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HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Utilization & Exploitation of Human Spaceflight Systems (3)

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DEEP SPACE COMMONALITY AND STANDARDS CONCEPTS

Abstract

Human space exploration beyond low Earth orbit will involve the cooperative effort of multiple space agencies and industry partners. Given the wide range of hardware designs and philosophies, c lose international cooperation will be a critical enabler for future success. Designing systems with commonality in mind can reduce sparing, increase integration, provide more reliability and lower cost. Commonality will become increasingly important as transportation costs rise dramatically with distance beyond low Earth orbit and space exploration budgets remain constrained. Early discussion and development of exploration systems standards will provide a firm basis for future design and production of deep space vehicles.

Building on previous years discussions of interoperability, this paper examines possible sources and processes for deep space standards. The importance and value of voluntary standards is discussed. While commonality could be accepted as a common goal among the partners, the process to achieve consensus will be critical for success. The advantages of implementing common standards for design and utilizing common hardware and spares are presented. In particular, a novel scheme for the production of large scale common assemblies is shown that emphasizes development of common building block elements rather than reusing heritage space systems. Defining common standards for deep space exploration is an important step towards realizing the advantages of commonality for upcoming cooperative exploration vehicles. Areas for standards and commonality include docking/berthing systems, secondary structure and outfitting, passive navigation aids, IVA/EVA tools, data/power standards, robotic grapple fixtures and inter-module cables/tubing.

A good example of developing these types of standards is the International Docking System Standard (IDSS). Since the latter part of 2009, efforts have been made to create an international docking standard to ensure that all space vehicles docking/berthing mechanisms could be compatible. The IDSS is an international endeavor by a cooperative team from the NASA, the Russian Space Agency (RSA), the Japan Aerospace Exploration Agency (JAXA), the Canadian Space Agency (CSA), and the participating member countries of the European Space Agency (ESA). The IDSS charter is to define the major interfaces for future docking systems. This effort is not for developing a design of a docking system, but instead is for defining the interfacing features and requirements for docking system designers to use to ensure compatibility with other Agencies' and companies' mechanisms. Lessons learned from this activity based on actual implemented docking system design have provided important guidelines for future standards development.