

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

Author: Dr. Daniel Barta

National Aeronautics and Space Administration (NASA), Johnson Space Center, United States

NEXT GENERATION LIFE SUPPORT TECHNOLOGIES FOR HUMAN EXPLORATION MISSIONS

Abstract

Next Generation Life Support (NGLS) is one of several technology development projects sponsored by the National Aeronautics and Space Administration's Game Changing Development Program. NGLS is developing life support technologies (including atmospheric revitalization, water recovery, and space suit life support technologies) needed for humans to live and work productively in space. NGLS has three project elements: Portable Life Support Systems (PLSS), Advanced Oxygen Recovery, and Alternative Water Processing. The selected technologies within each of these areas are focused on increasing affordability, reliability, and vehicle self sufficiency while decreasing mass and enabling long duration exploration. The PLSS project element will focus on the prototyping and testing next generation components including Suit Water Membrane Evaporator (SWME) for long-life heat rejection, Rapid Cycle Amine (RCA) swing-bed ventilation, which will provide integrated carbon dioxide removal and humidity control that can be regenerated in real time during an EVA, and a Primary Variable Regulator (PVR), to significantly increase the number of pressure settings available to the space suit. Current spacesuit pressure regulators are limited to only two settings while the adjustability of the advanced regulator will be nearly continuous. The Advanced Oxygen Recovery element will focus on developing hardware to reclaim increased amounts of oxygen lost from atmosphere revitalization systems. It includes development of low power passive membrane-based recuperators to capture atmospheric moisture from air entering carbon dioxide control hardware and further development of Bosch carbon dioxide reduction hardware to more fully close atmosphere revitalization systems. The Alternative Water Processor efforts will result in the development of a system capable of recycling wastewater from sources expected in future exploration missions, including hygiene and laundry water, based on natural biological processes and membrane-based post treatment. The technologies will support a capability-driven architecture for extending human presence beyond low Earth orbit to potential destinations such as the Moon, near Earth asteroids and Mars.