

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Innovative Systems toward Future Architectures (1)

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EFESTO: A MODULAR SPACE FACTORY TO ENHANCE SUSTAINABILITY AND OUTPOSTS
AUTONOMY

Abstract

The last decades have witnessed a renewed emphasis on space activities and it has become increasingly evident how the capability of operating in space represents a strategic value for applications both on Earth and beyond. As a result, the number of launches per year is growing, thus a paradigm shift is necessary to ensure the long-term sustainability of space exploration sustainable, paving also the way for future autonomous outposts around the Earth or the Moon, or even on the lunar surface.

Space actors are currently looking for innovative ways to meet the new technological challenges with the increase in demand of space assets and the limitations of launchers. Indeed, up to now, all the structures in space are dependent on several constraints primarily related to the launch systems, which affect cost, volume and mass. Performing part of the manufacturing assembly processes directly in space rather than on Earth could be a possible solution to avoid or minimize this issue.

The capability to launch single components of a large structures and robotically assembly them in space would open new avenues as it allows the assembling of large space infrastructures including habitats, large telescopes and platforms that could not be launched in assembled configuration. At the same time, the fabrication of components in space would eliminate the need to launch different items (including contingency components) in advance and it also allows the production of monolithic large structures.

The concept of a factory in space has been investigated within the frame of Italian PNRR initiative MICS Made in Italy Circolare e Sostenibile by a partnership between industry and universities. EFESTO

- Enhanced Factory for Extraterrestrial Space Technology Operations – aims to be a factory in Low Earth Orbit, able to provide the whole production chain of new components and large space infrastructures, from the recycling of waste to the final in-situ assembling and deployment. The study has been carried out through MBSE methodology with the goal of identifying the main building blocks of the platform and the related enabling technologies, also taking into consideration the circularity and supply chain aspects.