Abstract

Too often successful system development projects fail to leave a legacy of design transfer information, beyond providing access to the physical descriptions of the system. The present authors were fortunate to be part of a long-term research program that culminated in the development of a new Taxi Navigation and Situation Awareness system (T-NASA) for commercial aviation. We are now in the process of developing a multi-media tool aimed at allowing designers, engineers, researchers and students to both learn about T-NASA and from T-NASA. Our main goal is to develop an interactive tool that both allows users to find detailed information on the T-NASA system and transfers important “lessons learned”, guidelines and methodologies to designers and engineers.

Introduction

To increase the efficiency and safety of surface operations, the Taxiway Navigation and Situation Awareness (T-NASA) cockpit display suite (see Figure 1), comprised of an electronic moving map (EMM) and a scene-linked head-up display (HUD was proposed developed and then subjected to an extensive design and evaluation process over a 6-year period (Andre et al. 1998; Foyle et al. 1996; McCann et al. 1998).

During this period, nearly every type of research activity was performed, including:
- Jump seat field observations of pilots and air traffic controllers.
- Low fidelity part-task desktop design concept studies.
- Medium-fidelity part-task simulation studies.
- Full-mission high-fidelity simulation studies.
- Flight tests in NASA’s B757.
- Focus groups with pilots and air traffic controllers.
- Studies using head and eye-tracking equipment.

The focus of the studies varied as well, to include:
- Research to determine pilot information requirements during taxi.
- Research on user interface design options.
- Research validating concepts against current conditions.
- Research focused on procedures and integration.
- Research focused on near vs. far-term technology assumptions.
- Research focused on benchmarking and quantifying safety and efficiency benefits of T-NASA.
- Research on usage characteristics.

Looking back on the T-NASA project, the research and development team realized that there was a vast quantity of information that could be passed on to persons interested in the T-NASA system, aviation researchers and system developers in general, and others outside of aviation who can generalize the philosophy, research approach and principle-based design techniques to their non-aviation product or system projects. In an effort to both capture the activities and results of the T-NASA program and to provide a usable form of traceability of the system philosophy, design
guidelines, and research decisions, we have developed a multi-media experience.

A Design Technology Transfer Tool

We have employed a “ladder” metaphor to the design of the tool. As shown in Figure 2, the user “climbs” the ladder, ending with a description of the T-NASA system. The left side of the ladder presents the user with information specific to the T-NAS system, while the right side of the ladder presents the user with various categories of knowledge transfer information.

Purpose and Benefits of Demonstration

Beyond merely demonstrating our multi-media design technology transfer tool, we hope to educate the HCI-Aero audience on the latest user interface design techniques for presenting such information. It is interesting to note that a tool that endeavors to document, trace and transfer human factors knowledge to a wide range of users and uses must inherently possess optimal human factors attributes in order to communicate through an effective user interface.

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References

