REDAC / NAS Ops

Review of FY 2021 Proposed Portfolio

Air Traffic Control / Technical Operations Human Factors

BLI Number: A11.i

Dan Herschler, ANG-C1

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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.
- 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 and acquisition 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.

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Overview Capabilities

People:

- Program Manager – Dan Herschler, ANG-C1
- Subject Matter Expert – Bill Kaliardos, ANG-C1

Laboratories:

- ANG-E25 Human Factors Branch, Aviation Research Division Research and Development Human Factors Laboratory
- AAM-520 NAS Human Factors Safety Research Laboratory

Air Traffic Control / Technical Operations Human Factors – Expected Accomplishments in FY18

- Develop ATC Academy student stress management training manual and training program materials for use by AJG-P2 on-boarding team
  - Target 1: Deliver ATC stress management training manual – March 31, 2018
  - Target 2: Deliver materials for ATC new hire stress management training (instructor guide with slides containing material extracted from manual and exercises) – September 30, 2018

- Initiate analyses of trainee performance data to inform planning for a study to improve consistency and accuracy of instructor ratings of ATC student performance in training.
  - Provide analyses of trainee final scores in initial qualifications training as a function of student and course characteristics to AJI-2 and AMA-500
  - Provide rater training on biases and errors to Academy raters.

- Demonstrate a Systematic Analysis Method for Evaluating Adoption and Use of Air Traffic Automation Systems' Capabilities
  - Develop method for mining data from fielded systems (e.g., ERAM) to identify usage levels and behavior for selected ATC system functions. Demonstrate use of the method to calculate frequency of use, effectiveness, number of errors, novel uses of capabilities.
  - Identify ways to encourage more frequent or more effective use of new ATC system features and provide feedback to programs on systems / procedures that pose problems for users.

- Provide a report "Human Factors in the Assessment of Remote Towers: Initial Lessons Learned," based on:
  - Human factors consultation support provided to the ANG-C5 team from assessments of the Remote Tower Services (RTSs) at Leesburg, VA and Fort Collins, CO
  - Participation in RTS Safety Risk Management Panels

- Publish the ATC Display Color Standard (FAA-HF-STD-010) (December 2017)

- Evaluate the costs and benefits of the AT-CTI program relative to the program goals for 2006 through 2013.

- Complete a Strategic Work Analysis for Technical Operations, NAS Security and Enterprise Operations (NASEO)
  - Provide information to the AJW sponsor on the roles and responsibilities and associated competencies of the Enterprise Control Center (ECC) employees who are responsible for managing the SWIM, Voice and Data Com, and surveillance and navigation service centers.

Anticipated Research in FY19

Planned Research Activities

- Conduct analyses and develop recommended practices for facility managers to increase the likelihood that controller trainees will succeed in field training, such that trainees are not lost due to factors other than their ability to control air traffic.
- Conduct targeted analyses to support data-driven decision making at the FAA Academy's Air Traffic Division, to document and provide recommendations for improving the reliability of raters who evaluate ATC student performance.
- Develop data mining methods to obtain and evaluate controllers' use of new equipment and system functions that provide additional air traffic control capabilities, and develop an approach for analyzing the data that will provide insights to acquisition programs and operational evaluation teams about which capabilities have been under-used as well as some of the operational human factors aspects that may limit their use.
- Identify and analyze elements of air traffic control system user interfaces that may introduce human error potential in ATC operations, and recommend candidate elements for additional evaluations through high fidelity human-in-the-loop simulations that include multiple new systems and functions.
- Develop a human factors handbook for design of alarms and alerts for air traffic and technical operations system displays, to be applied on future acquisition programs.

Expected Research Products

- Recommended practices for facility managers to help trainees succeed in field training
- Improved rater reliability and performance evaluation standards for Academy raters of student performance
- Recommended approach and methods for obtaining data on controllers' use of new equipment and system functions to identify potential challenges in use of fielded systems
- Recommendations for redesign of controller CHI to achieve user-system performance objectives
- Draft human factors handbook for design of alarms and alerts

Anticipated Research in FY20

Research to Improve Air Traffic Controller Selection, Training, and Performance

- Evaluate controller selection in relation to predictors of FAA Academy and field training success, and use the results to identify potential areas for the Air Traffic Organization (ATO) technical sponsor and FAA Human Resources (AHR) to improve the selection process.

- 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.

- Recommend improvements to controller visual scanning techniques to reduce runway incursions and loss of standard separation at tower-controlled airports.

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

- Provide recommendations to the ATO's Program Management Office for display of information to the controller, based on findings from human-in-the-loop simulations using multiple controller decision support tools and capabilities presented on large screen (43 inch) air traffic control displays.

Research to Develop Technical Operations Workforce Requirements and Capabilities

- Support selection and training of ATSS personnel by conducting a Strategic Job Analysis for ATSS 2101 to integrate the NAS Security and Enterprise Operations (NASEO) Workforce. Anticipated outcomes include reduced attrition and training times for new personnel to achieve full qualification, while reducing costs for selection and training efforts. Anticipated benefits also include system support (i.e., greater NAS component availability) to promote the efficient delivery of air traffic services throughout the NAS.

Emerging FY21 Focal Areas

- **Develop Technical Operations Workforce Skills for Setting Maintenance Priorities**
  - Develop maintenance triage decision and task management guidance with AJW subject matter experts.
  - Validate application of maintenance guidance in AJW-specified workforce using focused workshops and follow-up surveys.

- **Update the Human Factors Design Standard**
  - Address latest research and methods for guiding implementation of air traffic controller automated tools in an update to section 5.1 Automation.

Emerging FY21 Focal Areas (cont.)

- **Identify and Mitigate Automation Effects on Controller Performance**
  - Mine available system data and conduct site visits to determine what automation effects exist that limit controller performance
  - Conduct small scale simulation study to test mitigations (CHI changes, procedures, training methods)

- **Continue Runway Safety Research on Effective Controller Scanning**
  - Validate and recommend best-practices and evaluation techniques for visual scanning
  - Initiate research on visual scanning for multiple remote towers at a single control facility

Emerging FY21 Focal Areas (cont.)

- **Develop Controller Selection Tools that Predict Performance at First Field Facility**
  - Evaluate commercially available cognitive, psychomotor, and relevant job sample tests for predictive utility in the air traffic control job for tower, TRACON, enroute, and traffic flow management controllers.
  - Conduct validation studies of prospective air traffic controller selection tools using Academy and field training success as effectiveness criteria

Air Traffic Control / Technical Operations Human Factors

Research Requirement

Standards - Implement human factors standards for design requirements for new and modified air traffic control systems
Workforce Optimization – Provide research results to ATO sponsors and FAA Academy and AHR stakeholders 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 job tasks and minimum qualification standards of performance for ATC and Technical Operations personnel (e.g., initial training)

Outputs/Outcomes

1. Recommended practices for facility managers to help trainees succeed in field training
2. Improved rater reliability and performance evaluation standards for Academy raters of student performance
3. Recommended approach and methods for obtaining data on controllers' use of new equipment and system functions to identify potential challenges in use of fielded systems
4. Recommendations for redesign of controller CHI to achieve user-system performance objectives.

FY 2019 Planned Research

- Conduct analyses and develop recommended practices for facility managers to increase the likelihood that controller trainees will succeed in field training, such that trainees are not lost due to factors other than their ability to control air traffic.
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Out Year Funding Requirements

FY19	FY20	FY21	FY22	FY23
$0.143 M	TBD	TBD	TBD	TBD