

USING THE RESOURCES OF THE MOON TO CREATE A PERMANENT, CISLUNAR SPACE FARING SYSTEM. P. D. Spudis¹ and T. Lavoie², ¹Lunar and Planetary Institute, 3600 Bay Area Blvd., Houston TX 77058 spudis@lpi.usra.edu ²NASA Marshall Space Flight Center, Huntsville AL 35812 tony.lavoie@nasa.gov

We have previously described an architecture that extends human reach beyond low Earth orbit by creating a permanent space transportation system with reusable and refuelable vehicles [1]. Such a system is made possible by establishing an outpost on the Moon that harvests water and produces rocket propellant from the ice deposits of the permanently dark areas near the poles. Our plan is affordable, flexible and not tied to any specific launch vehicle or family of vehicles. Robotic assets are teleoperated from Earth to prospect, demonstrate and produce water from local resources. These robots are launched separately over several years, allowing the program to be implemented under constrained and uncertain funding conditions. In addition, the stepwise, incremental approach encourages and facilitates international and commercial participation. Humans arrive only after we have begun water production. Once there, the human mission begins to explore the potential for possible, practical, and affordable use of regolith for material production for outpost sustainment and growth. Consistent with the overarching goal to see if we can learn how to live off-planet, another objective of human activity on the Moon will be the experimentation of biological systems and their interaction and performance in the lunar environment. Our arbitrarily defined end stage is a fully functional, human-tended lunar outpost producing 150 metric tonnes of water per year – enough to export water from the Moon and create a permanent, extensible reusable transportation system that allows routine access for people and machines to all points of cislunar space. This cost-effective architecture advances technology and builds a sustainable space transportation infrastructure. By eliminating the need to launch everything from the surface of the Earth, we fundamentally change the paradigm of spaceflight. This lunar outpost serves as the vanguard for studying the practical employment of techniques, processes, and systems that allow humanity to effectively extend its reach off-planet.

Reference [1] Spudis P.D. and Lavoie T. (2011) An affordable lunar return architecture. *Space Manufacturing* **14**, NASA-Ames Research Center, October, 2010, in press.