

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Trey Clinton
Made In Space, Inc., United States

Mr. Justin Kugler
Made In Space, Inc., United States

REDWIRE: MANUFACTURING LUNAR SURFACE INFRASTRUCTURE

Abstract

Redwire is a new leader in mission critical space solutions and high reliability components for next generation space systems and infrastructure. With decades of flight heritage combined with the agile and innovative culture of a commercial space platform Redwire is uniquely positioned to deliver end-to-end solutions to meet the needs of our customers and advance the future of space exploration. A key phase of NASA's Artemis plan is creating lunar infrastructure for future exploration missions to the surface. Upcoming civil and commercial missions to the lunar surface benefit from development of construction technologies by unlocking the ability to manufacture necessary infrastructure at the point of need. New technologies must harvest and rely on available raw materials for manufacturing and construction. Building lunar infrastructure will depend on local manufacturing. Redwire has developed new space manufacturing methods and technologies, leveraging valuable spaceflight heritage from the company's payload portfolio on the ISS. These capabilities include: metals manufacturing, recycling, self-repairability, and in situ resource utilization (ISRU) technologies that will enable critical surface infrastructure such as stable foundations, habitats, radiation protection, hangars, barriers, support structures, and even launch pads. Additional applications ranging from enhanced communications architectures, power generation and transmission, repetitive landing at the same location, large scale production of oxygen and water, and human habitation infrastructure are unlocked Redwire's suite of technology. Redwire has also developed a suite of essential ISRU manufacturing tools and testing critical subsystems for the lunar surface to illuminate a path towards the construction of permanent human presence outside of Earth. These technologies include regolith fused filament fabrication, microwave sintering, and welding as baseline approaches for the construction of sustainable lunar architectures. Regolith printing combines proven Redwire techniques for additive manufacturing in low gravity and vacuum environments. This process of local resource utilization significantly reduces the total mass transported from the Earth when establishing surface infrastructure on the Moon. The manufacturing processes chosen are based on their applicability to small, medium, and large-scale construction activities. The Redwire family has extensive experience in space optimized technology and was selected as a prime contractor eligible to bid on lunar payload delivery. The expertise is applicable to lunar regolith sample return efforts, including development of single-mission architecture capable of accessing multiple surface locations.