HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
Enablers for the Future Human Missions (7)

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CONCEPT FOR INCORPORATING SUSTAINABILITY ATTRIBUTES EARLY IN THE ISECG HUMAN LUNAR EXPLORATION REFERENCE ARCHITECTURE

Abstract

In July of 2008, the members of the International Space Exploration Coordination Group (ISECG) – a voluntary, non-binding international space *coordination mechanism*, agreed to collectively explore ideas and plans for human exploration of the Moon as a first step in jointly defining objectives and mission scenarios, with the goal of defining a global reference architecture for human Lunar exploration by mid 2010. In support of this effort, a Campaign Integration Team and a number of Function Teams were established by the ISECG under the auspices of an International Architecture Working Group (IAWG), consisting of representatives of interested space agencies, to define the purpose, critical functions and technologies, incorporating strategic guidelines, and hardware elements needed to meet the goals and objectives for human exploration of the Moon established by the ISECG. Key objectives and strategies established at the start of developing the global reference architecture were to maximize opportunities for early partnerships, emphasis 'extreme' mobility exploration concepts, enable Mars Forward technologies and approaches, enable Science in an opportunistic way, and to introduce aspects of 'Sustainability' as early as possible into lunar exploration elements and operations. While the term 'Sustainability' can be broadly defined and interpreted, for this paper it includes attributes such as improvement in performance and capability, improvement in reducing risk to mission and crew, reduction in cost, and reduction in dependence on Earth supplied logistics and infrastructure continually over time as human exploration expands in scope and destinations. While a lunar Outpost will have the infrastructure necessary to establish closed-loop air and water cycles for life support, large scale In-Situ Resource Utilization (ISRU) to supplement life support and support reusable transportation elements, and nuclear reactors or large reactant depots for fuel cell night time power generation, there are significant challenges manifesting and powering the systems needed to perform these tasks in early highly-mobile human exploration mission scenarios. This paper will examine concepts proposed by the Habitation, ISRU, and Power Function Teams for modular systems and integration that could reduce launch mass and logistics, reduce development and life cycle costs, and increase robustness and flexibility for maintenance, evolution, and partnership/commercial involvement in all three of these areas, while at the same time demonstrating capabilities and hardware that would reduce the risk for full-scale implementation for a lunar Outpost.