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CONSIDERATIONS FOR NOMINAL OPERATIONS IN DEEP SPACE ORBITING ARCHITECTURES

Abstract

Deep Space Gateway (DSG) has given the community an opportunity to assess and develop deep space orbiting architectures. While much is known about nominal operations in low earth orbit, deep space architectures present their own challenges due to the unique requirements that revolve around uncrewed and crewed periods. Logistics supply models are challenged, and "traditional" reference architectures undergo another level of scrutiny because of the constraints placed on systems. Environmental Control and Life Support Systems (ECLSS) are particularly challenged because limitations on mass, and volume appear early and often. As a result, efficiencies are sought in the system architecture through shared functionality, and a reach for enhanced reliability through systems that have been used in previous missions. As such, DSG has wisely taken the approach to share functionality with systems within the overall Artemis mission. However, after development and review of the nominal concept of operations, several challenges have been illuminated. These challenges have subsequently created openings for other designs that may have an overall benefit to the system in terms of reliability and ultimately cost. This paper focuses on shared functionality between Orion and DSG, and how the sensitivities were evaluated to find an optimal solution. While the focus of the paper will be on the specific shared functionality, a broader discussion of deep space orbiting architectures will be presented through the perspective of ECLSS subsystem managers.