

Maintaining Adequate CO₂ Washout for an Advanced EMU via a New Rapid Cycle Amine Technology

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Over the past several years, NASA has realized tremendous progress in Extravehicular Activity (EVA) technology development. This has been evidenced by the progressive development of a new Rapid Cycle Amine (RCA) system for the Advanced Extravehicular Mobility Unit (AEMU) Portable Life Support Subsystem (PLSS). The PLSS is responsible for the life support of the crew member in the spacesuit. The RCA technology is responsible for carbon dioxide (CO₂) and humidity control. Another aspect of the RCA is that it is on-back vacuum-regenerable, efficient, and reliable. The RCA also simplifies the PLSS schematic by eliminating the need for a condensing heat exchanger for humidity control in the current EMU. As development progresses on the RCA, it is important that the sizing be optimized so that the demand on the PLSS battery is minimized. As well, maintaining the CO₂ washout at adequate levels during an EVA is an absolute requirement of the RCA and associated ventilation system. Testing has been underway in-house at NASA Johnson Space Center and analysis has been initiated to evaluate whether the technology provides exemplary performance in ensuring that the CO₂ is removed sufficiently enough and the ventilation flow is adequate enough to maintain CO₂ washout in the AEMU spacesuit helmet of the crew member during an EVA. This paper will review the recent developments of the RCA unit, the testing results performed in-house with a spacesuit simulator, and the associated analytical work along with insights from the medical aspect on the testing.

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