

BUSINESS INNOVATION SYMPOSIUM (E6)  
Innovation, Entrepreneurship & Investment: The Microscopic Perspective (1)

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IN-ORBIT SPACECRAFT MANUFACTURING: NEAR-TERM BUSINESS CASES

**Abstract**

The recent developments in space commercialization and the entry of new private entities of various size has re-opened the question of in-space manufacturing. This paper examines the viability of a broad set of initial use cases for in-orbit manufacturing around the Earth in particular, involving technologies that can be developed within 3-5 years. These include large aperture spacecraft or components, components for traditional satellites, standards-based components and nanosatellites such as cubesats, and serial production commercial satellite use cases among others. The definition of manufacturing extends to any activity involving some or all of three main parts of the value chain including fabrication, assembly, and integration. It also covers cases where testing, deployment, maintenance, repair, upgrades, recycling, and re-deployment have significant inclusion related to the mentioned areas. Pre-fabrication and 3D printing of components in orbit are considered across a number of sub-systems, including solar panels, support structures and truss elements, communication antennae, mirrors, radiation panels and other thermal components, propulsion and fuel elements, and standardized electronics, among others. A classification, evaluation, and selection methodology is provided. The initial broad set of use cases is analyzed and filtered based on factors such as technical feasibility, technology readiness level, potential market, costs, trade-offs and alternatives, and long term use case sustainability. The resulting short list is treated to a preliminary high-level business case analysis and existing project case studies are examined. The prioritized business cases are focused on: 1) antennae, and trusses for low earth orbit (LEO) smaller nanosatellites and serial production spacecraft, and 2) solar panels for geostationary orbit satellites. Lastly, recommendations on the prospects for further investigation are provided with the key one being to further develop further the preliminary business cases into true business cases down to return on investment aspects.