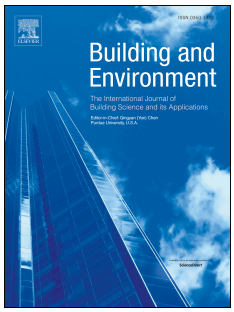
Accepted Manuscript



A generic simulation model for prediction of thermal conditions and human performance in cockpits

Jörg Schminder, Roland Gårdhagen

PII: S0360-1323(18)30399-8

DOI: 10.1016/j.buildenv.2018.06.055

Reference: BAE 5557

To appear in: *Building and Environment*

Received Date: 30 April 2018

Revised Date: 28 June 2018

Accepted Date: 29 June 2018

Please cite this article as: Schminder Jö, Gårdhagen R, A generic simulation model for prediction of thermal conditions and human performance in cockpits, *Building and Environment* (2018), doi: 10.1016/j.buildenv.2018.06.055.

A Generic Simulation Model for Prediction of Thermal Conditions and Human Performance in Cockpits

Jörg Schminder[1], Roland Gårdhagen

Linköping University, Department of Management and Engineering, Sweden

Abstract

This paper presents a computational approach to predict the thermal environment in a cockpit during on-ground and in-flight aircraft operation. A method was developed to model cockpit air temperature, which serves as input to black-globe and wet-bulb temperature computation. Subsequently the simulated temperatures are used to compute common heat stress indices such as Wet Bulb Globe Temperature (WBGT), Fighter Index of Thermal Stress (FITS), or Predicted Mean Vote (PMV). To demonstrate the manifold information made available by the computed heat stress indices, WBGT e.g. is set in relation to different types of occupational exposure limits demonstrating not only the possibility to predict physiological constraints but mental performance too. The generic cockpit model and thermal comfort computations were validated against experimental data gained from on ground temperature measurements inside an aircraft cockpit, which underwent a sudden large temperature change. The results exemplify how thermal comfort and possible physical as well as mental degradation of aircrews can be assessed quickly using the presented model.

Keywords: Thermal comfort, Heat stress, Mental performance, Simulation

[1] Corresponding author.
E-mail address: jorg.schminder@liu.se (J.Schminder).