REDAC / Human Factors

Review of FY 2018 Proposed Portfolio

Air Traffic Control / Technical Operations Human Factors

BLI Number: 8BA000 (Core Program)

Dan Herschler, ANG-C1

March 29, 2016

ATC / Tech Ops Human Factors – Core Program Overview

- **Purpose:**
  - To provide technical sponsors with timely and appropriate R&D products and consultation services that improve safety and efficiency of complex ATC systems

- **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.
- 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. This increases the likelihood for successful system implementation and operation, while reducing the likelihood for system design and engineering rework.

ATC / Tech Ops Human Factors – Core Program Team

ATO Sponsors:

- AJG – Management Services
- AJI – Safety and Technical Training
- AJM – Program Management Office

ANG-C1 Program Management:

- PM - Dan Herschler
- Human Factors Integration Lead - Bill Kaliardos

FAA Research Performers:

- FAA Civil Aerospace Medical Institute (CAMI)
  - Aerospace Human Factors Research Division (AAM-500)
    - » AAM-520 – Carol Manning, 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 Human Factors efforts for FAA acquisition programs through ISR Checklist human factors approval responsibility, and AMS Policy updates**

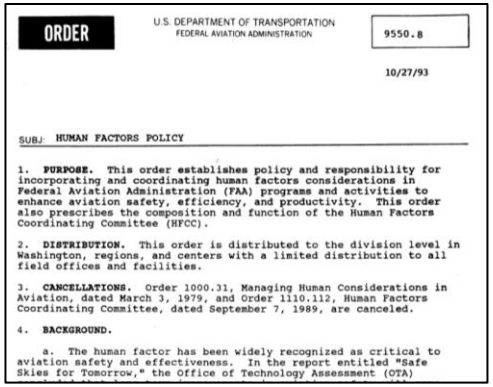
Provide Human Factors Support to FAA Acquisition

Research Requirement

- Promote human factors engagement in acquisition program planning and execution
- Provide advice and guidance to support incorporation of human factors principles and requirements, and the identification and mitigation of human factors issues throughout the AMS Lifecycle.
- Serve as human factors subject matter expert with signature authority on in-service review (ISR) checklist prior to the In-Service Decision milestone.
- Stakeholders: ATO Project Management Office (PMO)

Outputs/Outcomes

- Coordination on AMS HF across Lines of Business
- Consensus-driven HF updates to draft AMS documents
- Through ISR Checklist process: confirm human factors program adequacy and facilitate identification, tracking, mitigation, and resolution of human factors issues on acquisition programs.



ORDER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

9550.8

10/27/93

SUBJ: HUMAN FACTORS POLICY

1. **PURPOSE.** This order establishes policy and responsibility for incorporating and coordinating human factors considerations in Federal Aviation Administration (FAA) programs and activities to enhance aviation safety, efficiency, and productivity. This order also prescribes the composition and function of the Human Factors Coordinating Committee (HFCC).

2. **DISTRIBUTION.** This order is distributed to the division level in Washington, regions, and centers with a limited distribution to all field offices and facilities.

3. **CANCELLATIONS.** Order 1000.31, Managing Human Considerations in Aviation, dated March 3, 1979, and Order 1110.112, Human Factors Coordinating Committee, dated September 7, 1989, are canceled.

4. **BACKGROUND.**

a. The human factor has been widely recognized as critical to aviation safety and effectiveness. In the report entitled "Safe Skies for Tomorrow," the Office of Technology Assessment (OTA)

FY 14/15 Accomplishment / Issues

- Convened Human Factors Acquisition Working Group (Kaliardos) to discuss planned improvements to integrate human factors into 1) AMS guidance for the early phases, and 2) the Safety Risk Management Guidance for System Acquisitions (SRMGSA) document.
- Conducted semi-annual Human Factors Reviews to communicate the accomplishments, activities, and challenges for human factors R&D and F&E activities as they support ATO and AVS initiatives and research needs.
- Updated FAA Human Factors Division website https://www.hf.faa.gov to facilitate access to key information.

Out Year Funding Requirements

FY14	FY15	FY16	FY17	FY18
$0	$0	$0	$0	$0

ANG-C1 in-house resources:
Bill Kaliardos, Dan Herschler

HF.1 Human Factors Standards

- **Develop and update human factors standards that convey:**
  - Human factors design requirements for new and modified air traffic control systems.
  - Human factors practices and requirements for contractors who plan and execute human factors efforts to meet air traffic control acquisition program requirements.
- **Update AMS Policy and Guidance that PMO human factors specialists will reference and apply on FAA acquisition programs.**

1.07 Update "Requirements for a Human Factors Program" (FAA-HF-STD-004)

Research Requirement

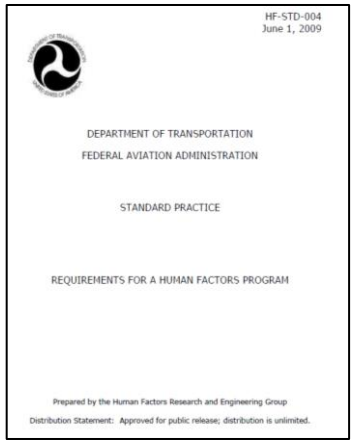
- The purpose of this effort is to update HF-STD-004 "Requirements for a Human Factors Program" that was published in June 2009. The current standard is based on MIL-STD-46855A and as such is more aligned to military procurement than with human factors acquisition contracting in the FAA.
- Updated material addresses lessons learned and best practices from acquisition programs' human factors efforts. The updated standard will guide the PMO in defining SOW requirements for the system acquisition contractors' human factors program activities and deliverables.
- Sponsor: Human Factors Division (ANG-C1)
- Stakeholders: AJM (Acquisition Program offices); HFAWG (Bill Kaliardos)
- POC: Dan Herschler, ATC/TO HF BLI Program Manager, ANG-C1

Outputs/Outcomes

Product:

- Revision A to FAA-HF-STD-004 (6/2016)

  Note: This effort will help the PMO to define SOW requirements for the contractor's human factors program activities and data for FAA system acquisition programs


HF-STD-004
June 1, 2009

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

STANDARD PRACTICE

REQUIREMENTS FOR A HUMAN FACTORS PROGRAM

Prepared by the Human Factors Research and Engineering Group
Distribution Statement: Approved for public release; distribution is unlimited.

FY 14/15 Accomplishment / Issues

- Develop new data item descriptions for human factors activities that are required during system development (e.g., Early User Involvement Events [EUIEs] and Heuristic Evaluations)
- Develop a new section on HF support for system fielding and deployment that addresses HF in site adaptation, system acceptance testing, coordination, in-service support, and post implementation review.
- Add text to clarify responsibilities FAA and acquisition contractor team human factors personnel regarding acquisition program human factors tasks and program support activities.

Out Year Funding Requirements

FY14	FY15	FY16	FY17	FY18
$0	$78K	$0	$0	$0

- Research Performer:
  - WJHTC Aviation Research Division, Human Factors Branch, ANG-E25

HF.2 Human Factors in Workforce Optimization

- Develop recommendations and guidance for ATO and FAA Academy sponsors who are responsible for policies affecting controller and technician recruitment, training, placement, staffing, and performance evaluation.

- Maintain reliable and valid job/task analysis data that support application of FAA policies, and that will withstand potential legal challenges.

- Upon sponsor request, conduct research to identify and recommend alternative approaches where current policies and methods result in adverse impact for employee selection, as required by EEOC Uniform Guidelines in 29 Code of Federal Regulations.

2.04 Training Certification Standards

Research Requirement

- Assess a method for improving air traffic controller training certification rates for roll out across the NAS
- Sponsor: Steve McMahon, DVP Safety and Technical Training , ATO (AJI-1)
- POC: Stephanie Kreseen, Program Manager, ANG-C1
  Nick Lento, Manager (A), ANG-C1

Outputs/Outcomes

Product:

- A complete and vetted collection of training standards
- Research report providing data on the effectiveness of the training standards

Outcomes:

- Increased certification rates
- Reduced time to certification

FY 14/15 Accomplishment / Issues

- Completed initial development of training standards with TRACON SMEs
- Developed and delivered Phase 1 training workshops
  - OJTIs and FLMs received skill enhancement and best practices training
  - Developmentals received learning styles and study skills training

Out Year Funding Requirements

FY14	FY15	FY16	FY17	FY18
$0	$310K	$61K	$0	$0

- Research Performer:
  – National Institute of Aerospace, Evans Inc.

HF.3 Human Factors in Improved Safety

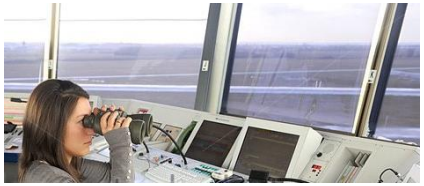
- Identify and characterize safety-related aspects of human capabilities and limitations that impact performance of air traffic control and technical operations personnel in the NAS

- Through analysis and research, support major FAA safety initiatives such as the Runway Safety Call to Action, by developing human factors recommendations and guidance that will improve procedures and training in operational domains where air traffic controllers and pilots interact

3.02 Tower Controller Visual Scanning

Research Requirement

- Numerous safety incidents have led ATO to declare Tower Controller Visual Scanning as a Top 5 Safety issues for FY2016.
- CAMI will review existing information to identify best practices based on what is currently known about visual scanning and what has proven effective for monitoring the airport environment from the air traffic control tower. These best practices will be confirmed in discussion with FAA SMEs.
- Additional human performance data will be obtained in a low-fidelity laboratory simulation study of controller visual scanning patterns.
- The results of these efforts will be combined to produce recommendations and guidance by September 2016 to ATO Safety (AJI-1) for tower controller visual scanning best practices.
- Sponsor: ATO Safety (AJI-155)
- POC: Dan Herschler, ATC/TO HF BLI Program Manager, ANG-C1



Outputs/Outcomes

Product:

- Develop a research plan in conjunction with AJI-155 based on a workshop with field personnel, a review of existing ATC handbook policy, field practices, incident/accident observations and lessons learned.
- Conduct low-fidelity research to test some identified techniques and provide recommendations that AJI-155 can offer to the field for improved scanning

FY 14/15 Accomplishment / Issues

- Tower Scanning was included on AJI's list of the Top 5 ATC Safety Hazards.
- AJI-155 (Jason Demagalski) identified a list of activities on visual scanning in the tower environment that he asked AAM-520 to support.
- This is a new task in FY16.

Out Year Funding Requirements

FY14	FY15	FY16	FY17	FY18
$0	$0	$70K	$0	$0

- Research Performer:
  - CAMI Aerospace Human Factors Research Division AAM-520

HF.4 Human Factors in NAS Technology Integration

- Develop methods and tools to support air traffic control system acquisition program efforts to address human factors during concept development, including prototyping and scenario evaluations.

- Improve human factors laboratory capabilities using state-of-the-art human performance and human factors measurement techniques, to support studies that more robustly evaluate and predict human performance with future NAS technologies and procedures.

4.01 Standardized Scenario Development and Performance Metrics

Research Requirement

- ATO Project Management Office (AJM) requested assistance in developing methods to allow acquisition programs to identify and mitigate human factors concerns before fielding of new and upgraded NAS capabilities.
- ATC technologies and procedures should be subjected to HF evaluations using standardized human performance metrics prior to deployment. New systems should be evaluated against situations as close as possible to those likely to be encountered in the field and should include off-nominal events.
- To meet this need, CAMI is developing and obtaining SME concurrence on operational scenarios that will be used in human factors testing of new NAS technologies and procedures; they also are developing recommended measures of human performance that can be used in evaluations of new ATC capabilities.
- Sponsor: ATO Program Management Office (AJM-352)
- POC: Dan Herschler, ATC/TO HF BLI Program Manager, ANG-C1

Outputs/Outcomes

Products:

- Scenario requirements database
- Validated performance measures
- Technical report and briefing to sponsor

FY 14/15 Accomplishment / Issues

- Completed sector analysis
- Developed 9 example scenarios
- Associated scenario elements with an existing ATC task analysis.

Out Year Funding Requirements

FY14	FY15	FY16	FY17	FY18
$5K	$31K	$0	$0	$0

- Research Performer:
  - CAMI Aerospace Human Factors Research Division AAM-520

HF.5 Human Performance Enhancement

- Develop methods of measurement and assessment criteria supporting evaluation of air traffic controller and technician performance and application in workforce improvement policies.

- Conduct focused research to identify minimum qualifications for specific air traffic control and technical operations jobs and performance in initial training.

5.10 Content Validation of ATSS Common Principles Course to Support Employment Decisions

Research Requirement

- The Vice President of Technical Operations (AJW) would like to implement methods to identify trainees who are likely to be successful in training and certification as an ATSS.
- To meet the AJW requirement under this task, CAMI will determine whether attachment of job jeopardy to ATSS performance in the Technical Operations Common Principles course is supported by content validation.
- If there is a reasonable correspondence between course content and job knowledge and skill requirements, then attachment of job jeopardy to student performance is justified. If there is little correspondence between course content and job requirements, then job jeopardy would not be justified.
- Sponsors: ATO Management Services (AJG-R42)
- POC: Dan Herschler, ATC/TO HF BLI Program Manager, ANG-C1

Outputs/Outcomes

Products:

- Recommendation to AJW on whether to attach job jeopardy to Common Principles (April 2016)
- Common Principles content validation technical report (June 2016)

FY 14/15 Accomplishment / Issues

- American Institutes for Research previously completed subject matter expert (SME) panels and a joint management/labor review panel to identify technician job tasks, knowledge, skills, abilities, and other personal characteristics (KSAOs), and tools and equipment.
- Prepared a Job analysis survey data to identify: (a) the most critical or important job duties/tasks, and (b) the most important KSAOs needed on Day 1 at an SSC.

Out Year Funding Requirements

FY14	FY15	FY16	FY17	FY18
$160K	$0	$0	$0	$0

- Research Performer:
  - CAMI Aerospace Human Factors Research Division AAM-520, American Institutes for Research (AIR)

Anticipated Research in FY16 and FY17

Planned Research Activities (with anticipated completion dates)

- Human Factors Standards:
  - Develop a standard for the use of color on ATC displays using a defined palette of colors which are recognizable, legible, and discriminable by controllers (FY2017)
  - Develop and implement an air traffic control information display and control management design strategy that incorporates best practices and lessons learned from prior and current air traffic user team activities (2019)
  - Expand the work on the air traffic control information display and control management design strategy to achieve agile design characteristics (2020)

- Workforce Optimization:
  - Conduct research to provide data and targeted analyses to support data-driven decision-making at the FAA Academy Air Traffic Division, including documenting and improving the reliability of the raters who evaluate ATC student performance at the end of their initial courses (FY2017)
  - Assess the Radar Vectoring Aptitude Test (RVAT) as a measure of vectoring aptitude and assist in determining its predictive validity, utility, and fairness use in the placement of newly hired air traffic developmental controllers (FY2017).

Anticipated Research in FY16 and FY17

Planned Research Activities (with anticipated completion dates)

- Improved Safety:
  - Evaluate factors related to controller recognition of hazards in the airport traffic area (e.g., via visual scanning) and develop recommendations to improve safety in the airport environment (FY2017).
  - Conduct an ATO fatigue mitigation effectiveness study to determine the extent to which fatigue associated with insufficient sleep remains an issue in ATC/TO work force and whether particular work schedules are associated with greater fatigue (FY2017).

- Human Factors in NAS Technology Integration:
  - Develop a systematic analysis method for evaluating how well the user community is adopting and taking advantage of Air Traffic automation systems' capabilities (FY2017).

- Human Performance Enhancement:
  - Deliver prototype training standards and training performance measures to decrease the attrition rate at large and complex ATC facilities (FY2017).
  - Develop recommendations for increasing the likelihood that controller trainees will succeed in field training to ensure that trainees are not lost due to factors other than their ability to control air traffic (FY2017).

Emerging FY18 Focal Areas

- **Human Factors Standards:**
  - Complete development of an empirically-validated color palette for ATC displays to ensure that displayed information is recognizable, discriminable, and legible for personnel with normal color vision and color-vision deficient personnel
- **Workforce Optimization:**
  - Develop and evaluate the suitability of objective assessments of electronics knowledge and skill levels of newly hired technical operations personnel and applicants (AJW funding)
- **Improved Safety:**
  - Assess the effects of shift work on personnel fatigue and develop recommended mitigations for fatigue effects on performance
- **Human Factors in NAS Technology Integration:**
  - Develop recommendations for a design strategy to optimize presentation of air traffic control information on controller workstation displays, to allow the controller to quickly and accurately process the information.
- **Human Performance Enhancement:**
  - Develop training performance measures and standards to reduce attrition of controllers-in-training at ATC facilities.

Air Traffic Organization

Human Performance

NATCA®

Federal Aviation Administration

ATC/Tech Ops Strategic R&D Plan - F&R Winter 2015 Finding #5

Presented to: HUMAN FACTORS REDAC

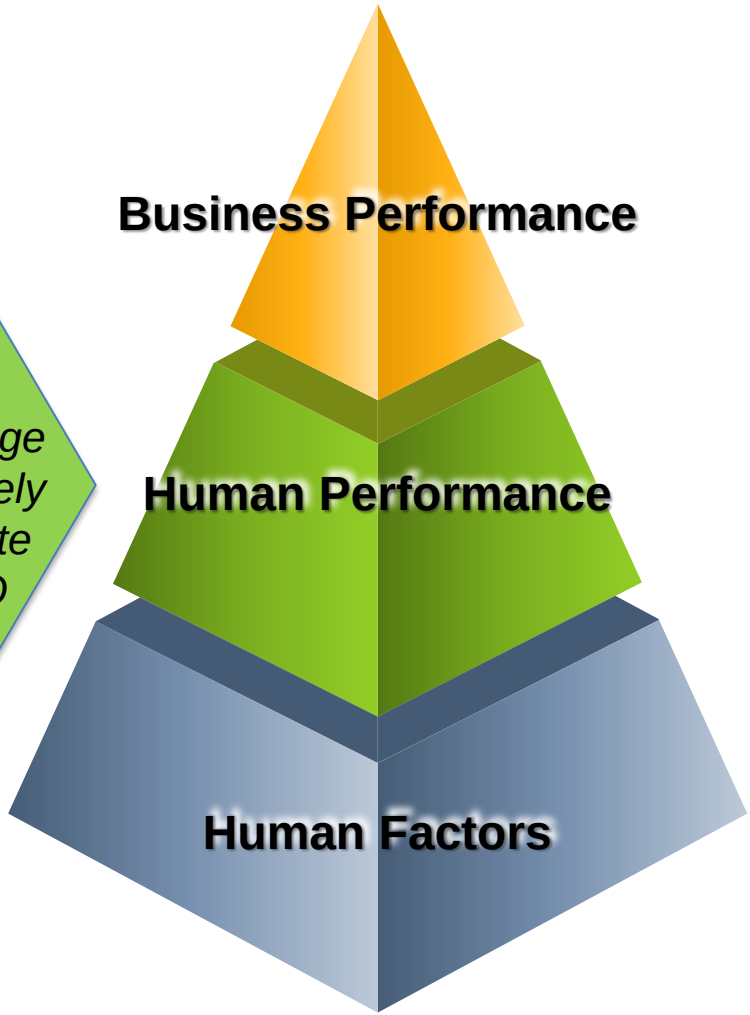
By: Jason Demagalski

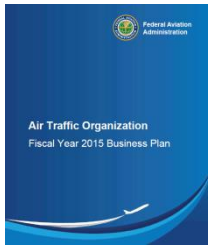
Human Performance Manager
ATO – Safety and Training

Date: Tuesday 29th March 2016

Defining Human Performance

Human Performance *is about using scientific human factors knowledge directly and consultatively to support and contribute to the needs of the ATO and its users*





ATO BUSINESS GOALS

ENABLES

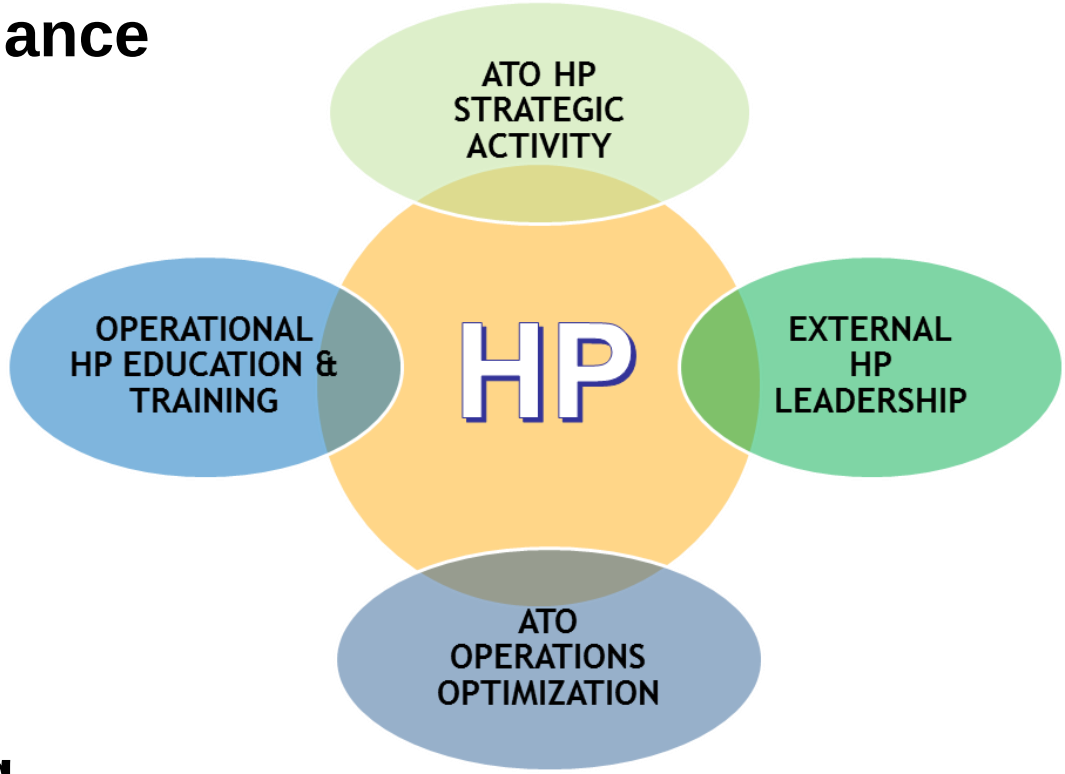
Level of effectiveness achieved by ATO employees in their work

SUPPORTS

Influences that underlie the work of ATO employees and the discipline that optimizes these influences

Human Performance Process Areas

1. ATO Human Performance Strategic Activities
2. External Human Performance Leadership
3. ATO Operations Optimization
4. Operational Human Performance Education & Training



ATO HP Program Elements

Fatigue Risk Management

FULLY CHARGED

ATO Human Performance & Human Factors 2018

- **Human Factors Research Roundtable**
- **Fatigue program**
  - Measuring levels of fatigue and workload in the operation
- **Health and Wellness program**
  - Maximizing performance from operational rest facilities
- **Runway Safety Call to Action**
  - Conduct Human Factors studies to include location of signs, line of sight, familiarity with airport environment, and possible distractions.
  - Determine the extent to which human factors and fatigue represent hazards that were contributory or causal to runway safety events, and recommend corrective actions as appropriate to reduce, control and/or mitigate associated elevated safety risk.
  - Conduct an assessment for factors associated with fatigue and Human Factors and its relationship to runway incursions. Recommend corrective actions, as necessary.

ATO Human Performance & Human Factors 2018 Cont….

- **ATC Training**
  - Training Standards

- **Sources of Research Requirements**
  - Top 5
    - Simulation and/or live research
  - Human Factors Investigations
  - Team Resource Management
  - Human Performance Facility Audits

- **Finding:**
  - A recent finding of the Subcommittee (Spring 2014) applauded the efforts of ATC/Tech Ops Core program to initiate a more strategic planning effort for their area of research. However, the Subcommittee observed at this meeting that the ATC/Tech Ops Core program is no longer pursuing a strategic research planning effort due to a lack of resources. The Subcommittee had previously found that the strategic research planning effort being initiated within ATC/Tech Ops Core program was of high value, as it would help the FAA uncover emerging risks as well as position itself for doing the appropriate research in a timely manner. Without this strategic research component, there is once again risk being built into the ATC system for both current operations as well as for NextGen implementations.

Recommendation:

Reconsider the prioritization of this work and look to allocate necessary resources to re-start this important strategic research planning effort including resources to execute the projects in the strategic plan.

- **Response:**
  - FAA concurs that an ATC/Tech Ops strategic R&D plan would be of value, if there were funding available to address a portfolio of research needs. However, as a result of the lack of funding, there is a limited set of activities and areas of R&D that can be addressed, using in-house human factors expertise and resources at CAMI and WJHTC. In addition, without a sold funding base for R&D efforts, we are unable to commit to the multiyear efforts necessary to support the research needs identified by various technical sponsors in the Air Traffic Organization. As a result, we are aligning R&D efforts to the near-term technical sponsor requirements that can be achieved using in-house resources on an ad-hoc, year-to-year basis. We are working to maintain core competencies at CAMI through appropriate tasking in such areas as development and application of controller and technical operations job task analysis and training data, human error taxonomies, human engineering standards for ATC and Tech Ops systems, and safety assessments. We are looking forward to increases in funding for important safety and efficiency related human factors R&D initiatives that would enable us to take a more strategic approach as we seek to develop R&D products that meet longer term technical sponsor needs.

ATO Human Factors Roundtable

- **Pilot Roundtable Met on Feb 16th 2016**
  - Representatives from active sponsors
- **Discussed and prioritized FY16 activities**
- **Documenting scope, roles and responsibilities**
- **VP Executive Sponsorship**
- **Educate ATO**
- **Hold next meeting September 2016**
  - Invite ATO wide representatives

Internal ATO Human Factors

- Agree mission
- Agree priorities
- Connection with roundtable
- Story/Branding
- Educate ATO
- Resources
- OPS Funding

Any questions?