Mechanical/Aerospace Sustainability Project

Heat Transfer for NASA Space Suit & Orion Capsule

Mission Statement

To study the water flow and heat transfer for the next generation space suit, in order to provide NASA with recommendations for a new design's viability, as well as to investigate the thermal load inside the Orion capsule for a post-landing cooling system.

Synopsis

Space Suit - Currently, the space suit heat rejection is accomplished by using a porous plate sublimator. The team investigated using a design that utilizes evaporating water through a hydrophobic, porous Teflon membrane.

The team concluded that the use of a membrane based water evaporator seems like the best solution for extensive extravehicular activity due to its high performance in rejecting heat and it is not sensitive to contamination which gives it a long lasting life time.

Orion Capsule - After the Orion Capsule (OC) lands in the water, the crew must remain alive until a rescue team reaches them. Heat rejection is critical. The team calculated the thermal load inside the capsule due to different factors such as electronic load, metabolic load (astronaut's body heat) and water thermal load. These calculations enabled the team to determinate the exact amount of power needed to cool the capsule to an acceptable temperature.

Cooling is provided by a single-loop propylene glycol fluid loop with a radiator and a fluid evaporator system. The total heat load was calculated to be 6.25 kW. The post-landing requirements are 3.3 kW.

The final report has been submitted to NASA for review.

Tom Boynton	Central CT Sate University
Emily McDermott	University of Harford
Vishal Desai	University of New Haven
Juan Navarro	Fairfield University
Kevin Rosales	Quinebaug Valley CC
Lindsay Strole	University of Harford