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TM - 03 - 93 ***Evaluation of Personal Cooling Systems*** ***Explosive Ordnance Disposal Suits***

By Sgt. Ken Beiko

TECHNICAL MEMORANDUM

Submitted by
Ron Purvis
Canadian **Bomb Data Centre**

January 1993

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SUMMARY

Evaluation of Personal Cooling Systems Explosive Ordnance Disposal Suits

The Canadian Bomb Data Centre contracted with Defence and Civil Institute of Environmental Medicine (DCIEM) to conduct an evaluation of three types of personal cooling systems to assess how well each reduced the heat stress built up inside a bomb suit by a working bomb technician. This study was conducted by John Frim, Ph.D. and Capt. Andre Morris.

The study examined the capabilities of three technologies (a liquid cooled undergarment, a thickly-ribbed vest of hydrophilic nylon, and an air vest) to alleviate thermal strain in personnel working in Explosive Disposal clothing under environmental conditions of 18 C degrees @ 40% relative humidity, 34 C degrees @ 40% rh, and 34 degrees C 80% rh. Simulated explosive disposal tasks consisted of treadmill walking, unstacking/carrying/stacking weighted boxes and a rest period with the helmet and jacket removed. This sequence was repeated for 120 minutes or until stress limits were reached. Physiological data recorded included rectal temperature, skin temperature, heart rate, sweat production and evaporation, metabolic rate, and subjective evaluations of thermal comfort and perceived exertion.

The results indicated that wearing the explosives disposal suit produces significant increases in thermal physiological strain over performing the same tasks in a standard station uniform. However, the liquid-cooled Exotemp personal cooling system was very effective in reducing that strain during heat exposure. Rectal temperatures, heart rates and fluid losses were reduced back to values comparable to those when not wearing the explosives disposal suit, while skin temperatures were actually lower with the cooling system than with only the station uniform. Subjects indicated reduced perceived exertion levels and improved thermal comfort when wearing the liquid-cooled garment with the explosives disposal suit. In contrast, the ribbed vest and air vest showed no significant benefits with the explosives disposal suit. It is concluded that the increase in thermal physiological strain resulting from wearing the explosives disposal suit while performing work in hot environments can effectively be minimized by use of the Exotemp personal cooling system.

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A complete report is available from the Canadian Bomb Data Centre. Please direct any questions or inquiries to:

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