



**Federal Aviation  
Administration**

# REDAC / HF Subcommittee

## *Review of FY 2021 Proposed Portfolio*

### ***A11.h Air Traffic Control / Technical Operations Human Factors***

***BLI Number: 8BA000 (Core Program)***

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# ATC / Tech Ops Human Factors – Core Program Overview

- Purpose:
  - To provide technical sponsors with timely and appropriate R&D products and consultation services, as identified by the ATO Human Factors R&D Roundtable and ANG-C management, that improve safety and efficiency of complex ATC systems
  - Provide support to Human Factors efforts for FAA acquisition programs through In-Service Review (ISR) Checklist human factors approval responsibility, and Acquisition Management System (AMS) Policy updates
- Methods used:
  - Measuring individual and team performance of air traffic controllers and technical operations specialists.
  - Recommending and testing improvements to design, procedures, training, selection and placement; and mitigations to address human performance shortfalls.

# ATC / Tech Ops Human Factors Benefits

## 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 by:
  - ✓ Recommending and testing improvements to design, procedures, training, selection and placement
  - ✓ Developing mitigations to address human performance shortfalls

## What determines program success:

- ✓ Research results inform ATO sponsors and stakeholders who make important workforce policy and acquisition decisions.
- ✓ Acquisition program offices embrace human factors processes and requirements during system acquisition and technical refresh efforts, increasing likelihood for successful system implementation and operation, while reducing the potential for system design and engineering rework.

# ATC / Tech Ops Human Factors – Core Program Team

## ATO Sponsors/ATO HF Roundtable Members

<b>AJF*</b>	Flight Program Operations	<b>AJR*</b>	System Operations Services
<b>AJG</b>	Management Services	<b>AJT</b>	Air Traffic Services
<b>AJI</b>	Safety and Technical Training	<b>AJV*</b>	Mission Support Services
<b>AJM</b>	Program Management Office	<b>AJW</b>	Technical Operations
<i>* New to ATO Roundtable in FY2019</i>			

## ANG-C1 Program Management:

- ✓ BLI PM – Dan Herschler

## FAA Research Performers:

- ✓ FAA Civil Aerospace Medical Institute (CAMI)  
Aerospace Human Factors Research Division (AAM-500) AAM-520 –  
Jennifer Myers, Manager
- ✓ FAA William J. Hughes Technical Center  
Aviation Research Division (ANG-E2), Human Factors Branch ANG-E25 –  
Kenneth Allendoerfer, Manager



# ATC / Tech Ops Human Factors Focus Areas

- ✓ The program addresses R&D needs within five focus areas:
  1. Human Factors Standards
  2. Workforce Optimization – Human Factors Efforts
  3. Improved Safety – Human Factors Efforts
  4. Human Factors in NAS Technology Integration
  5. Human Performance Enhancement
- ✓ The program also supports efforts for FAA acquisition programs through ISR Checklist human factors approval responsibility, and AMS Policy updates



# FY2019 Research Requirements

Service Unit	Title	Provider	New or Continuing
AJI	Identify Human Factors Issues for Integrating Remote Towers into Operations	CAMI	NEW
AJI	Controller Visual Scanning Instructional Methods Research	CAMI	CONTINUING
AJI	ATO Recovery Effectiveness Study	ANG-E25	NEW
AJI	Human Performance Assessment Pertaining to Wrong Surface Landings	ANG-E25	NEW
AJM	Optimizing Air Traffic Control Information Presentation	ANG-E25	CONTINUING
AJI	ATO Fatigue Mitigation Effectiveness Study	ANG-E25	CONTINUING
AJI	ATC Field Training Effectiveness	CAMI	CONTINUING
AJG	ATCS Longitudinal Database	CAMI	CONTINUING
AJM	Color Palette and Palette Deployment	ANG-E25	CONTINUING
AJI	Evaluation of innovative ATCS aptitude assessments	CAMI	NEW
AJG	AJW Reassessment of 2101 ATSS JTA	CAMI	NEW
AJM	Capability Utilization Analysis	ANG-E25	CONTINUING
AJM	Integration of alarms and alerts into air traffic systems	Universities	CONTINUING
AJF	Workflow process efficiencies for scheduled aircraft inspections	Industry	NEW
AJM	Follow-up Capability Utilization Analysis	ANG-E25	CONTINUING
AJG	ATCS Selection Process Evaluation	CAMI	CONTINUING
AJT	Changing roles and tasks in Trajectory Based Operations (TBO)	CAMI	NEW
AJF	Aircraft Inspection Work/Task labor standards	Industry	NEW
AJM	Update HFDS Chapter 5 "Displays and printers" section	ANG-E25	CONTINUING
AJM	Integration of decision support tools and procedures into air traffic systems	ANG-E25	CONTINUING
AJF	Training issues for multiple aircraft/multiple missions at ACY	ANG-E25	NEW
AJF	Use of PEDs in the cockpit and risks of distraction; how to maximize benefit vs risk	CAMI	NEW
AJW	Revising HF Style Guide for New ATO Equipment	ANG-E25	CONTINUING

# Anticipated Research in FY2020

## Planned Research Activities

- ✓ Start AJF-sponsored project to develop a method for establishing normative aircraft maintenance and inspection task performance times and work flows
- ✓ Evaluate controller selection in relation to predictors of FAA Academy and field training success, and use the results to identify potential areas for AJG and AHR to improve the selection process
- ✓ Conduct simulation research to identify and recommend mitigations to AJM for operator and maintainer performance risk posed by ATC automation

## Expected Research Products

- ✓ Provide recommendations to AJI and ATO facility managers to address training environment challenges that adversely affect performance of developmental and CPC-IT controllers during field training
- ✓ Provide guidance for improved learning and transfer of training using ATC training games and applications (Apps) to develop and augment controller knowledge and skills

# Emerging FY2021 Research Needs

Focus Area	Project	Description	Expected Output
Improved Safety	UAS integration with ATC	Conduct human performance modeling research to identify potential controller workload impacts when UAS are operating in controlled airspace, for a variety of UAS missions and numbers of UAS that are simultaneously operating, beginning in the TRACON environment	Report of modeling results including recommendations for future HITL research to confirm the predicted impacts on controller workload
Improved Safety	UAS integration with ATC	Develop a research plan to evaluate operational safety considerations for UAS operations, focused on ATC human performance impacts in current operations	Research plan to guide future study UAS operations on ATC human performance
HF Standards	Air Traffic Management Displays	Conduct research on human factors literature and a survey of best practices for integrating data of various types on Traffic Management displays to support traffic management decision making, and propose new and revised requirements for design characteristics of traffic management displays.	Report identifying data needed to support traffic management decision making (e.g., weather, traffic management initiatives, special use airspace activations), with recommendations for display design requirements providing for the most effective ways to depict these data types on an integrated dynamic display.
Workforce Optimization	Controller selection and training	Conduct research to analyze field training success as a function of performance in training at the Academy and measures of cognitive skill and personality	Report recommending additional research on promising selection measures
Workforce Optimization	Controller student performance evaluation	Conduct research to evaluate and recommend improvements to student performance evaluations at the Academy's ATC Lab, focusing on reliability of instructor ratings	Report recommending training standardization methods for improving inter- and intra-rater reliability
Workforce Optimization	ATSS job task analysis	Conduct research to update the 2016 job/task analysis (JTA) for non-supervisory field system specialists (2101) in view of Tech Ops future concept of operations, updated maintenance concepts, and new systems introduced by NextGen programs	Report with updated 2101 field JTA with technical report describing the changes in KSAOs from the 2016 baseline
Workforce Optimization	ATSS training	Conduct research to analyze ATSS training data to identify potential criterion measures for success in training, including performance and time to achieve certification	Report recommending training success criterion measures for the ATSS
Workforce Optimization	Controller field training	Conduct research to identify training best practices for improved ATC field training effectiveness	Training recommendations report



# Emerging FY2021 Research Needs (continued)

Focus Area	Project	Description	Expected Output
Human Performance Enhancement	Air traffic controller training in cognitive skills	Conduct laboratory research to identify age-related cognitive skills and abilities that predict success or failure in the ATC occupation, and make recommendations for future training and selection research	Report on age-related cognitive skills and abilities that predict success or failure in ATC
Human Performance Enhancement	ATCSCC personnel training for time-based metering	Conduct research to identify time-based metering skills for ATCSCC personnel, within their roles and responsibilities in coordinating time-based flows with facilities throughout the NAS to inform requirements for scenario-based training. (Ref MITRE Report MP 180686)	Report on ATCSCC job skills, roles, and responsibilities with recommendations for scenario-based training for ATCSCC staff
Improved Safety	Addressing air traffic controller performance factors contributing to wrong surface runway safety events	Conduct research to identify and address knowledge gaps about ATC human performance contributions to wrong surface runway safety events	Report about ATC human performance contributions to wrong surface runway safety events with recommendations for further study and simulations to identify mitigations
Improved Safety	Research on the relation between perceived air traffic controller workload and perceived fatigue	Conduct controller survey studies to determine the extent to which perceived controller workload contributes to perception of fatigue	Report of study results showing relation between ATC workload and controller fatigue
HF Standards	Air Traffic Control system automation requirements	Conduct research on human factors literature to identify relevant findings, and propose new and revised requirements for design characteristics of automation in ATC systems, as an update to the Human Factors Design Standard (HF-STD-001B) section 5.1 Automation.	Revision to HFDS to include update to section 5.1 Automation
HF in NAS Technology Integration	STARS user interface optimization	OAIP STARS: Conduct research to expand the Optimization of Air Traffic Information Presentation (OAIP) project to address the STARS user interface	Report documenting STARS user interface characteristics that are inconsistent with human factors design requirements, probable impacts on controller performance, and recommended mitigations
HF Standards	Air Traffic Control system display requirements for visual coding of dynamic information	Conduct research on human factors literature to identify relevant findings, and propose new and revised requirements for design characteristics of displayed information in ATC systems, as an update to the Human Factors Design Standard (HF-STD-001B) section 5.6 Computer-Human Interface.	Revision to HFDS to include update to section 5.6 Computer-Human Interface, including but not limited to visual coding of dynamic displays (e.g., weather, traffic) to clearly indicate what is historic, current, and forecast information

# A11.i – Air Traffic Control/Technical Operations Human Factors, Base Program - RE&D

## FAA Strategic Initiatives

Priority 1: Make Aviation Safer and Smarter  
 Priority 2: Deliver benefits through Technology and Infrastructure  
 Priority 4: Empower and innovate with the FAA's people

### Need

The ATC/TO Human Factors research program supports FAA strategic goals for increased safety and greater capacity by developing research products and promoting the use of those products to meet the future demands of the aviation system.

## Research Goals

Standards - Implement human factors standards for design requirements for new and modified air traffic control systems

Workforce Optimization – Provide research results to ATO and FAA Academy sponsors on policies affecting controller and technician recruitment, selection, placement, staffing, and performance evaluation

Improved Safety – provide recommendations to improve procedures and operating practices for ATC and Technical Operations personnel

Human Factors in NAS Technology Integration - Provide methods and tools to support air traffic control system acquisition programs as they address human factors during concept development, including prototyping and scenario evaluations

Human Performance Enhancement - Identify minimum qualification standards of performance of ATC and Technical Operations personnel (e.g., initial training)

## FY 2021 Accomplishments

Evaluate controller selection in relation to predictors of FAA Academy and field training success, and use the results to identify potential areas for ATO Management Services and FAA Human Resources to improve the selection process.

Research the relation between perceived controller workload and fatigue and provide recommendations to the ATO for the management of fatigue-inducing workload using FRMS strategies.

Identify STARS user interface characteristics that are inconsistent with human factors design requirements, probable impacts on controller performance, and recommended mitigations for use by the ATO Program Management Office

Conduct research to identify and address knowledge gaps about ATC human performance contributions to wrong surface runway safety events and provide training and other recommended mitigations to the ATO Safety and Technical Training office

Provide display design research results to support traffic management decision making (e.g., weather, traffic management initiatives, special use airspace activations), with recommendations for providing for the most effective ways to depict these data types on an integrated dynamic display.

## Out Year Funding Requirements

	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
<b>Funding Target (\$000)</b>	TBD	TBD	TBD	TBD	TBD