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FAA Office of NextGen (ANG)

REDAC / NAS Ops

Review of FY2023 – 2026 Proposed Portfolio

ATC Tech Ops

BLI Number: A11i

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ATC / Technical Operations Human Factors Overview

What are the benefits to the FAA

- Analysis products inform FAA personnel who are responsible for developing and updating air traffic control (ATC) / technical operations (Tech Ops) policy, guidance, standards, training, procedures, job aids, and other material

What determines program success

- Enhancing human factors integration through research and development (R&D), applied engineering activities, and robust collaborations to:
  - Support safe integration of technology, operations, procedures, and training.
  - Provide targeted recommendations for improvement.
  - Identify human factors shortfalls and recommend possible mitigations.

ATC / Technical Operations Human Factors Program Support

Points of contact

- Program Manager: Karl Kaufmann
- Project Managers: Sabreena Azam, Reshma Kumar
- Subject Matter Expert: Bill Kaliardos
- Program Support: Kevin Siragusa, Lauris Williams, Marlo Allen

Research laboratories

- ANG-E25 Human Factors Branch, Aviation Research Division Research and Development Human Factors Laboratory
- AAM-520 NAS Human Factors Safety Research Laboratory
- John A. Volpe National Transportation Systems Center

Current Accomplishments in FY24

Final technical reports

- Develop and document an efficient and cost-effective job analysis methodology

Scientific and technical proceedings

- *Validation of a new method for designing air traffic control alarms* - published in Transportation Research Interdisciplinary Perspectives, November 2023
- *Creation of a Novel Microburst Alarm for Air Traffic Control Using a Signal Design Framework* –submitted to Transportation Research Interdisciplinary Perspectives for publication

https://www.cnbc.com/video/2022/06/14/an-inside-look-at-how-the-faa-and-airlines-deal-with-bad-weather.html

Research Continuing in FY24

Research Activities

- Human factors guidance for artificial intelligence (AI) / machine learning (ML) in the human-automation ATC systems context
- Effective integration of human factors engineering into system development acquisition
- ATC alarms and alerts design
- Controller visual scanning instructional methods

Expected Research Products

- Human factors design guidance for AI/ML based automation in ATC
- Alarms and alerts handbook & controller training
- Web-based program management, systems engineer, and human factors practitioner guidance
- Airport traffic control tower (ATCT) visual scanning training tool and evaluation report

https://www.ainonline.com/aviation-news/air-transport/2017-10-18/though-airlines-slow-equip-faa-plans-future-ads-b

Research Expected to Conclude in FY24

Research Activities

- Air Traffic Control System Command Center (ATCSCC) task analysis
- Training for ATC new hires on common competencies: proficiency level of academy graduates
- Airway Transportation Systems Specialist (ATSS) competency model
- Pilot report (PIREP) Information Display (PID) assessment
- ATC Human Factors research and development support for FAA response to NTSB/AIR-18/01 recommendations

Expected Research Products

- ATCSCC task analysis and training needs recommendations report
- ATC competency model report
- ATSS competency model report
- PIREP PID post implementation report
- ATC best practices report

https://www.ainonline.com/aviation-news/air-transport/2017-10-18/though-airlines-slow-equip-faa-plans-future-ads-b

Research Expected to Conclude in FY24 (continued)

Research Activities

- Augmented and Virtual Reality (AR/VR) technologies in Technical Operations – training
- AR/VR Technologies in Technical Operations - technical support
- Stress management – academy students
- Stress management – field training effectiveness

Expected Research Products

- AR/VR Applications - training and technical support reports
- ATSS competency model report
- ATCSCC task analysis and training needs recommendations report
- Academy student stress management training effectiveness
- Controller stress management training effectiveness in field

https://www.ainonline.com/aviation-news/air-transport/2017-10-18/though-airlines-slow-equip-faa-plans-future-ads-b

Anticipated Research in FY25

Planned Activities

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

Expected 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

https://www.volpe.dot.gov/our-work/air-traffic-systems-and-operations/air-traffic-management-systems

Emerging Focal Areas in FY26

- 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

https://www.radarbox.com/blog/us-domestic-air-traffic-posts-strong-growth

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.

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

	FY24 (Enacted)	FY25 (President's Budget)	FY26 (CIP)
RE&D	$ 5.9M	$ 5.9M	$ 5.9M