Paper ID: 88406
oral

22nd IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Systems (2A)

Author: Mr. John Scott
National Aeronautics and Space Administration (NASA), United States

"...AND FOR THE PRECIOUS THINGS PUT FORTH BY THE MOON" - TOWARD INTEGRATED FOUNDATIONAL INFRASTRUCTURE IN CIS-LUNAR SPACE

Abstract

The establishment of cis-lunar foundational infrastructure is critical for creating a vibrant space economy around and on the Moon. Of primary importance to enabling large scale industrial activity is infrastructure for communications, navigation, and power. This infrastructure must provide such diverse services as communications from and among vehicles, modules, experiments and astronauts on the Lunar surface, precise location of all of these (as well as of craft in cis-Lunar space), energy storage, and power distribution and generation. Such infrastructure will spread throughout and outward from the initial outpost of the Artemis Program near the South Pole and also from communications/navigation/power nodes in Lunar orbit. The demand for these services may ultimately grow as industrialization spreads toward the Lunar Equator.

NASA's Space Technology Mission Directorate and its Lunar Surface Innovation Consortium (LSIC) are tasked with supporting the development of the technological building blocks needed by industry to create this infrastructure and with coordinating the demand signals necessary to attract private capital toward its creation. These building blocks must be reliable and durable for a decade or more in the cis-Lunar surface thermal, dust, and radiation environment. The highest priority building blocks include: nuclear fission, solar, and radioisotope power generation, suites of maintainable power management and avionics circuits, power transmission cables, optical power and communications beaming, and regenerative fuel cell and battery energy storage operable at the cryogenic temperatures of the permanently shadowed regions. NASA is supporting industry in creating the intellectual property necessary for these building blocks through a range of contractual and partnership vehicles, and the LSIC is coordinating the broad community in identifying demand signals.

This paper provides a high-level overview of NASA's plans for the development of foundational infrastructure in cis-Lunar space, a description of the state of the art, capability goals, technical challenges and gaps, and thoughts on partnerships with industry and government agencies towards developing a robust foundational infrastructure to support a Lunar economy.