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Author: Mr. Matthew Duggan
The Boeing Company, United States

Mr. Takashi Nakamura
Mitsubishi Heavy Industries, Ltd., Japan
Mr. Mitsutoshi Tsujioka
Mitsubishi Heavy Industries, Ltd., Japan
Mr. James Engle
The Boeing Company, United States
Mr. Kevin Post
Boeing, United States

COOPERATIVE STUDIES FOR SPACE EXPLORATION

Abstract

The international space community is continuing to discuss the future of human space exploration, just a few years before the first flight of the Space Launch System that will carry humans beyond low Earth orbit. Exciting proposals from stakeholders around the world drive interest at commercial and governmental levels. The International Space Station program has demonstrated the great things that can be achieved through cooperative effort and that international participation often brings unique benefits. Future space exploration, whether in low Earth orbit or deep space, will likely continue to be a combined effort of nations around the world. MHI and Boeing believe that international cooperation is key to successful deep space exploration and undertook a joint study to investigate and evaluate areas of common interest including collaborative architecture studies and the use of HTV-X for deep space logistics resupply. This paper will describe the status and early conclusions from these joint studies.

Mitsubishi Heavy Industries (MHI) and Boeing are studying subsystems that are expected to be common among international partners for a cislunar habitat and architecture. Common systems and interfaces offer benefits including lowered cost, lowered resupply/sparing burden and greater redundancy. The key systems identified as benefitting the most from commonality and preliminary implications and conclusions are presented in this paper. Mitsubishi and Boeing are also performing a collaborative study to assess and analyze potential modifications to the HTV-X, JAXA's next generation cargo vehicle, for applications in cislunar resupply missions. The study combines Mitsubishi's knowledge of HTV-X with Boeing knowledge of cislunar architectures, mission design and potential logistics requirements. In the paper, the authors explore the requirements for a lunar resupply mission based upon various mission design alternatives. HTV-X systems trades and configuration options are discussed with regards to evolving the HTV-X into a lunar capable vehicle; additionally, multiple launch vehicles are investigated as possible