

Abstract

Redesign of the Extravehicular Mobility Unit Airlock Cooling Loop Recovery Assembly

John Steele¹, Theresa Elms², Barbara Peyton³ and Tony Rector⁴
UTC Aerospace Systems, Windsor Locks, CT 06096-1010

Mallory A. Jennings⁵
NASA Johnson Space Center, Houston, Texas 77058

During EVA (Extravehicular Activity) 23 aboard the ISS (International Space Station) on 07/16/2013 an episode of water in the EMU (Extravehicular Mobility Unit) helmet occurred, necessitating a termination of the EVA (Extravehicular Activity) shortly after it began. The root cause of the failure was determined to be ground-processing short-comings of the ALCLR (Airlock Cooling Loop Recovery) Ion Beds which led to various levels of contaminants being introduced into the Ion Beds before they left the ground. The Ion Beds were thereafter used to scrub the failed EMU cooling water loop on-orbit during routine scrubbing operations. The root cause investigation identified several areas for improvement of the ALCLR Assembly which have since been initiated. Enhanced washing techniques for the ALCLR Ion Bed have been developed and implemented. On-orbit cooling water conductivity and pH analysis capability to allow the astronauts to monitor proper operation of the ALCLR Ion Bed during scrubbing operation is being investigation. A simplified means to acquire on-orbit EMU cooling water samples have been designed. Finally, an inherently cleaner organic adsorbent to replace the current lignite-based activated carbon, and a non-separable replacement for the separable mixed ion exchange resin are undergoing evaluation. These efforts are undertaken to enhance the performance and reduce the risk associated with operations to ensure the long-term health of the EMU cooling water circuit.

¹ Engineering Fellow, Hamilton Sundstrand Space Systems International, 1 Hamilton Road, MS 1A-2- W66, Windsor Locks, CT 06096-1010.

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³ Staff Engineer, Hamilton Sundstrand Space Systems International, 1 Hamilton Road, MS 1A-2-W66, Windsor Locks, CT 06096-1010.

⁴ Staff Engineer, Hamilton Sundstrand Space Systems International, 1 Hamilton Road, MS 1A-2-W66, Windsor Locks, CT 06096-1010.

⁵ EMU Subsystem Manager, Crew and Thermal Systems Division, 2101 NASA Parkway/Mail Code: EC5, Houston, Texas 77058.