

Manufacturing in Space: Where are we? What needs to be done?

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The ability to manufacture spacecraft and associated hardware in space is expected to bring significant transformations to a wide range of space activities.

By alleviating launcher fairing size limitations and launch load structural requirements, on-orbit manufacturing and assembly can allow to achieve larger spacecraft components (e.g. antennae reflectors, solar arrays, radiators) thereby enabling higher performance, higher power available for payloads and lighter structures, while reducing the launch costs. These benefits can enhance mission scenarios for various applications, including Telecommunications, Earth Observation, Navigation and Science.

In addition, on-demand production of the required tools and hardware can be achieved through in-situ manufacturing and recycling capability, in the context of long-term Exploration missions.

The identified benefits on in-space manufacturing are dependent on the development of manufacturing and assembly technologies able to produce the targeted parts and structures in the challenging space conditions. Depending on the application case, the manufacturing systems and processes would need to be operated in microgravity, either in a controlled environment, such as for producing items inside an orbital station or in an uncontrolled environment, for instance for the production of spacecraft parts on orbit.

The presentation proposes to map the achievements already reported and the resulting capabilities already demonstrated for in-space manufacturing, in an international context.

Based on identified application cases, the remaining technology gaps will be presented, to help support the formulation of potential directions for future technology developments.