HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
Enablers for the Future Human Missions (7)

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ACLS - THE ADVANCED CLOSED-LOOP SYSTEM FOR ACCOMMODATION ON THE ISS

Abstract

The 'Advanced Closed-Loop System ACLS' is a regenerative life support system for closed habitats. With regenerative processes the ACLS covers the life support functions:

(1) Supply of breathable oxygen via electrolysis of water for astronauts, (2) Removal of exhaled carbon dioxide from the spacecraft atmosphere via a regenerative adsorption/desorption process, (3) Catalytic conversion of carbon dioxide with hydrogen to water and methane.

The conversion process reduces the carbon dioxide respectively oxygen loss by a factor of 2 and leads to a significant reduction of water upload to the ISS.

ACLS will be accommodated in a double ISPR Rack which will contain all main and support functions like power and data handling and process water conditioning.

In 2015 the ACLS will be installed onboard the International Space Station (ISS) in the Columbus Module. After an initial commissioning phase ACLS will be operated throughout the ISS extended lifetime as a supplement to the ISS Life Support Subsystem thus enhancing its redundancy.

The technology has been developed since the eighties. The accommodation of ACLS as an ISS ISPR rack facility started in 2003. ACLS is presently in Phase C2 comprised of design development activities supported by testing in support of a system PDR.

The paper summarizes the achieved development status and comprises an outlook on the upcoming ACLS phase C3/D design development and qualification of the ACLS. In addition the concept for ACLS phase E operations onboard the ISS is addressed. Finally, the potentials of ACLS technologies for human and robotic exploration are discussed.