Human Factors

research and technology division

Human Factors Design Methodology

Objective

To develop principled and robust user interfaces with appropriate allocation of function between the display/automation system and the user.

Approach

A human-centered design methodology was developed during the Taxiway Navigation and Situation Awareness (T-NASA) project, an avionics display suite for airport surface navigation. This human-centered design process involved over 300 transport pilots participating in observational studies, interview studies, part-task simulations, high-fidelity simulations, and a flight test.

- A *Task Analysis* based on field observation was conducted to develop a thorough understanding of problems and issues associated with current operations from a user's perspective.
- Formal *Technology Assumptions* consisting of technology requirements and availability were made, based on assumptions of implementation time frame.
- Both the task analysis and technology requirements were analyzed to develop the *User Information Requirements* defining the precise nature of information required by the users under the proposed operating conditions.
- Combining these analyses and current human factors domain knowledge, *System Requirements* were determined, consisting of a set of desired system characteristics and a design philosophy.
- Finally, those system requirements determined the specific display components which made up the *System Definition*.
- Through *Iterative Evaluation and Validation*, performance metrics are determined, procedural integration issues defined, and knowledge is gained which can continuously refine each of these separate process elements.
- *Off-Nominal Testing* allows for increased understanding of the human-machine system under evaluation, uncovers design issues that can be addressed, and helps determine training issues and procedures.

Impact

The human-centered design methodology was successfully used during the development of the T-NASA System for the Terminal Area Productivity program. Its success is demonstrated by the incorporation of the T-NASA display formats into Rockwell Collins/Flight Dynamics' Surface Guidance System under development for certification in the 2003 time frame.

Information Technology

User-centered interface design; Human-automation functional allocation

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