Doubling the task – Effects of task switching during simultaneous control of multiple airports

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Abstract

Research on remote tower control solutions for small airports raised the question whether it is possible for an air traffic controller to control multiple airports simultaneously. This simultaneous control would require the air traffic controller to switch between task sets of two airports. Therefore it is important to analyse the factors influencing task switching in these dynamic multiple task environments and how they are affecting the air traffic controller. A human-in-the-loop microworld simulation was conducted (N = 24, student sample). In the experimental conditions the task set was either the same (two airports with the same layout, global task repetition) or different (two airports, different layout, global task switch). It was expected that global task switch would lead to a decrease in task performance and increase of workload compared to global task repetition. Performance data, ECG data, eye data and questionnaires were analysed. Analysis revealed no significant influence of global task switch on dependent variables compared to global task repetition. However, local task switches (i.e. switches from one airport to the other) revealed a significant influence on mean reaction times. Participants responded slower when they switched between the two airports independent of the experimental condition. Additionally the analysis revealed a significant influence of training on dependent variables.

Introduction

Within the projects RApTOr (Remote Airport Tower Research 2005-2007) and RAiCe (Remote Airport Traffic Control Centre; started 2008) alternative solutions to the direct outside view from the tower are developed (Schmidt et al., 2007). Although the direct view out of the tower is regarded as one of the most important sources of information for the tower controller (Pinska, 2006) its use depends on the visual conditions. The development of sensor-based information systems is addressing this problem. These technical solutions try to reduce the dependence on the visual conditions and to find a replacement for the direct view that is sufficient to allow for controlling the movements on the aircraft on the same level in regard to safety as direct view operations. An important advantage of these sensor-based information systems is that they can be used for remote air-traffic control (Fürstenau et al., 2009).

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