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Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and Development (3)

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CRITICAL ASSESSMENT OF IN-SPACE ASSEMBLY AND MANUFACTURING VIABILITY AS APPLIED TO NEW MISSIONS

Abstract

In-Space Assembly and Manufacturing (ISAM) is a potential game-changing technology that promises to expand horizons to build what has historically been too large or even too fragile to be launched into space. While this potential has been acknowledged by many, there has not been a critical assessment of which space applications ‘win out’ for ISAM over traditional methods and why. The business case must be better understood – which applications of ISAM technology can be acknowledged as better, faster, or cheaper than traditional build on earth and launch architectures?

In this study, we bring discipline to the ISAM conversation by conducting a technical application study to assess economics, performance, and unexplored parameters that will ultimately govern the success and economic viability of future ISAM applications. This study sets up the decision making process to frame this complex question and explores motivating questions that dictate which mission applications are well-suited for ISAM.

This study evaluates the applicability of ISAM over current techniques for potential future missions that have not yet been placed under critical review – telescopes, antennas, truss structures, and the like. Doing so will add credibility to ISAM as an approach and provide data to help make informed decisions.

We introduce the decision making process for the evaluation of ISAM applicability to new missions as a high-level flow chart. This process allow the characterization of missions for which this technology clearly applies and where it does not. Ultimately, this decision making process serves as a tool to help mission designers begin to make informed decisions about the practical viability of ISAM technology for new missions.