

Summary of Past Accomplishments

In order to understand where the research program is going, it is important to understand what the program has accomplished to date. The research program is embraced nationally and internationally by the [FAA](#), industry, academia, and the human factors scientific community at large. The research team members have helped airlines implement and evaluate training for maintenance resource management and have assisted the [ATA](#) Maintenance Training Committee to "raise the bar" regarding requirements for advanced technology training. The FAA *Human Factors Guide for Aviation Maintenance*, developed by the research program, is recognized by industry maintenance personnel, other government industries, and military throughout the country and the world. The FAA Flight Standards Service has fielded the On-line Aviation Safety Inspection System (OASIS), which is a mobile computing job aid for the Flight Standards Service Aviation Safety Inspectors. These and other research products have made the transition, with overwhelming success, from the research program into government and industry.

This section highlights some of the key products that the research program has delivered. These products are organized by the primary activities of the research program. All of the research program's products, procedures, and reports contribute to continuing safety and improvement of operational efficiency through improvements in human performance.

Job Task Analysis Products

Job Task Analysis projects can be broad or narrow in focus. The research program has conducted JTAs of both types.

AMT JTA

Regulatory efforts to revise the [FAA](#) airframe and powerplant mechanic certificate have led to the development of a proposed Part 66 rule. This rule prescribes new training and certification standards for technicians returning transport aircraft to service (Parts 25/29). Those who complete this training would receive the Aviation Maintenance Technician (Transport) AMT-T certification. The change in the certificate structure implies that corresponding training requirements will be needed. The [JTA](#) supported the regulatory effort by collecting survey data on tasks performed by [AMTs](#) across all segments of civil aviation. A total of 2,434 validated surveys were collected from 84 facilities. Respondents rated 303 tasks in 20 subject areas in three categories: frequency, criticality and difficulty to learn. The JTA results provide data to support the regulatory changes and provide an objective basis for AMT-T curriculum development.



Proposed System for Technician Certification

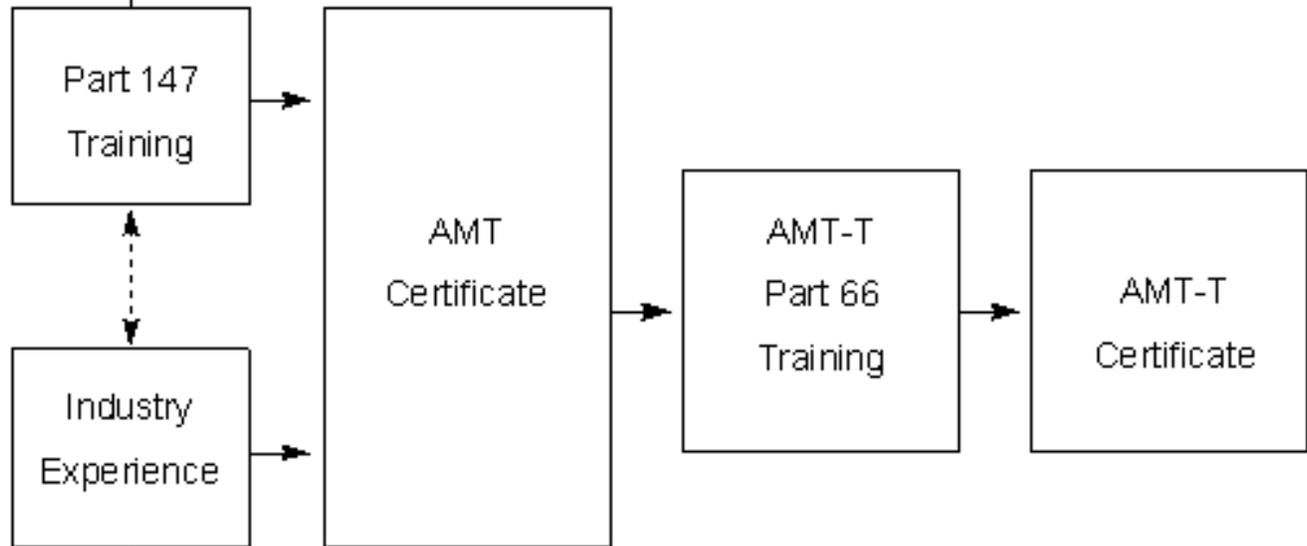
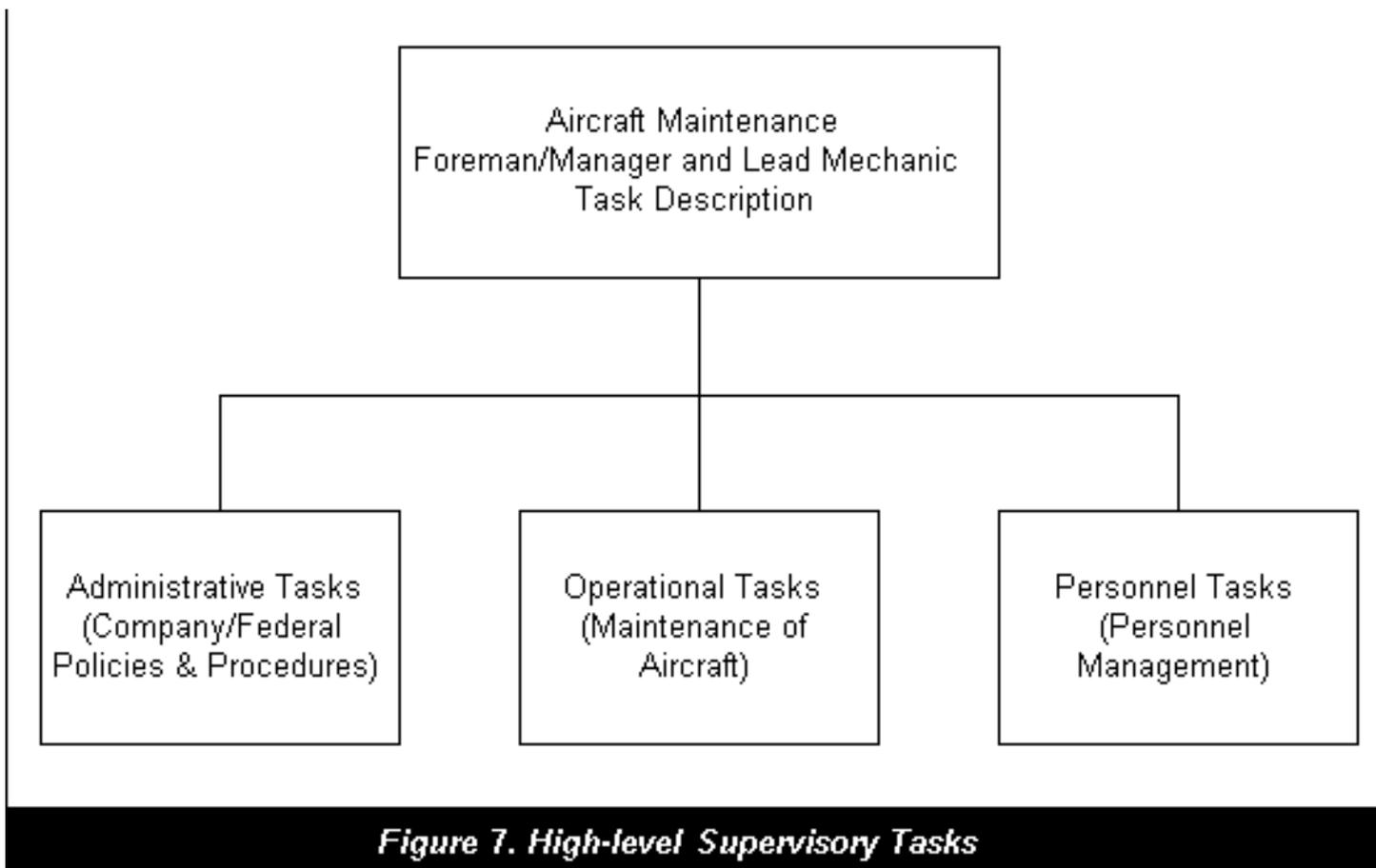


Figure 6. Proposed System for Technician Certification

Supervisory JTA

Airlines indicated that maintenance personnel receive a lot of technical training, but supervisory positions within maintenance have not been systematically studied. A Job Task Analysis was conducted that focused on analyzing the tasks of first and second level aircraft maintenance supervisors (foremen and lead mechanics). A detailed listing of tasks was created for three broad categories of supervisory tasks: Administrative, Operational, and Personnel. This [JTA](#) identified the need for improved training for new foremen and lead mechanics. A preliminary curriculum outline for leadership training was also developed in conjunction with two airline partners over a six-month period.



Maintenance Resource Management Products

Maintenance Resource Management is a relatively new focus area for the program. The first major product was the prototype Team Situation Awareness Training Curriculum.

Team Situation Awareness (SA) Training Curriculum

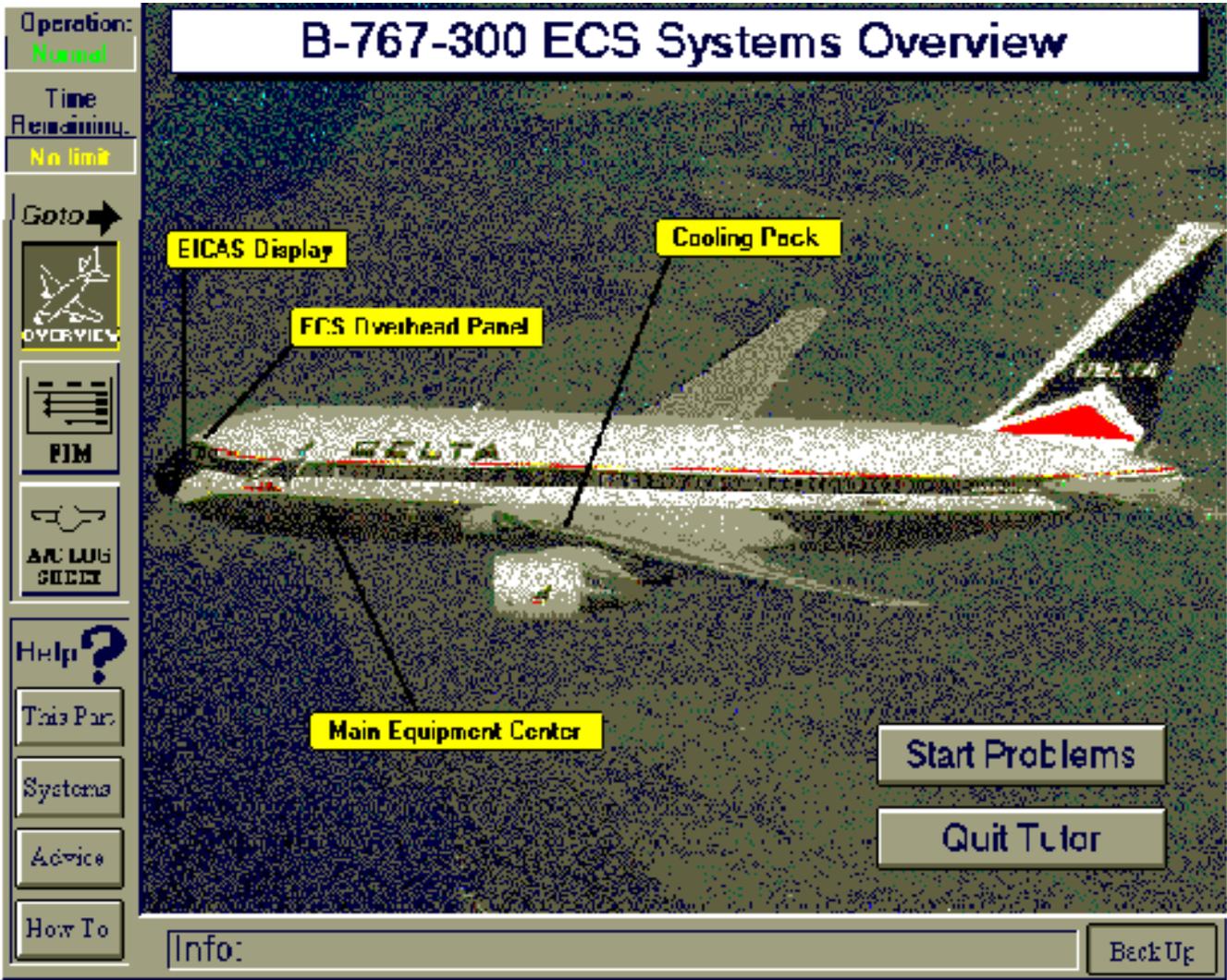
Airlines have requested expertise related to situation awareness in maintenance. The research team responded with a prototype training curriculum. The objective of this curriculum is to equip Technical Operations personnel with the skills and abilities to develop an awareness and understanding of factors that affect SA in the maintenance domain and team processes. Five [SA](#) concepts are taught: 1) Shared Mental Model, 2) Verbalization of Decision, 3) Better Shift Meetings and Teamwork, 4) Feedback, 5) SA Errors. Materials include Microsoft Power Point slides, group activities, and a facilitator’s handbook. The SA Training Curriculum shall be included on [FAA](#) CD-ROM ‘98, which has been published annually since 1993.

Training Products

Completed prototype training products include the Environmental Control System Tutor, the Team Situation Awareness Training Curriculum, the System for Training Aviation Regulations and the Aircraft Maintenance Team Training Program. These systems use a combination of instructional methods for training delivery. The training research answers industry's request for demonstrations of advanced technology for training maintenance technicians.

Environmental Control System Tutor (ECS)

The [ECS](#) Tutor uses intelligent simulation for maintenance training. It simulates the operation of the ECS for the B-767-300. As the student operates and troubleshoots the system, the simulation maintains models for student, instructor, and expert knowledge. These models allow the ECS Tutor to provide remediation and advice to the student. ECS was included on [FAA](#) CD '94.

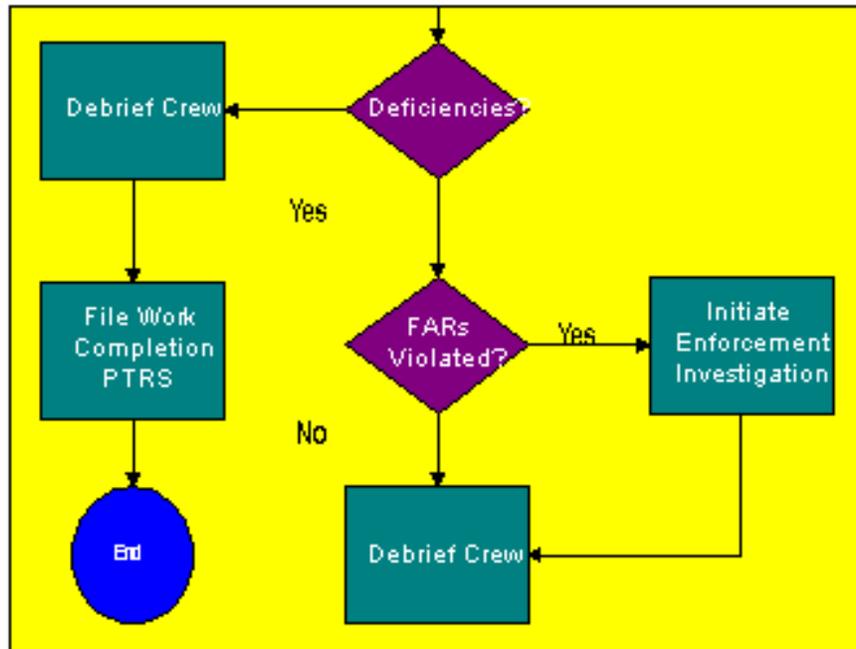


System for Training Aviation Regulations (STAR)

Aviation maintenance trainers lament the "boring" task of training [FAA](#) regulations using conventional instructional methods. [STAR-AMT](#) provides Part 147 school instructors with a computer-based tool to help convey the role the Federal Aviation Regulations (FARs) play in the daily operations of aviation maintenance. The system is heavily infused with multimedia to motivate student interest. Scenario-based training techniques are employed to place students in true-to-life work scenarios where FAR-dependent decisions need to be made. STAR-AMT has several different learning environments: Overviews, Scenarios, Challenges, and Resources. STAR-AMT is included on FAA CD '97.



[FAA](#) has also expressed a requirement to deliver on-the-job computer-based training for Aviation Safety Inspectors (ASI). The purpose of [STAR-ASI](#) is to be an on-the-job training aid for Aviation Safety Inspectors. It is designed to function as both a training tool for new inspectors and a reference resource for seasoned inspectors. Like STAR-AMT, STAR-ASI has Scenarios, Challenge Questions, a Glossary and a Document Browser. In place of the Overview learning environment, STAR-ASI has the Inspection Task Flow Chart learning environment. STAR-ASI is included on FAA CD '97.



Aircraft Maintenance Team Training

This tool is a multimedia computer-based team training program that trains aircraft maintenance technicians (AMTs) on team skills that are critical in performing aircraft maintenance tasks. The goals of the software are: to provide AMTs a systematic exposure to a teamwork skills curriculum, to allow users to learn at their own pace, to monitor the progress of users in acquiring team skills, and to motivate the users to learn and use the skills through an interesting, media-rich and interactive environment. Aircraft Maintenance Team Training was published on a stand-alone CD in 1997.



Job Aiding Products

The next group of products is the job aiding products. These products include the Performance Enhancement System Program which evolved into the On-line Aviation Safety Inspection System (OASIS), the Ergonomics Audit Program, the Coordinating Agency for Supplier Evaluation Job Aid, the Documentation Design Aid, and the Turbine Repair Automated Control System. These products capitalize on advanced technology information systems.

Performance Enhancement System (PENS) Program & OASIS

The Performance Enhancement System is an electronic performance support system designed for [FAA](#) Aviation Safety Inspectors. It provides data entry and validation support, as well as on-line access to policy guidance such as Federal Aviation Regulations, Airworthiness Directives, and Inspector's Handbooks. This system has evolved into the On-line Aviation Safety Inspection System (OASIS), which is currently being used by the FAA Flight Standards Service. This effort is an excellent product of a research, engineering, and development project running the gamut from conceptualization to full scale development for all FAA Aviation Safety Inspectors worldwide. The [PENS](#) prototype was included on FAA CD '94.

OASIS
On-line Aviation Safety Inspection System

For tracking purposes, please provide your initials here:

Name: TDY Inspector Name
Office: S011
Unit: OPNS
Type: ASI

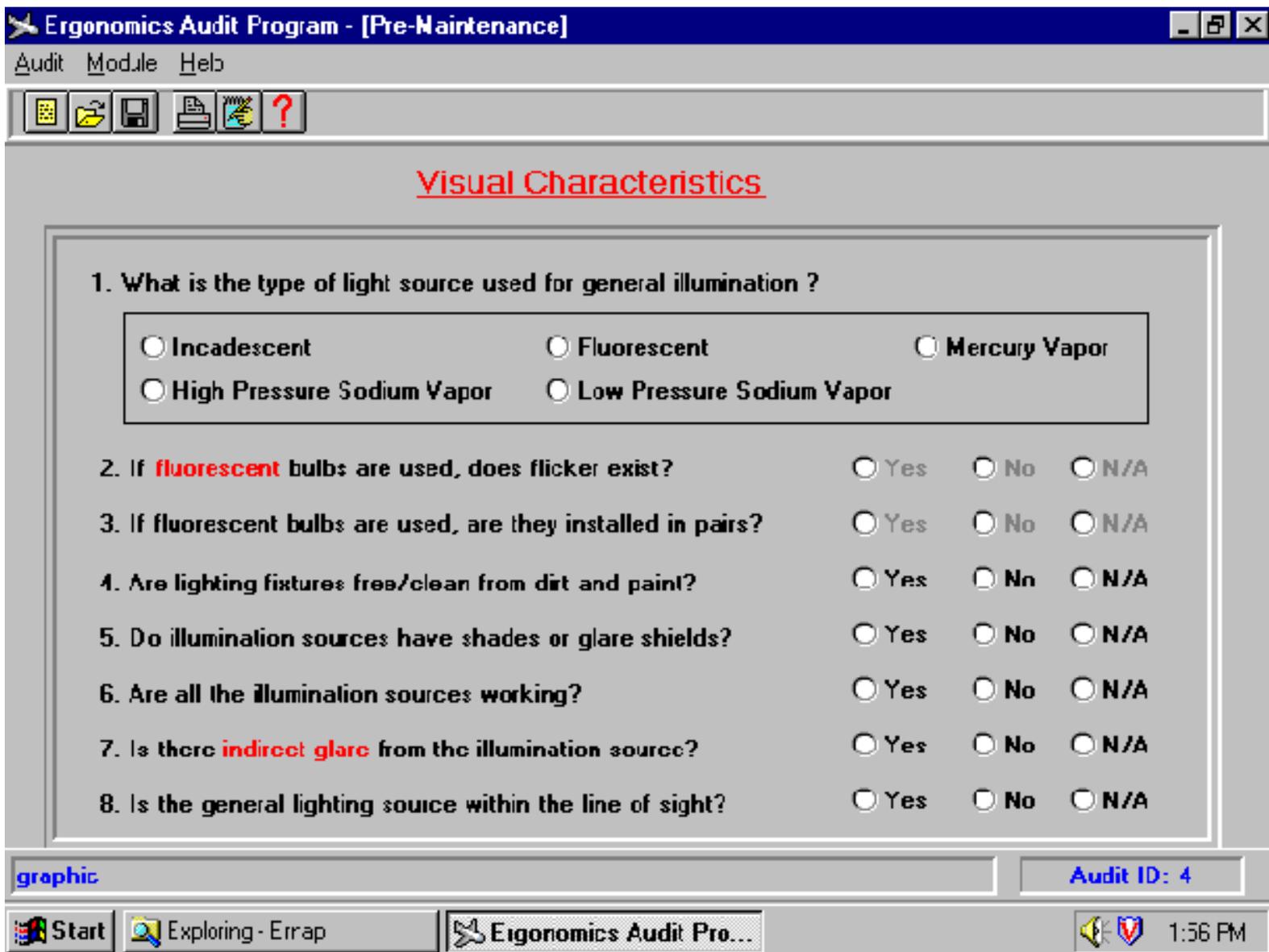
Create a New Record ...
Open an Existing Record
Records Management ...
Quit

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oasis@galaxyatl.com, <http://skyway.galaxyatl.com/galaxy.html>

Oasis is designed, developed, and helced to the FAA Flight Standards Service by Galaxy Scientific Corporation under contract DTFAD1-95-Y-C1044.

Ergonomics Audit Program (ERNAP)

Industry personnel requested a job aid that would permit them to conduct human factors audits without retaining a human factors consultant. [ERNAP](#) is a computerized job aid to help managers evaluate or design ergonomically efficient procedures for maintenance and inspection. ERNAP is simple to use and evaluates existing and proposed tasks and setups by applying ergonomic principles. ERNAP also suggests ergonomic interventions based on its evaluation. ERNAP allows the auditor to maintain audits for further reference. ERNAP was included on [FAA](#) CD '96.



Coordinating Agency for Supplier Evaluation (CASE) Job Aid

Airlines and suppliers asked for an electronic checklist tool for collecting supplier evaluation data. The [CASE](#) Vendor Audit program contains electronic CASE forms for auditing suppliers such as fuel vendors. These checklists are integrated with standards and regulation references to enable quick look-ups. The CASE Vendor Audit program also includes a facility for saving/retrieving audits and a report generation module for printing the results and findings of the audit based on the completed checklist. CASE was included on [FAA](#) CD '96.

CASE [CASE Air Carrier Section Component Repair/Overhaul Vendor (Part A)]

Form Window Page of Contents General Comment Help

Icons: [File] [Print] [Save] [Check] [Close] [Help] [d+A] [Globe]

CACS-20

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4. QUALITY CONTROL (continued)

I. Do supervisors have A and P or Repairman certificates? [1J, 3C, 11A(1)]

[1J] [3C] [11A(1)]

YES NO N/A

Comment

J. Does ROV have an established procedure to provide corrective action for discrepancies noted during repair/overhaul? [11E]

[11E]

YES NO N/A

Comment

K. Does ROV maintain a list of "sub-contracted" maintenance actions and approved vendors for those functions? [2G]

[2G]

YES NO N/A

Comment

L. Does ROV ensure that sub contractor quality meets customer specifications and legal requirements? [2D(3)]

[2D(3)]

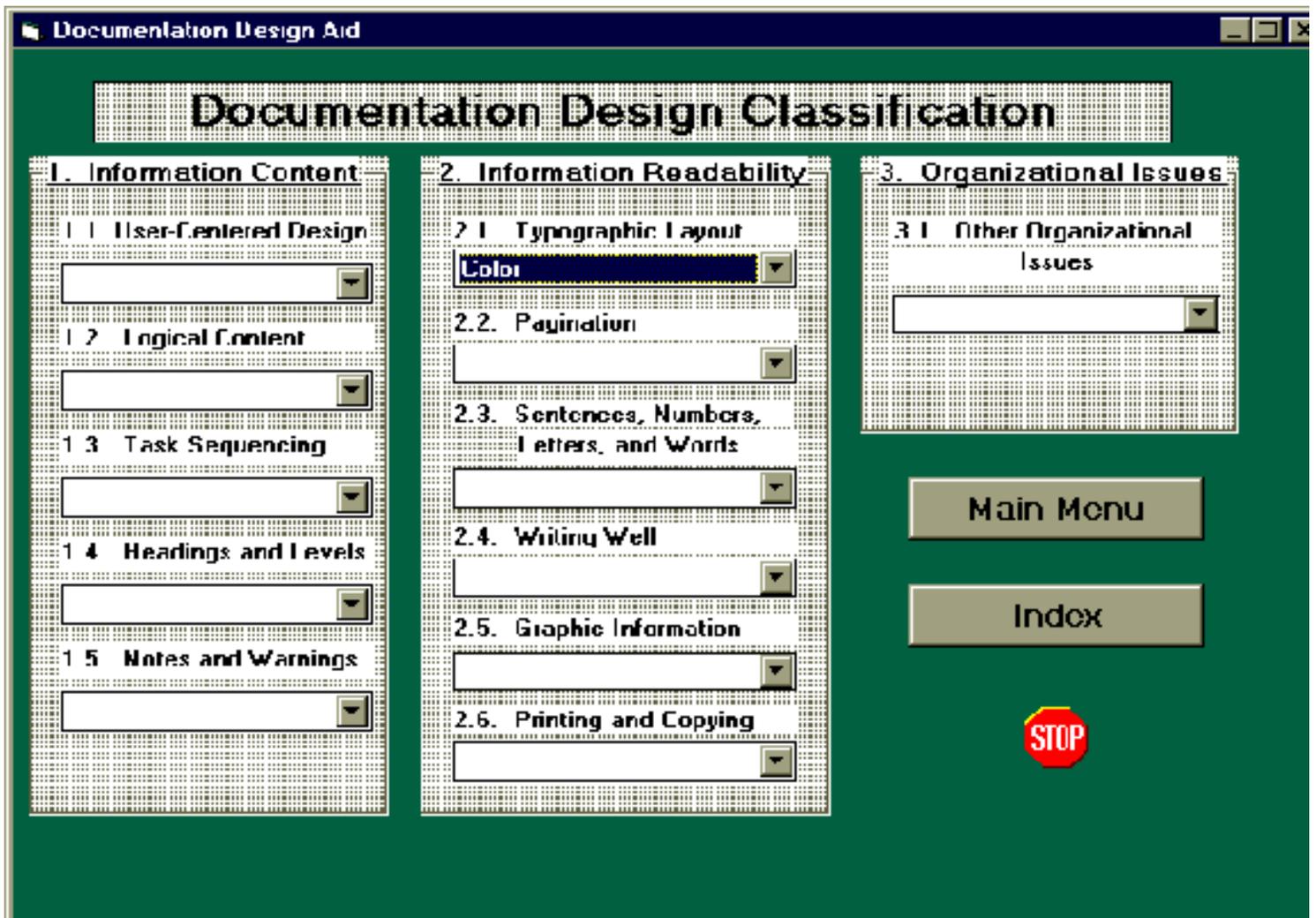
YES NO N/A

Comment

[Continue to Part B] [Continue to Part C] [Continue to Part D]

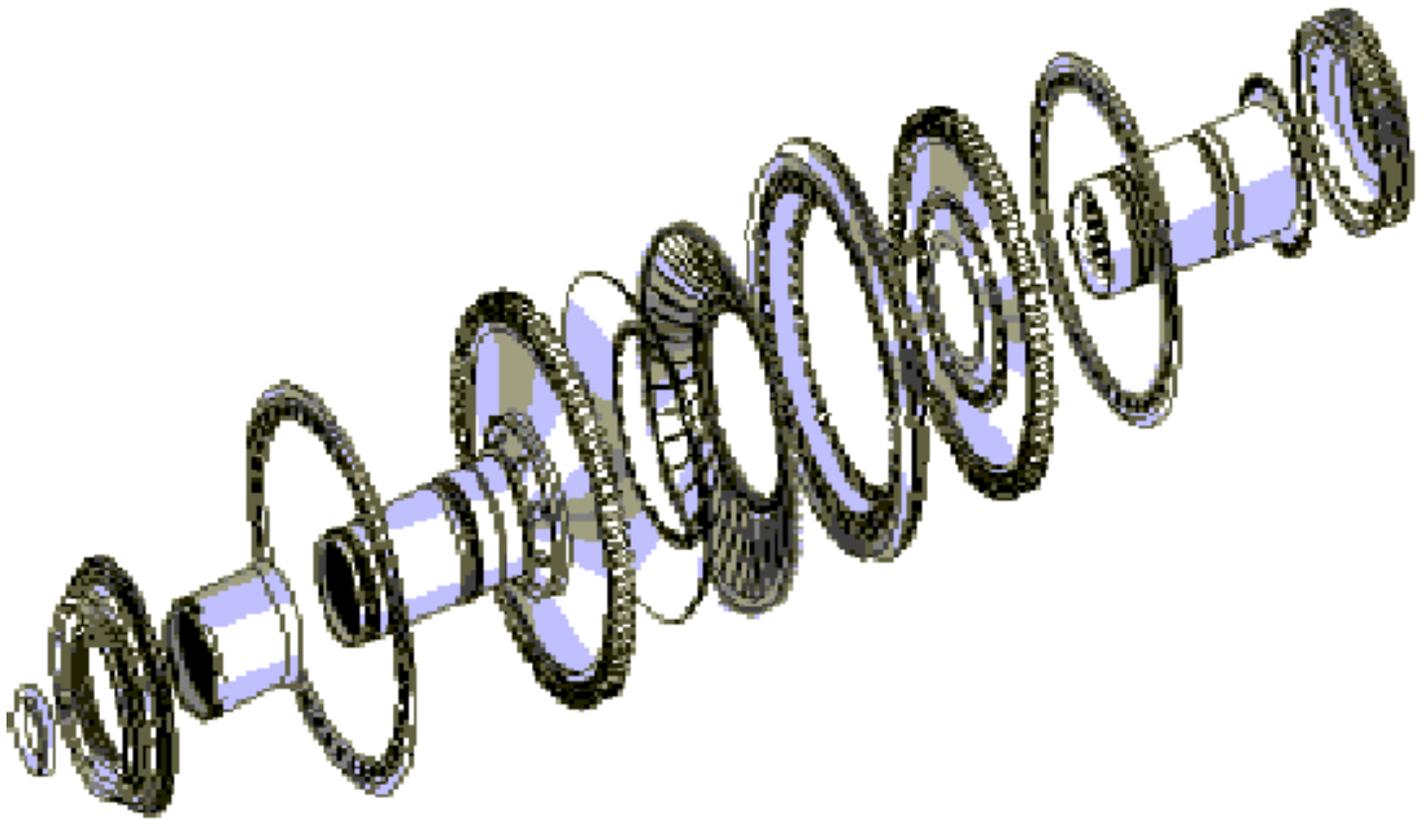
Documentation Design Aid (DDA)

Airline documentation writers asked for help to ensure that their procedures use Simplified English and follow proper human factors conventions. Two versions of the [DDA](#) were developed to improve the ability of technical writers and engineers to write more usable documents. The paper-based version lists the rules in a format suited to the user's needs. A computer-based version adds reasons for the rules and examples of their use. Both versions were similarly effective in allowing users to find and make changes in existing aircraft maintenance task documentation. The DDA shall be included on [FAA](#) CD '98.



Turbine Repair Automated Control System (TRACS)

Industry expressed the requirement to have easy access to manufacturers and regulatory information. [TRACS](#) is an integrated software tool which aids airline technicians in tracking, repairing, and returning jet engine parts back to serviceability. The prototype system gives technicians and inspectors the ability to log critical information and data, access manuals and orders, and sign-off on repair steps in the shop environment. The operational TRACS is included on [FAA CD '97](#).

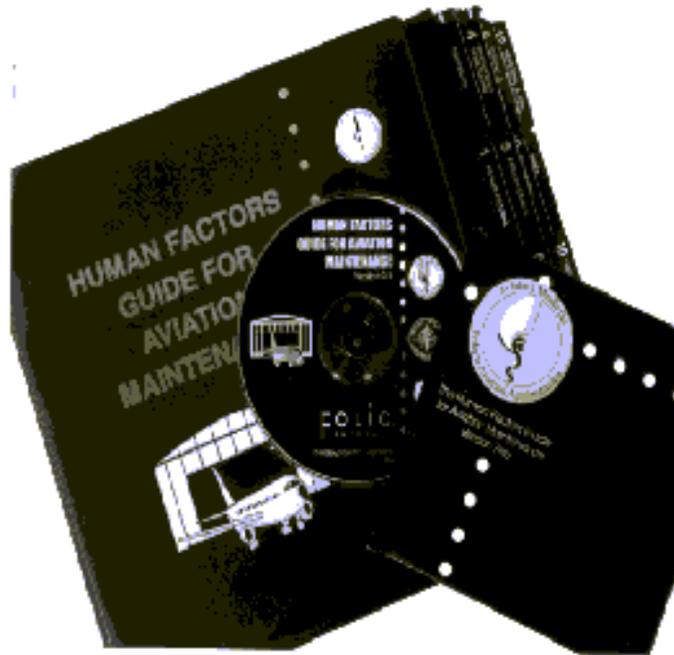


Information Dissemination Products

The research program disseminates reference materials on human factors information to the aviation maintenance community at large. These reference materials can be used by people throughout the maintenance organization.

Human Factors Guide

Industry participants involved with the FAA Human Factors in Aviation Maintenance research program requested practical human factors guidance that could be used on the shop floor. In addition, maintenance managers requested information that could be used to make informed decisions with respect to human factors issues in aviation maintenance, including pointers on where to find additional information or help. *The Human Factors Guide for Aviation Maintenance* was first completed and published in 1995. Three additional chapters were added in 1996 to make fifteen in all (see [Figure 8](#)). The *Guide* is designed to be used in aviation maintenance environments and is written for maintenance management. However, it contains information and guidance that can be used by people with various responsibilities within maintenance organizations. The *Guide* is available in hardcopy, on CD-ROM, and on the internet at <http://www.hfskyway.com>.



[HFAMI Web Site](#)

The Human Factors in Aviation Maintenance and Inspection (HFAMI) Web site is an on-line information exchange for the Human Factors in Aviation Maintenance Research Program. It includes an interactive forum for human factors professionals as well as a repository for electronic and multimedia reference documents and programs. The HFAMI web site has been accessed over 1 million times since January 1997.

- Chapter 1. Human Factors
- Chapter 2. Establishing a Human Factors Program
- Chapter 3. Workplace Safety
- Chapter 4. Shiftwork & Scheduling
- Chapter 5. Facility Design
- Chapter 6. Work Design 3
- Chapter 7. Training
- Chapter 8. Testing & Troubleshooting
- Chapter 9. Automation
- Chapter 10. Disabilities
- Chapter 11. Sexual Harassment
- Chapter 12. Personal & Job-Related Factors
- Chapter 13. Communication
- Chapter 14. Human Error
- Chapter 15. Information Transfer

Figure 8. Human Factors Guide Chapters

Hypermedia Information System (HIS)

Government, industry, and academic personnel have requested a means for easy access and search of all of the research results. Thus the Hypermedia Information System was developed. HIS is an electronic reference of over 4,000 pages of publications from the Human Factors in Aviation Maintenance research program, including phase reports and conference proceedings. HIS makes it easy to find information about specific topics with its hypermedia links and fast, full-text search engine. HIS is updated annually on the [FAA](#) Human Factors Issues in Aircraft Maintenance and Inspection CD-ROMs.



Communication and Harmonization Products

Annual conferences have been the standard forum for providing communication of research results and industry needs. Eleven Human Factors Issues in Maintenance and Inspection conferences have been conducted, as listed in [Table 3](#).

Table 3. Human Factors Issues in Maintenance and Inspection Conferences

TOPIC	LOCATION	DATES
Human Factors Issues in Aircraft Maintenance & Inspection	Washington, DC	October 12-13, 1988
Information Exchange and Communications	Alexandria, VA	December 13-14, 1989
Training Issues	Atlantic City, NJ	June 12-13, 1990
The Aviation Maintenance Technician	Alexandria, VA	December 12-13, 1990
The Work Environment in Aviation Maintenance	Atlanta, GA	June 19-20, 1991
Maintenance 2000	Alexandria, VA	January 22-23, 1992
Science, Technology, and Management: A Program Review	Atlanta, GA	August 5-6, 1992
Trends and Advances in Aviation Maintenance Operations	Alexandria, VA	November 16-17, 1993
The Human Factors Guide	Albuquerque, NM	November 8-9, 1994
Maintenance Performance Enhancement and Technician Resource Management	Alexandria, VA	January 17-18, 1996
Human Error in Maintenance	San Diego, CA	March 11-12, 1997