



Cool the Force

Overview:

Heat stress is a significant issue that affects the health, safety, and operational performance of the Soldier, Marine, Sailor, Airman, and Emergency Responder. The fundamental issue is their inability to reject metabolic body heat to the environment due to the insulation characteristics of their personal protective clothing. As a result, body heat is stored, core temperature rises and operational performance can become severely impaired. The good news is that Microclimate Cooling (MCC) can mitigate the effects of heat stress by removing excess body heat and reducing body core temperature rise. Operationally, MCC has been shown to significantly increase users' mission duration, improve mental acuity, reduce hydration needs and enhance thermal comfort.

In 2002, NSC completed a three-year effort with the Product Manager Air Warrior to develop a microclimate cooling capability for aircrew in the UH-60, CH-47D, and OH-58D rotary wing aircraft. Studies in a 100°F UH-60 simulator have shown that the microclimate cooling system can extend the mission duration of aircrew in MOPP IV more than three-fold. The Air Warrior Microclimate Cooling System is a liquid circulating system consisting of the Microclimate Cooling Unit (MCU) and the Microclimate Cooling Garment (MCG). The MCU circulates a chilled fluid to the tube lined MCG, which is worn under the uniform layers.

More recently, two near term microclimate cooling solutions were developed in conjunction with TARDEC and Foster Miller, Inc. to provide a cooling capability to Soldiers in HMMWVs in Iraq. After-market air conditioners installed in these vehicles have proven to be inadequate in the extreme heat, so two types of supplemental microclimate cooling systems were developed, fabricated, and shipped to Iraq in August 2004 for evaluation. The first type, an air based system, simply diverts some of the airflow from the air conditioning ducts to the Microclimatic Conditioning Air Vest worn under the uniform. In the second system, a fluid is chilled by the air conditioner using a secondary heat exchanger and pumped into the Air Warrior MCG, where body heat is removed.

NSC is also working to provide microclimate cooling to dismounted users. The size, weight, and power consumption of autonomous cooling systems have traditionally precluded their use. However, the recent development of two vapor compression prototype coolers under the Future Force Warrior program in 2002 has brought this one step closer to reality. These systems, called the Compact Vapor Compression Cooling Systems, weigh less than five pounds, excluding batteries. NSC will continue to push the state of the art in the development of portable microclimate cooling systems to meet the need of our Soldiers.

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