

THERMAL RESPONSES OF FIGHTER PILOTS DURING SIMULATED PARACHUTING IN THE COLD

S. Rissanen, O. Aatsalo, P. Kuronen, T. Mäkinen and H. Rintamäki, Laboratory of Physiology, Oulu Regional Institute of Occupational Health, Oulu, Finland.

Ejection from a fighter aircraft can expose the pilot to extreme cold and windy conditions. Depending on the type of aircraft the parachute opens at the altitude of 5000 or 3000 m. In these cases descending takes 8 to 13 min at the descend velocity of $6 \text{ m}\cdot\text{s}^{-1}$. The purpose of this study was to investigate the cooling rate of the body during simulated parachuting. Parachuting was simulated in a wind tunnel at air temperature of -35°C and wind velocity of $10 \text{ m}\cdot\text{s}^{-1}$. Seven male pilots volunteered for the study as subjects. The subjects were hanging from the ceiling in their harness for 8 min. The subjects were facing the wind for the first 1 min and for the last 30 s of the total 8 min, otherwise back was against the wind. The subjects wore their personal F-18 winter aircrew garments. Breathing mask was kept on and both of the two visors were down. Flight gloves were used. The subjects were allowed behaviourally to thermoregulate their hands. During the exposure skin temperatures were measured. Mean skin temperature, calculated as area weighted mean, was $28.2 \pm 0.5^{\circ}\text{C}$ (mean \pm SE) at the end of the 8 min exposure. Cheek (bare) and chin (covered) temperatures were $9.1 \pm 2.1^{\circ}\text{C}$ ($3.2 - 13.8^{\circ}\text{C}$) and $27.2 \pm 0.5^{\circ}\text{C}$ ($25.8 - 27.0^{\circ}\text{C}$), respectively, at the end of the exposure. Finger temperature was $6.0 \pm 1.2^{\circ}\text{C}$ ($3.2 - 10.7^{\circ}\text{C}$). Risks of frostbites in cheek or fingers were apparent in some individuals. Thin flight gloves did not protect cooling of the fingers. Predicted time for frostbite (skin temperature of 0°C) for cheek was 10 - 14 min and for fingers 15 - 18 min. In order to maintain performance and to avoid health hazards, more attention should be paid on developing better protection for hands and face.

sirkka.rissanen@occuphealth.fi