SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

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RESOURCE PROSPECTOR MISSION TO THE MOON

Abstract

The Resource Prospector Mission (RPM) is a cost-constrained in situ resource utilization (ISRU) technology demonstration mission under study by the Human Exploration and Operations Mission Directorate's (HEOMD's) Advanced Exploration Systems (AES) Division. The mission, currently planned to launch in 2018, will demonstrate extraction of oxygen from lunar regolith to validate ISRU capability. The mission will utilize the RESOLVE Payload, developed under AES with early risk reduction supported by STMD. RPM will address key Strategic Knowledge Gaps (SKGs) for robotic and human exploration to the Moon, Near Earth Asteroids (NEAs), and ultimately Mars.

While RPM is not a science-focused mission, it is intended to conduct activities to characterize the conditions of representative exploration environments, identify hazards, and assess resources to enable future human exploration. RPM will provide knowledge to inform the selection of future destinations, support the development of exploration systems, and reduce the risk associated with human exploration. Expanding human presence beyond low-Earth orbit to asteroids and Mars will require the maximum possible use of local materials, so-called in-situ resources. The moon presents a unique opportunity to conduct robotic investigations that advance ISRU capabilities without additional challenges of distance from Earth resulting in extended cruise phases and communications lag times. The moon provides significant exploration and science value as the lunar regolith contains useful resources such as oxygen, water, silicon, and light metals, like aluminum and titanium. Oxygen can be separated from the regolith for life support (breathable air), or used to create rocket propellant (oxidizer). Regolith can be used to protect against radiation exposure, be processed into solar cells, or used to manufacture construction materials such as bricks and glass. The RPM would characterize the constituents and distribution of water and other volatiles at the poles of the Moon, enabling innovative uses of local resources, in addition to validating ISRU capabilities. This capability, as well as a deeper understanding of regolith, will be valuable in the exploration of near-Earth asteroids (NEAs) and Mars.

The proposed paper will provide a mission concept overview and status current mission planning.