20th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Interactive Presentations - 20th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (IP)

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IN-SPACE MANUFACTURING - 2022 INDUSTRY SURVEY AND COMMERCIAL LANDSCAPE

Abstract

New in-space economy fields are emerging. Research in microgravity for in-space manufacturing (ISM) has been active for decades, but continuous production of profitable products is still a nascent industry. Numerous commercial space stations, free-flying platforms and small re-entry capsules have been announced in the last year with the goal to expand the field. Factories in Space (www.factoriesinspace.com) is the largest public and non-profit database of commercial entities in the emerging in-space economy and microgravity manufacturing fields. The directory was started in 2018 and has over 450 entries.

In-Space Manufacturing (ISM) divides into two larger categories. First is ISM for space, which involves companies active in the in-space assembly and in-orbit construction of structures and services that will remain for use in space or on planetary surfaces. Second is ISM for Earth, which includes new materials and products that have better properties when made in microgravity and which are primarily sent to Earth for utilization in the terrestrial markets. In parallel to them, various enabling and supporting service providers exist for transportation, orbital platforms, space utilities and raw resources.

First part of the paper will focus on defining what in-space manufacturing entails and establish classification to group the commercial entities. Literature review has been performed to assist with the definition and taxonomy. After filtering the database by in-space manufacturing activities, the remaining key players will be listed for overview purpose as the survey of the supply chain and to demonstrate existing opportunities for downstream customers.

Second part of the work will include the first statistical insight of which types of companies are or aim to become active in the emerging in-space manufacturing and related fields. Within the classifications, comparisons will be made between products, development status, geographical distribution and funding where available.

Last third of the research will take a further look into a few selected ISM markets. Many reports have been produced about the market analysis of various in-space manufacturing products and enabling services, which will be referenced and discussed.

New profitable and sustainable economic activities in space have the potential to speed up space technology development and the rate of activities, which would also greatly benefit human and robotic space exploration thanks to multi-use systems. To authors' knowledge, such industry surveys of in-space manufacturing have not been published before.