Navigating the Information Space of a PC Computer-Based Aviation Flight Training Device: an Expert Evaluation of Information Search and Retrieval

Jeffrey S. Forrest, James L. Simmons, and Steven D. Zink

The Department of Transportation’s Federal Aviation Administration (FAA) administers aviation flight training and pilot certification within the United States. Beginning in 1997, the FAA began permitting the use of PC-based Aviation Training Devices (called PCATD’s) for flight training. Research has provided information evaluating PCATD interface design and usability, the transfer of learning associated with various PCATD related training procedures, and pilots’ attitudes concerning the PCATD concept. Most of the current research that has been applied to the PCATD system has focused on assessing simulation fidelities and their influence upon training effectiveness.

However, recent concern has focused on problems associated with a “multidimensional information space,” since a PCATD system is analogous to the computer based interface or “glass cockpit.” PC-based flight displays have introduced a new concern regarding human factors identified as “navigating through an information space.” These systems must balance the considerations of determining what information should be provided with properly designed features that enable successful operational control by the user.

The particular PCATD used in this study, a commercially available Jeppesen Model FS-200AC, operates in essentially two modes: (1) a full-screen “glass simulator” mode, showing a view from the pilot’s seat of the full aircraft instrument panel, including a modest amount of ground features such as runways, and a “map-screen” mode, essentially showing representations of aviation charts. Thus, three-dimensional information is simulated within a two dimensional electronic environment.
The goal of this study was to identify factors affecting the user’s ability to navigate and find information identified as necessary for the enhancement of situational awareness while using the PCATD’s map-screen. Five expert flight and ground instructors evaluated PCATD system. These experts were given a basic orientation to the PCATD hardware and software; specifically, they were shown how to “toggle” back-and-forth between the two main modes of presentation. They were then asked to fly a series of “precision instrument approaches” to various runways contained in the database. Expert evaluators were not given specific information about either the precision instrument approaches (e.g., altitudes, headings, radio frequencies, etc.) or related data contained within various presentations in the map-screens. Thus, they needed to successfully formulate and execute searches using the map-screen for precise information needed to successfully complete each task.

Although the relatively small number of expert evaluators to this study precluded the usage of inferential or parametric statistical analysis, the experts were able to describe relevant issues of situational awareness, information searching, and knowledge are generally qualitative in nature by the use of open-ended questioning.

Overall, the experts reported that it was moderately difficult to locate and identify tools inherent to the map-screen that would help in formulating, searching, and retrieving information. Considerable exploration of icons, menus, and menu commands was needed to find pertinent information. The experts suggested the need for “finding aids,” such as intermediary help menus or screens. The “zoom control” was particularly problematic, since it frequently contributed to the loss of situational awareness of the instrument approach being flown. The experts generally thought a “pop-up” quick-search function, ideally one that would allow for the use of a specific search term, would be the most helpful.