

## Creating a Multi-Media Living Legacy: The T-NASA Design Technology Transfer Tool

**Anthony D. Andre**

San Jose State Foundation/  
NASA Ames Research Center  
MS 262-4  
Moffett Field, CA 94035  
andre@interface-analysis.com

**David C. Foyle**

NASA Ames Research Center  
MS 262-4  
Moffett Field, CA 94035  
dfoyle@mail.arc.nasa.gov

**Becky L. Hooley**

Monterey Technologies, Inc./  
NASA Ames Research Center  
MS 262-4  
Moffett Field, CA 94035  
bhooley@mail.arc.nasa.gov

### 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.



Figure 1. T-NASA System.

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 useable 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.

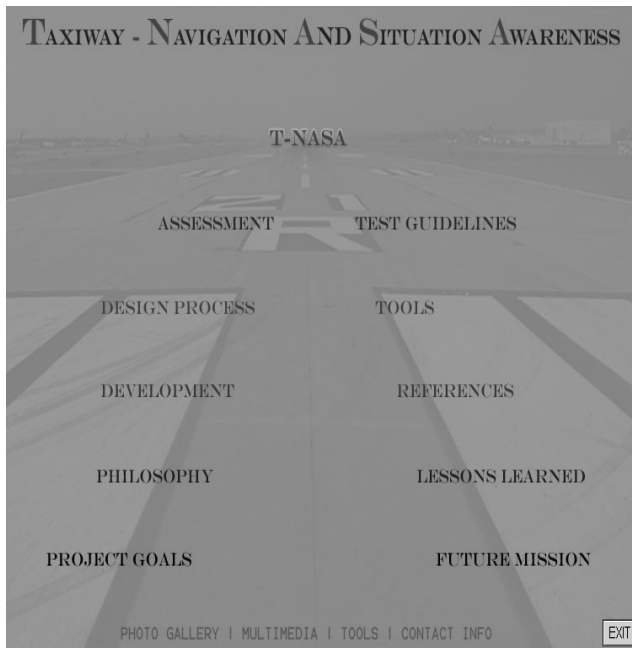


Figure 2. Prototype Menu Screen for the T-NASA design technology transfer tool.

### 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.

### Acknowledgements

Funding was supplied by the NASA Ames Aerospace Operations Systems (AOS) R&T Base Program, RTOP 711-41-12.

### References

- Andre, A.D., Hooley, B. L., Foyle, D. C., and McCann, R. S., (1998). Field evaluation of T-NASA: Taxiway Navigation and Situation Awareness System. *IEEE/AIAA Digital Avionics Systems Conference*. Seattle, WA.
- Foyle, D. C., Andre, A. D., McCann, R. S., Wenzel, E., Begault, D., & Battiste, V. (1996). Taxiway Navigation and Situation Awareness (T-NASA) system: Problem, design philosophy, and description of an integrated display suite for low-visibility airport surface operations. *SAE Transactions: Journal of Aerospace*, 105, 1411-1418.
- McCann, R.S, Hooley, B.L, Parke, B., Foyle, D.C., Andre, A.D. & Kanki, B. (1998). An Evaluation of the T-NASA System in High Fidelity Simulation. (Paper 985541) *Proceedings of the AIAA/SAE World Aviation Congress*. SAE International: Warrendale, PA.