

One reason for measuring the skin temperatures on the sites given in the regulations is to avoid cold damages. In that respect the selected sites may not give the temperatures on the coldest part of the body. Subjective comments from participating subjects have indicated that the heels get painfully cold during suit tests in cold water. Heel skin temperatures as low as 2°C have been observed while the skin temperatures as specified in the regulations are still above 10°C. Such observations confirm that from a safety point of view, one should pay more attention to the skin temperatures of these parts of the body during testing.

37 A comparison of the protection against immersion hypothermia provided by Coast Guard anti-exposure clothing in calm versus rough seas

A.M. Steinman, M.J. Nemiroff, J.S. Hayward,¹ and P.S. Kubilis, U.S. Department of Transportation, United States Coast Guard, Washington, D.C., USA ¹ Biology Department, University of Victoria, Victoria, British Columbia, Canada

The purpose of this study was to compare the protection against immersion hypothermia provided by various types of Coast Guard operational clothing to survivors of mishaps in calm versus rough seas. Eight garment ensembles were evaluated: 1) flight suit (control); 2) full wet suit and 3) shorty wet suit (tight-fitting "wet" garments); 4) aviation anti-exposure coveralls, 5) boatcrew anti-exposure coveralls, and 6) thermal float coat (loose-fitting "wet" garments); 7) dry suit, 8) survival suit ("dry" garments). Mean calm-water temperature was 10.7°C. Rough-water mean temperature was 11.1°C with 4-6 foot swells, occasional 4-foot breaks, 2-3 foot wind-waves and 0-3 knots current. Eight volunteer Coast Guard crewmen wore each garment-ensemble once in each of the two sea conditions. Dependent variables were rectal temperature, groin skin temperature, back skin temperature, heart rate, and subjective evaluations of warmth, tightness of garment fit, and amount of cold water flushing. The results showed significantly faster mean rectal temperature cooling rates and significantly larger declines in skin temperatures in rough seas than in calm seas for subjects wearing the float coat, aviation anti-exposure coveralls and boatcrew coveralls. Heart rates were significantly faster in rough seas than in calm seas for all garments. Rectal and skin temperature changes were positively correlated with each other and with subjective evaluation of cold water flushing, but they were negatively correlated with warmth and tightness of fit. In general, "dry" garments provided better protection than did "wet" garments in both sea conditions, and tight-fitting "wet" garments provided better protection than did loose-fitting "wet" garments in rough seas but not in calm seas. These results demonstrate that survivors in rough seas may have significantly greater risk from immersion hypothermia than previously assumed based on survival time projections from calm-water studies.

38 Functional characteristics of helicopter pilot suits during cold water immersion and hot air exposure

I.B. Mekjavic and C.A. Gaul, School of Kinesiology, Simon Fraser University, Burnaby, British Columbia, Canada

There is an increasing demand for the development of constant wear thermal protective garments for aircraft personnel. Such suits are required to offer adequate thermal protection in case of accidental cold water immersion and should not precipitate heat stress during normal flight operations. Such a suit must therefore incorporate an optimal balance between fabric permeability and insulation and should allow adequate ventilation of the suit microenvironment. Two suit design solutions have been suggested for aircraft personnel servicing offshore installations: a) wet suit concept and, b) dry suit concept.

Four types of helicopter pilot suits were investigated, representing both the dry and wet suit concepts: A) Goretex, B) Cotton ventile, C), Nomex/Insulite, and D) Nomex/Neoprene. Suits A and B were of the dry suit type, whereas suits C and D were of the wet suit type. The insulative characteristics of the suits during cold water immersion were investigated in the first part of the study. Five subjects were immersed