A Systematic Way to Assess Compliance with Human Factors Standards

Mary Stearns

Assessing the human factors considerations associated with the design or evaluation of any major new system can be a formidable challenge. To make this more manageable, the Federal Aviation Administration's (FAA) Office of the Chief Scientific and Technical Advisor for Human Factors (AAR-100) and Research, and Special Programs Administration's (RSPA) Volpe National Transportation Systems Center have created a product which will help to enhance the human factors aspects of air traffic control (ATC equipment. The FAA and the Volpe Center developed this product in response to requests from the aviation community.

This product pairs an electronic checklist with a reference text. Using the checklist, a user can rate the performance of equipment against specific criteria, add personal notes, and customize the checklist for specific needs. The checklist contains references linking it to the text, which is a compendium of information on the relationship between human factors and air traffic control operations. This combination of electronic and text format brings to the desk top, and to the lap top, a comprehensive way to identify human factors issues related to air traffic control and a user-friendly way to report results.

Although the checklist and the accompanying text, *Human Factors in the Design and Evaluation of Air Traffic Control Systems*, are geared toward ATC, they can be used to identify human factors issues in any domain, since most of the topics, such as the effects of automation, visual and auditory displays, etc., are applicable to any human-machine interface. Application of the information presented in this handbook will help to minimize the probability of human error in human-system interactions, limit the consequences of these errors, ensure that subsystems are well integrated, and increase the efficiency of human-system performance.
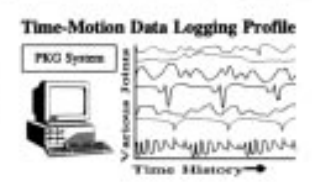
This product covers many topics

including the role of human factors in acquisition, how to develop a human factors plan, the capabilities of humans as information processors, and how to evaluate displays and controls (see Fig. 1). It also discusses issues of particular interest to air traffic control such as the benefits and limitations of automation, methods of workload assessment, the capabilities and limitations of human vision and of the auditory system, time required for information-processing activities, attention, memory and forgetting, problem solving, use of color, flicker, visual and auditory alerts, keyboards, touch screens, trackballs and other input devices, menus, formats for data-entry, and error messages.

The reference handbook and checklist were designed to be used by operations specialists, human factors experts, and system designers. Air traffic control specialists must be involved in every aspect of ATC system development because the human factors challenges, faced in the design and evaluation of air traffic control systems and subsystems, are numerous and complex. These operations specialists help to establish the requirements and play a role in deciding how these systems should be tested before implementation. This important task requires making decisions about the design and operation of displays, controls, and supporting software functions.

The users of this product have primarily been FAA and US military personnel who are involved in the design and evaluation of ATC equipment; the contractors who write requirements for, and manufacture, the systems and subsystems; and an international set of specialists involved in these areas. The FAA has also used a subset of the checklist items in their market survey for the STARS (Standard Terminal Automation Replacement System) program. Unlike previous system buys, where they provided the entire set of specifications and asked the manufacturers to bid on and then build a system to those specifications, the FAA was looking to buy a commer-
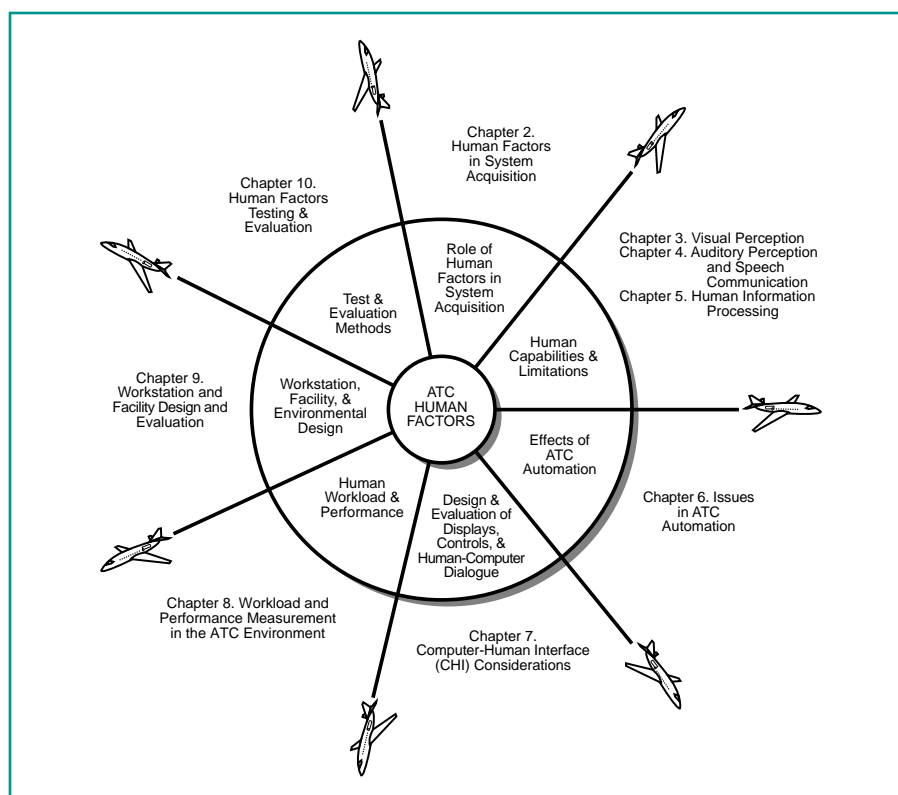

Figure 1. Overview of key human factors topics addressed and chapter where these topics are presented.

cial, off-the-shelf system. The checklist allowed them to evaluate the computer-human interface of each candidate system independently. In this way, the checklist added objectivity and structure to what had historically been a less structured evaluation process.

Use of this product will help to minimize the probability of human error in human-system interactions, limiting the consequences of these errors, and increasing the efficiency of human-system performance. These results support goals identified in the FAA's *National Plan for Civil Aviation Human Factors: An Initiative for Research and Application* (March 1995).

To use the checklist , the following components are needed:
- 386 DX (486 preferred)PC
- Minimum of 8 MB RAM
- 3 1/2 in. diskette drive
- Minimum of 15 MB free hard disk space
- Windows 3.1 or greater
- Windows compatible mouse
- VGA monitor

The checklist and companion text are also available in a hypertext format on CD-ROM.

For more information about *Human Factors in the Design and Evaluation of Air Traffic Control Systems*, contact:

Dr. Kim M. Cardosi
DTS-45
Volpe National Transportation
Systems Center
55 Broadway
Cambridge MA 02142

Tel: 617-494-2696
FAX: 617-494-3622
Email: cardosi@volpe1.dot.gov

Mary Stearns, Ph.D., is the Program Manager for the cockpit Human Factors Program, Volpe National Transportation Systems Center, Cambridge, MA.