

International Space Station as a Testbed for Exploration Environmental Control and Life Support Systems – 2025 Status

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Human exploration missions beyond low Earth orbit, such as NASA’s Artemis Program, present significant challenges to spacecraft system design and supportability. A particularly challenging area is the Environmental Control and Life Support System (ECLSS) that maintains a habitable and life-sustaining environment for crewmembers. NASA is utilizing the experience gained from its current and prior spaceflight programs to mature life support technologies for exploration missions to deep space. The intent is to establish a portfolio of life support system capabilities with proven performance and reliability to enable human exploration missions and reduce risk to success of those missions. As a fully operational human-occupied platform in microgravity, the International Space Station (ISS) presents a unique opportunity to act as a testbed for exploration-class ECLSS, such that these systems may be tested, proven, and refined for eventual deployment on deep space human exploration missions. This paper will provide an updated status on the testbed development, including hardware and ISS vehicle integration progress to date, lessons learned during development and operation, and future plans for efforts to design, select, build, test, and fly Exploration ECLSS on the ISS.

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