

- 1) the average values of Esk and Ecl at three sites showed no significant difference in the initial stage until Esk abruptly increased;
- 2) following the sudden increase in Esk, Esk decreased exponentially but Ecl gradually increased over a period of 1 hr;
- 3) Esk returned to the initial levels, and Ecl remained in the range between 60 and 80 W/m² during the last one-third of entire exposure.

These results may be associated with the onset of sweat secretion (sudden increase in Esk), the progress of saturation with water vapor in clothing microenvironment (exponential decay of Esk) and moisture and water gain in fabric (gradual increase in Ecl). In addition, substantial reduction of Esk in the heat indicated lack of ventilation as the obvious nature of protective clothing.

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58 Helicopter pilot suits for offshore application: a survey of thermal comfort and ergonomic design *C.A. Gaul and I.B. Mekjavic, School of Kinesiology, Simon Fraser University, Burnaby, British Columbia, Canada*

The objective of this study was to determine the existing problems associated with helicopter pilot survival suits currently in use. A survey of helicopter pilots from both Canadian commercial and military disciplines was conducted. Pilots commented on eight different types of survival suits. Reduced thermal comfort as well as lack of ventilation were the two most common criticisms of the pilot suits. The "greenhouse" effect, common to helicopter cockpits, results in hot working ambients both in summer and winter. The air cooling mechanisms employed in summer may cause a "chilling" effect following an on-ground stand-by where cockpit temperatures may reach 40°C. Thermal stress may also be induced with high cockpit temperatures caused by the sun's radiation in winter and summer. Suit design was another area considered. 72% and 86% of military and commercial pilots respectively felt their freedom of movement was hindered by their survival suits. Certain designs were considered more hazardous than others with regards to clips and hooks catching switches on the control panel. Difficulty in donning suits appeared to be a universal problem irrespective of type of suit used. Lack of comfort and movement in addition to thermal stress may lead to reduced time to fatigue and, thus, occurrence of errors and accidents. The results of this survey reflect the inadequacies of the helicopter pilot survival suits presently in use. It is suggested that evaluation of these suits be made on the basis of their ventilation capabilities, ergonomic design and thermal properties in a variety of ambient environments.

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59 Modelling human exposure to thermal stress *E.H. Wissler, University of Texas at Austin, Austin, Texas USA*

Physical scientists and engineers, and to a lesser degree biological scientists, rely on mathematical models to describe natural systems with which they deal. Mathematics provides both a convenient language for describing quantitatively various components of a system and logical rules for converting a given description into a form more suitable for a particular purpose. Although some may argue that the human thermal system is too complex to be described mathematically, the author would argue that such a complex system can only be described adequately in mathematical terms. To be sure,