

IAF SPACE OPERATIONS SYMPOSIUM (B6)
Innovative Space Operations Concepts and Advanced Systems (2)

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ON-ORBIT OPERATIONS FOR SUSTAINABILITY

Abstract

In the upcoming years, space will become increasingly accessible for mankind, and a significant amount of space private companies will expand their productivity in this crucial sector. The focus of future

space exploitation will be the reduction of costs achievable by improving sustainable systems capable of maintaining high-level performance for an indefinite time.

Because the main cost of current space missions is related to propellant consumption, the need for in-orbit services has become paramount. The possibility of performing refuelling, assembly, and maintenance directly in a Low Earth Orbit (LEO) could pave the way for improved space accessibility, reducing the amount of fuel needed inside the system at launch, reducing the mass and volume of complex spacecraft, and enhancing the lifetime of orbiting satellites. Moreover, such services could be employed far beyond the Earth's environment, allowing future generations of astronauts to travel through the Solar System, opening a new era in human history where space exploration will play a key role.

In this context, the development of a European commercial space station in LEO will certainly improve the possibility of performing in-orbit operations, serving as the main outpost for maintenance provision, assembly infrastructure, and fuel storage. The relevance of this project is also that the ISS will be abandoned in the future, and a new European commercial space station can constitute the proper heir for its legacy. The main features of such a complex and innovative system have been investigated by our team of students from three different universities (Politecnico Torino, ISAE SUPAERO Toulouse, and Leicester University), within the second-level specializing master's program in Space Exploration and Development System (SEEDS), which is this year in the XV edition. The commercial space station was also designed in collaboration with the Thales Alenia Space Italy (TAS-I) and the Italian Space Agency (ASI).