Modeling Task Prioritization Behaviors in a Time-Pressured Multitasking Environment

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Abstract

Funk (1991)'s Cockpit task management (CTM) theory is structurally consistent with cognitive multitasking models. The following three research questions were made based on the CTM framework: RQ-1) Can reported task priority decision be explained by the reported importance, urgency, performance status, salience, and workload of tasks in a cockpit?; RQ-2) Can awareness of task-related signals be explained by the reported task priority, task-related signals salience and expectancy, and the number of tasks?; and RQ-3) Can task execution and performance be explained by the reported task priority? A middle fidelity flight simulation study was conducted to test the above research questions.

For RQ-1, questionnaire data indicated that reported task importance and reported task salience were significantly related to reported task priority after taking the individual and flight situational differences into account. For RQ-2, surprisingly, reported task priority was not significantly related to the awareness of task-related signals. Instead, signal salience and expectancy (bottom-up factors) were significantly related to the awareness of task-related signals. It was difficult for participants to be aware of the task-related signals when the number of tasks increased. For RQ-3, reported task priority was related to task execution: the participants spent more time on the tasks with better task performance. Comparisons of the reported task priority and actual task execution at the frozen moment indicated that the participants executed tasks by combining reported task priority and habitual ANCS hierarchy priority. This result indicates that under high workload environment, a pilot may not be able to notice an abnormal flight instrument indicator problem even when the pilot prioritizes the problem-related task. Both alarms installation and pilots training shall be conducted together because this experiment indicated that only when both right expectancy and salient signal conditions are met, pilots may be able to notice the abnormal signals in a multitasking environment.

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