

Using the ISS to Prepare for Exploration (01)
Exploration Technology Demonstrations Using ISS (2)

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PREPARING FOR HUMAN EXPLORATION – EUROPEAN PLANS FOR USING ISS

Abstract

Through the past years, ESA has been investing in the development of many key enabling capabilities for Human Exploration building further on previous developments from past missions. The ISS is a prime example with European pressurised modules/structures, Life Support, Fault Tolerant computers, Robotics and other critical systems. Other technologies are currently at a lower technology readiness level (TRL) and these would surely benefit from demonstration on the ISS.

Currently ESA is preparing a programme for using the ISS as a test-bed for demonstration of enabling technologies required in elements included in the European Roadmap for Exploration. ESA has issued a Call for Ideas among European industry and academia, to help identify areas which are ready for flight demonstration. There was a large interest in this call and the findings are being used to identify future developments. Specific candidates which are TRL wise ready for flight demonstration foresee the Advanced Closed Loop System (ACLS) for CO₂ removal and O₂ replenishment, ANITA-2 for cabin air trace gas contamination monitoring using infra-red technology and MIDASS for microbial monitoring of air and surface samples. Other systems needing additional design maturity that could be demonstrated at the ISS are under study, e.g. Fuel Cells, Additive Manufacturing, Food Production etc. These demonstrations are all based on European technologies and will help pave the way for long duration, deep space human missions. Several of these will act as precursors and technology demonstrators to validate capabilities which are needed in several strategic areas like life support, habitation, pressurised structures, power systems etc. ESA is investigating how to best use these elements in combination with the ISS.

ESA is also studying several future infrastructure/ architecture elements that could represent European contributions to the Design Reference Missions included in the Global Exploration Roadmap. Some of these elements are associated with future in-space infrastructures in LEO or Cis-Lunar space. The studies will inform the development of a European roadmap for human spaceflight and exploration, aligned with ISECG Global Exploration Roadmap

This paper will elaborate on the topics given above and in particular demonstrate how the intended capability advancements and their demonstration on board ISS are preparing a future European role aligned with the ISECG and European studies on future exploration roadmaps.