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SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development (1)

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LUNAR STATION: THE NEXT LOGICAL STEP IN SPACE DEVELOPMENT

Abstract

The International Space Station (ISS) is the product of the efforts of 16 nations over the course of several decades. It is now complete, operational, carrying out a wide variety of research and technology development experiments, and starting to produce some pleasantly startling results. The ISS has a mass of 420 metric tonnes, supports a crew of 6, within a pressurized volume of 916 cubic meters. Its solar arrays produce up to 84 kilowatts of power. In the course of developing the ISS, many lessons were learned and much valuable expertise was gained. Where do we go from here?

The ISS offers an existence proof of the feasibility of sustained human occupation and operations in space over decades. It also demonstrates the ability of many countries to work collaboratively together on a very complex project in space over an extended period of time to achieve a common goal. By harvesting best practices and lessons learned, the ISS can also serve as a useful model for exploring concepts beyond Low Earth Orbit.

This paper will explore the concepts for and the feasibility of a Lunar Station. The Station concept can be implement by either putting the equivalent capability of the ISS down on the surface of the Moon or developing the equivalent capabilities through a combination of delivered materials and equipment and in situ resource utilization. Scenarios that leverage existing technologies and capabilities as well as capabilities that are under development and are expected to be available within the next 3-5 years, will be examined. This paper will explore how the lessons learned and expertise gained from developing the ISS can be applied to reducing the cost and time required to develop the lunar equivalent.

In addition to technical feasibility, this paper will also examine the organizational, legal and business realities and options that must be addressed to reach a successful conclusion. The potential uses of such a facility will also be examined, including: scientific exploration, resource prospecting, mining and resource extraction, low gravity research, development and manufacturing, tourism, astronomy, earth observation, in-situ resource utilization (ISRU), additive manufacturing using lunar materials and cryogenic research in the permanently shadowed craters.

The paper will describe a set of options for developing the Lunar Station in the shortest time for the lowest price and most acceptable risk.