ANG The Future of the NAS Starts Here

FAA Office of NextGen (ANG)

REDAC / Human Factors

ATC Tech Ops

BLI Number: A11i

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ATC Technical Operations Human Factors Overview

What are the benefits to the FAA

- Improving the safety and efficiency of complex ATC systems by application of R&D to address factors affecting human performance in air traffic control operations and ATC system maintenance through improved guidance, selection, and training.
- Recommending and testing improvements to design, procedures, training, selection and placement; and mitigations to address human performance shortfalls.

What determines program success

- R&D Sponsors and Stakeholders in the ATO are able to make important workforce policy, acquisition, and operational management decisions based on the results of thorough, timely, and focused R&D efforts.
- When programs embrace human factors processes and requirements during system acquisition, they reduce human factors risks.
- Reducing human factors risks increases the likelihood for successful system implementation and operation, while reducing the likelihood for system design and engineering rework.

ATC Technical Operations Human Factors Program Support

People:

- Program Manager: Karl Kaufmann
- Project Managers: Sabreena Azam, Reshma Kumar, Deborah Shaibe
- Subject Matter Experts: Bill Kaliardos
- Program Support: LaTesha Holloman, Lauris Williams, Marlo Allen

Laboratories:

- ANG-E5B Human-Systems Integration Branch, Aviation Research Division Research and Development Human Factors Laboratory
- AAM-520 NAS Human Factors Safety Research Laboratory
- John H. Volpe National Transportation Center

Current FY23 Accomplishments

- Human Autonomy Teaming : A Literature Review
- A Handbook for Signal Design: Alarms Alerts, and Warnings in Air Traffic Control
- A Structured Interview for Alarm Design – peer reviewed journal submission
- Completed update to FAA HF-STD-001 on requirements for displays, testing, maintenance and training
- “Stress Mitigation Efforts for FAA Academy Students” accepted for presentation at American Psychology Association annual meeting
- “Adapting the FAA-HF-STD-010A Standard Color Palette to Daytime Illumination” technical report completed
- “Operational Usability Assessment of the New Color Standard for Primary Terminal Air Traffic Control Displays” technical report completed

Anticipated Research in FY24

Planned Research Activities

- ATO/ATC Workload and Fatigue Research
- ATC Human Factors R&D Support for FAA Response to NTSB Report AIR-18-01 Recommendations
- Human-Machine Teaming Knowledge Base
- Human Factors Guidance for AI/ML in the Human-Automation ATC Systems Context
- ATC Alarms and Alerts Design

Expected Research Products

- Operational ATC Workload and Fatigue Assessment
- ATO Fatigue Mitigation Effectiveness Evaluation
- Inventory of Missing Information Needed by ATC
- FAA Human-Machine Teaming Research Capability Needs
- Methodology for Identifying Safety Critical Information in ATC
- Human Factors Design Guidance for AI/ML based Automation in ATC
- Alarms and Alerts Handbook & Controller Training

Anticipated Research in FY24

Planned Research Activities

- Effective Integration of Human Factors Engineering into System Development Acquisition
- Tower Controller Visual Scanning Instructional Methods
- Training for ATC New Hires on Common Competencies: Proficiency Level of Academy Graduates
- ATSS and ATCS Competency Alignment
- Air Traffic Control System Command Center (ATCSCC) Training Needs Analysis

Expected Research Products

- Web-based Program Management, Systems Engineer, and HF Practitioner Guidance
- ATCT Visual Scanning Training Tool and Evaluation Report
- ATC Competency Model Report
- ATSS Competency Model Report
- ATCSCC Task Analysis and Training Needs Recommendations Report

Anticipated Research in FY24

Planned Research Activities

- Develop and Document an Efficient and Cost-Effective Job Analysis Methodology
- PIREP Information Display (PID) Assessment
- Tech Ops Safety Culture Assessment
- Augmented and Virtual Reality Technologies in Technical Operations – Training
- Augmented and Virtual Reality Technologies in Technical Operations - Technical Support
- Stress Management

Expected Research Products

- Technical Report on Job Analysis Methodology
- PID Tool Post-Implementation Report
- Safety Culture Focus Groups and Survey Report
- Tech Ops VR/AR Training Report and Recommendations
- Tech Ops VR/AR Technical Support Report and Recommendations

Anticipated Research in FY25

Planned Research Activities

- ATC Task and Workload Management
- Cognitive Skills Degradation
- Controller Response to Stress

Expected Research Products

- Report on Workload Management Best Practices
- HF Assessment of Task and Workload Management Vulnerabilities in ATC
- Recommendations for Mitigating Task and Workload Management in ATC
- Identification of Potential Cognitive Skill Degradation Vulnerabilities in ATC from Information Automation
- HF Recommendations for Information Automation System Design, Procedures, and Training
- Recommendations for Stress Management Interventions, Mitigations, and System Design
- Effectiveness Evaluation of Stress Management Interventions, Mitigations, and System Design

Emerging FY26 Focal Areas

- Expanded Use of Alternative Training Delivery Systems – Increased use of AR/VR and remote learning alternatives to reduce training cost while improving training effectiveness (skill acquisition and skill retention)
- Human Factors Research To Support Adoption and Implementation of Virtual and Augmented Reality Applications across multi-disciplinary areas (e.g., training and remote maintenance)
- Continued Exploration of Automation Impacts on Controller Performance and Development of Mitigations – Increase controller and controller team performance with alternative procedures and other mitigations to address increases in system automation and less frequent need for coordination among adjacent control positions
- Display Input Display End Coordination Alternatives for the TRACON environment – Develop guidance on Advanced Automation with AI and ML Capabilities
- Informed by ATO research requirements

ATC/Tech Ops Human Factors

Research Requirements

- The Program strives to provide useful human factors R&D results that support the ATO's development and implementation of new technologies and procedures in the national airspace in accordance with FAA Order 9550.8.
  - Improved safety, reduced hazards and error mitigation in ATC
  - Automation effects and controller performance
  - Improved design and operation of ATC systems
  - Improved controller selection and training
  - Controller and technical operations workforce optimization.
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Outputs/Outcomes

- Guidance document on Advanced Automation with AI and ML Capabilities
- HF assessment and recommendations report to help facilitate adaptation of VR/AR applications across multi-disciplinary areas.
- A HF comparison analysis between existing TRACON Display End Coordination Alternatives and industry. Accompanied with a recommendations report identifying down selection of modern alternatives for the TRACON environment.

FY 2026 Planned Research

- Controller Job Performance Standards
- Human Factors Research To Support Adoption and Implementation of Virtual and Augmented Reality Applications across multi-disciplinary areas (e.g., training and remote maintenance)
- Continued Exploration of Automation Impacts on Controller Performance and Development of Mitigations
- Display Input Display End Coordination Alternatives for the TRACON Environment

Out Year Funding Requirements

	FY23	FY24	FY25
RE&D	$ 5.9M	$ 5.9M	$ 5.9M