

Life support Challenges for Human Space Exploration (10)
Life Support Technologies and Systems (1)

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DESIGN AND TEST OF AN ATMOSPHERE REVITALIZATION AND ENVIRONMENTAL
MONITORING SYSTEM FOR SHORT AND LONG DURATION MISSIONS

Abstract

Highly reliable, closed-loop life support systems are among the capabilities required for the longer duration human space exploration missions assessed by NASA's Habitability Architecture Team (HAT). The consumables mass savings in addition to the potential lower lifecycle cost that such systems offer can more than offset the mass of the system and its necessary spares, provided that highly reliable operation can be assured. At the same time, for affordability, it is important to minimize destination-specific developments.

For life support, this means that there is the need for flexibility in enabling a safe, affordable, and sustainable human space exploration program. An approach to strategically achieve this necessary flexibility employs a common core architecture with modularity as the key building block of human spacecraft/space habitat systems at the lowest functional level possible. Doing so will provide tangible non-recurring and recurring cost reduction through minimizing destination-specific Design, Development, Test, and Evaluation (DDTE) and sustaining infrastructures. Exploration risk will also be reduced by the accumulation of operational experience with modular and common systems as the exploration framework is incrementally executed.

This paper will summarize NASA's plan to develop and test Atmosphere Revitalization Systems (ARS) and Environmental Monitoring Systems (EMS) that will reduce risk; lower lifecycle cost, and validate operational process design and system architectural concepts for future human missions beyond Earth orbit. The NASA Atmosphere Resource Recovery and Environmental Monitoring (ARREM) for Long Duration Exploration Project objectives and plans will be discussed.