

DRAFT Oct 30, 2014

Multifunctional Cooling Garment for Space Suit Environmental Control

Abstract submitted for the 45th International Conference on Environmental Systems

Session: ICES402: Extravehicular Activity: PLSS Systems

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Future manned space exploration missions will require space suits with capabilities beyond the current state of the art. Portable Life Support Systems for these future space suits face daunting challenges, since they must maintain healthy and comfortable conditions inside the suit for long-duration missions while minimizing weight and water venting. We have demonstrated the feasibility of an innovative, multipurpose garment for thermal and humidity control inside a space suit pressure garment that is simple, rugged, compact, and lightweight. The garment is based on a conventional liquid cooling and ventilation garment (LCVG) that has been modified to directly absorb latent heat as well as sensible heat. This hybrid garment will prevent buildup of condensation inside the pressure garment, prevent loss of water by absorption in regenerable CO₂ removal beds, and conserve water through use of advanced lithium chloride absorber/radiator (LCAR) technology for nonventing heat rejection. We have shown the feasibility of this approach by sizing the critical components for the hybrid garment, developing fabrication methods, building and testing a proof-of-concept system, and demonstrating by test that its performance is suitable for use in space suit life support systems.