

Mini-Membrane Evaporator for Contingency Spacesuit Cooling

Janice V. Makinen, Grant C. Bue, Colin Campbell - NASA JSC

Jesse Craft, William Lynch, Robert Wilkes, Matthew Vogel - Jacobs Engineering

The next-generation Advanced Extravehicular Mobility Unit (AEMU) Portable Life Support System (PLSS) is integrating a number of new technologies to improve reliability and functionality. One of these improvements is the development of the Auxiliary Cooling Loop (ACL) for contingency crewmember cooling. The ACL is a completely redundant, independent cooling system that consists of a small evaporative cooler--the Mini Membrane Evaporator (Mini-ME), independent pump, independent feedwater assembly and independent Liquid Cooling Garment (LCG). The Mini-ME utilizes the same hollow fiber technology featured in the full-sized AEMU PLSS cooling device, the Spacesuit Water Membrane Evaporator (SWME), but Mini-ME occupies only 25% of the volume of SWME, thereby providing only the necessary crewmember cooling in a contingency situation. The ACL provides a number of benefits when compared with the current EMU PLSS contingency cooling technology, which relies upon a Secondary Oxygen Vessel; contingency crewmember cooling can be provided for a longer period of time, more contingency situations can be accounted for, no reliance on a Secondary Oxygen Vessel (SOV) for contingency cooling--thereby allowing a reduction in SOV size and pressure, and the ACL can be recharged—allowing the AEMU PLSS to be reused, even after a contingency event. The first iteration of Mini-ME was developed and tested in-house. Mini-ME is currently packaged in AEMU PLSS 2.0, where it is being tested in environments and situations that are representative of potential future Extravehicular Activities (EVA's). The second iteration of Mini-ME, known as Mini-ME2, is currently being developed to offer more heat rejection capability. The development of this contingency evaporative cooling system will contribute to a more robust and comprehensive AEMU PLSS.