Low-Cost Commercial ISRU Flight Demonstrator – MINER

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While the production of oxygen, water, and propellants on the Moon from in-situ resources holds great promise for reducing the cost and risk of robotic and human exploration, NASA mission architects and planners are hesitant to rely on this ability for mission success until it has been adequately proven to be cost effective and technically achievable. One way to gain confidence in this new approach to exploration, known as In-Situ Resource Utilization (ISRU), is to perform subscale demonstrations on robotic precursor missions to verify critical processes and steps involved in in-situ processing, as well as verify critical engineering design factors to allow confidence in finalizing the full scale system design (ex. forces exerted in excavation, time and energy required to extract resource, etc.). NASA has performed several recent preliminary assessments relative to a possible oxygen extraction from regolith demonstration on the lunar surface. The project, entitled: Mini-ISRU Nodal Evaluation of Regolith (MINER), is aimed at leveraging past and current Mars robotic science exploration hardware with on-going lunar ISRU volatile and oxygen extract from regolith development to create a low mass and low power ISRU demonstration package. The concept is to leverage commercial capabilities and international partnerships with NASA in an effort to lower the cost of the demonstration(s) and potentially led to commercialization of oxygen production on the Moon. A costing analysis was performed to quantify the financial value of producing oxygen at the lunar surface (ISRU) for a lunar Outpost versus the cost of transporting the oxygen from Earth-to Moon for both life support and early propulsion needs. A second assessment was to performed to determine initial mass, power, and volume estimates for an subscale ISRU demonstration that heavily leverages past and current hardware designs. A brief summary of the costing assessment and demonstration sizing study will be presented.