here on earth, and transfer them directly to the expansion of civilization into the solar system.

Program: In 2023 OffWorld Europe has undertaken extensive Research and Development in the field of processing regolith and operating robots in the extreme environment of the Moon. The objective is the establishment of an end-to-end collaborative robotic system comprising of hundreds or thousands of multi-species robots working together with internal and collective autonomy to achieve strategic objectives.

Offworld is developing these systems first here on Earth with the ongoing input of mining industry expertise on a daily basis. OffWorld has been developing a task agnostic machine learning framework to address and optimize any industrial process. This revolutionary approach to minimally supervised autonomy ushers in a new era of remote operations in extreme environments such as the Lunar or Martian surface. We are already developing the first suite of machine learning agents and building on this platform to include an ISRU regolith processing unit developed in Luxembourg.

OffWorld will present updates on its growth as a company as well as the ISRU technology program which includes six distinct processes from volatile extraction to separation. Each process is envisioned as a stand-alone function within an autonomous robotic platform.

Our subsequent goals in near-Earth space for the expansion of this modular toolkit are to enable the formation of in-space vehicles, transport, depots and facilities, and orbital workshops for the autonomous recovery and re-utilization of space debris as a resource. Once our machine intelligent robotic system has mastered lunar surface and in-space operations, we will expand their utility to near Earth asteroids and the Martian surface, leveraging lessons learned to enable the expansion of humanity into the solar system.