REDAC / Human Factors

Name of Program: Flight Deck, Maintenance, System Integration ("Core Flight Deck HF")

BLI Number: A11G (8AA)

Presenter Name: Chuck Perala

Office: NextGen Human Factors Div. (ANG-C1)

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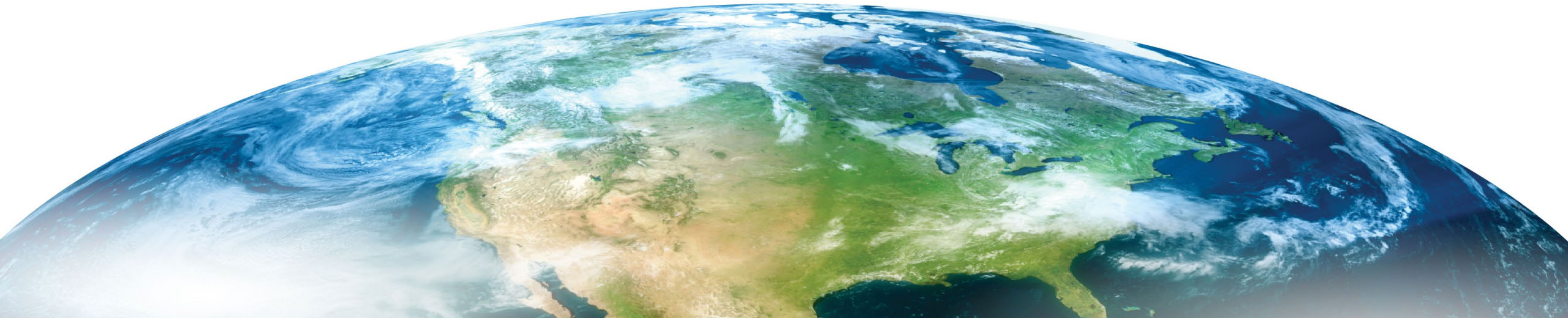
Review of FY 2022 - 2025 Proposed Portfolio



Flight Deck, Maintenance, System Integration Overview

Program Scope

- This program addresses research, engineering, and development requirements defined by technical sponsors in the Aviation Safety Organization (AVS). Requirements are driven by the human factors needs of FAA Aircraft Certification (AIR) and Flight Standards (AFS) personnel (field, Headquarters)
- This program also considers rapid changes to current-day technologies, procedures, and emerging issues

FAA Benefits

- Program outputs are transferred to AVS technical sponsors to develop and maintain, as appropriate, human factors-related rules, guidance, procedures, Orders, standards, job aids, and other materials
- Work products benefit AIR and AFS personnel responsible for the evaluation, certification, approval, and continued airworthiness of aircraft; and the certification of pilots and mechanics

Measures of Success

1. Sponsor Satisfaction – did the research meet AVS's needs?
2. Access to Research – is there sufficient awareness/access to results?
3. Application of Results – did the research support or inform a data-driven decision?
4. Contribution to Safety – how did the research support improvements to human and system performance?

Flight Deck, Maintenance, System Integration Team and Researchers

Program Management Team

- Tara Gibson, Division Manager (Tara.M.Gibson@faa.gov)
- Chuck Perala, Program Manager (A11G) (Chuck.Perala@faa.gov)

Researchers

- FAA Civil Aerospace Medical Institute (CAMI)
- Volpe National Transportation Systems Center, DOT
- FAA Center of Excellence for Technical Training and Human Performance (COE TTHP)
- Academia: Auburn University, University of Central Florida, University of Michigan, Massachusetts Institute of Technology

Advanced Vision Systems
Research Requirement Overview

Objective
- Provide research data to support human factors needs of FAA personnel who evaluate, approve, and oversee the use of advanced vision systems during new low visibility concepts of operation.

How Results are Used
- Research informs FAA equivalent level of safety decisions and policy changes that can increase the number of viable airports/runways for low visibility approach, landing, rollout, and takeoff operations (expand operational credit). It also informs FAA personnel who develop evaluation criteria for use of advanced vision system technologies and incorporate this information into human factors – related regulations, guidance material, and other FAA work products

Current Research Portfolio Topics
- Operational Use of Head-up Display (HUD) Technology
- Low Visibility Flight Operations to Airports with Alternative Approach Lighting Systems
- Human Factors Evaluation Aids for Aircraft Evaluation Division (AED) Pilots (advanced vision technology)

Advanced Vision Systems
On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
Quantifying the contribution of HUD to Pilot Performance on Approaches Where HUD is Used, But Not Required, to Transition to Landing (visual segment of SA CAT I approach)	Evaluate pilot performance and human factors considerations when using a HUD (flight information only) during the visual segment of an SA CAT I ILS approach or during the visual segment of approaches that have a high DA and long visual segment	**CAMI**	**FY2023 Q1**
Evaluation of HF & Crew Coordination Aspects of Dual HUD CAT III Operations Compared to Single HUD CAT III Operations. Evaluate Whether Active Monitoring Improves Crew Performance Over a Baseline Condition	– Evaluate human factors and crew coordination impacts when using dual HUD during CAT III approach, landing, and rollout operations vs. single HUD CAT III flight operations – Examine whether dual HUD provide the pilot monitoring with active monitoring capabilities (e.g. early detection of flightpath changes)	**CAMI**	**FY2023 Q3**
Pilot Performance Using HUD, SVGS, and Flight Director During the Instrument Segment of an Approach	– Evaluate the implementation of SVGS technology and flight director information on a head-up display (HUD) – Examine pilot performance and human factors considerations when SVGS-HUD with flight director is used during the instrument segment of a CAT I ILS approach	**CAMI**	**FY2023 Q4**
Pilot Performance and Operational Impacts Associated with using a HUD to Conduct CAT II and CAT III Approaches Using Other than ALSF I or ALSF II Approach Lighting Systems	Examine pilot performance and human factors considerations when using a HUD (flight information only) to conduct CAT II and CAT III approaches to a runway with using alternate approach lighting systems (other than ALSF I, ALSF II)	**CAMI**	**FY2024 Q1**
Pilot Performance and Human Factors Considerations using SVGS on an SA CAT I Approach with Less than a MALSR Approach Lighting System	Examine pilot performance and human factors considerations when using SVGS-HDD to conduct an SA CAT I ILS approach to a runway with an approach lighting systems that has fewer visual characteristics than a MALSR approach lighting system	**CAMI**	**FY2024 Q1**

Advanced Vision Systems
On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
Development of Aircraft Evaluation Group (AED) Pilot Evaluation Tools for new **EFVS** Systems Development of Aircraft Evaluation Group (AED) Pilot Evaluation Tools for new **SVGS** Systems	Develop AED pilot evaluation tools for new enhanced flight vision systems (EFVS) and synthetic vision guidance systems (SVGS) to support core AEG responsibilities, including evaluation of: 1) Aircraft and associated systems for operational suitability, 2) Flightcrew training requirements (Flight Standardization Board), 3) Minimum equipment required for dispatch (Flight Operations Evaluation Board), 4) Continued Airworthiness (Maintenance Review Board), and 5) Review and acceptance of Instructions for Continued Airworthiness (ICA).	**CAMI**	**FY2023 Q4**

Advanced Vision Systems

Potential Program Plans (FY23 – FY25+)

*** Indicates research builds upon on a project within the current portfolio**

Planned Research Portfolio Topics

- Synthetic Vision Guidance Systems (SVGS) for Lower than Standard Takeoff Minima Operations*
- Use of SVGS as a CAT III Rollout Aid - Approach, Touchdown, and Rollout
- Use of an Enhanced Flight Vision System (EFVS) on a Head-down display (HDD) for Operations to 100 feet Above Touchdown Zone Elevation
- Operational Acceptability of New Automatic Takeoff and Landing Operations Performed by a Single Pilot and Optional Dual Pilot Crews (Split Location)*
- Empirical Basis for Minimum Visual Features and Aids a Pilot Must See During Lower Than Standard Takeoff Minima Operations Using Natural Vision and Advanced Vision

Improved Transport Operational Safety through Pilot Training, Qualification, Procedures, and Flight Operations

Research Requirement Overview

Objective

- Provide research data to support the human factors needs of FAA personnel who evaluate, approve, and oversee pilot training and qualification programs, flight deck operations, and pilot procedures.

How Results are Used

- Research informs FAA personnel who develop evaluation criteria for pilot tasks, skills, and training and incorporate this information into regulatory and documents.

Current Research Portfolio Topics

- Emerging Pilot Workforce
- Electronic and Distance Learning
- Single Source (compendium) Reference Document for Flight Standards Human Factors (RDFSHF)
- Pilot – Automation Dependencies

Improved Transport Operational Safety through Pilot Training, Qualification, Procedures, and Flight Operations

On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
Training the Emerging Pilot Workforce	Provide scientific and technical efficacy data on potential FAA training and checking methods for the current and projected pilot workforce; areas of emphasis include information management, decision-making, and command judgment	**Auburn University**	**FY2023 Q1**
Modern Training Practices: Methods and Assessment in the Air Carrier Industry (Distance Learning)	Provide recommendations to help decide which topics, skills, and knowledge in aviation training are appropriate for modern training practices, and which are better suited for other learning methods	**University of Central Florida**	**FY2022 Q4**
Crew Resource Management (CRM) section of the Reference Document for Flight Standards Human Factors (RDFSHF)	Develop a single-source reference document for human factors-related rules and guidance that pertain to CRM, including relevant issues to consider when AFS personnel evaluate CRM aspects of proposed operations, procedures, and training	**University of Central Florida**	**FY2022 Q4**
Manual Flight Operations (MFO) section of the Reference Document for Flight Standards Human Factors (RDFSHF)	Develop a single-source reference document for human factors-related regulations and guidance material that pertain to MFO, including relevant issues to consider when AFS personnel evaluate the MFO aspects of flight deck operations, pilot procedures, and pilot training and qualification.	**MITRE**	**FY2022 Q4**
Pilot- Automation Dependencies	Research the current state of pilot-automation dependencies in global transport category aircraft operations- e.g., training for automation management, pilot-automation reliance, manual flying skills. Analyze aircraft accident data (Sept. 2016 – Dec. 2021) where flightcrew use of aircraft automation for flightpath management is a factor to develop an update to the data analysis in the Flight Deck Automation Working Group Report	**MITRE**	**FY2023 Q1**

Improved Transport Operational Safety through Pilot Training, Qualification, Procedures, and Flight Operations

Potential Program Plans (FY23 – FY25+)

*** Indicates research builds upon on a project within the current portfolio**

Planned Research Portfolio Topics

- Incorrect Pilot Response to System Failures, Malfunctions, and Systems Not Functioning as Expected
- Reference Document for Flight Standards Human Factors*
- Cognitive Indicators of Pilot Performance in Crew Resource Management (CRM)*
- Training and Operational Effectiveness*

Maintenance Human Factors
Research Requirement Overview

Objective
- Provide research data to support the human factors needs of FAA personnel who evaluate, approve, and oversee aviation maintenance related training, operations, and procedures.

How Results are Used
- Research informs FAA personnel who develop evaluation criteria for maintenance technician tasks, skills, procedures, and operations and incorporate this information into regulatory and documents.

Current Research Portfolio Topics
- Safety Culture
- Failure to Follow Procedures

Maintenance Human Factors
On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
Maintenance Human Factors - Safety Culture	Understand the current state of maintenance safety risk management, and examine the effectiveness of applied tools to verify and address potential human factors vulnerabilities	**CAMI**	**Complete**
Maintenance Human Factors – Failure to Follow Procedures	Propose and test the effectiveness of human factors countermeasures for failure to follow procedures (FFP)	**CAMI**	**FY2022 Q2**

Maintenance Human Factors
Potential Program Plans (FY23 – FY25+)

Planned Research Portfolio Topics

- Analysis of Data to help FAA Assess Adequacy of Policy, Guidance, and Assumptions Related to Maintenance Training Requirements (includes differences training)

Fatigue Mitigation in Flight Operations
Research Requirement Overview

Objective
- Provide research data to support effective implementation of recent changes to 14 CFR Part 117 which introduces scientific concepts, performance-based concepts, and procedures for industry to safely conduct flight operations within and outside the table limits of 14 CFR Part 117.

How Results are Used
- Informs FAA personnel who refine operational standards for fatigue risk management systems and incorporate evidence-based criteria into regulations, guidance, training, and other FAA work products.

Current Research Portfolio Topics
- Fatigue Risk Management System (FRMS) Database
- Short Haul Longitudinal Study

Fatigue Mitigation in Flight Operations

On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
Fatigue Risk Management System (FRMS) Database	Analyze operational data to assess and monitor the reported pilot performance impact(s) of flight operations conducted outside the table limits of 14 CFR Part 117 (Flight and Duty Limitations and Rest Requirements for Flightcrew Members).	**CAMI**	**FY2022 Q4**
Short Haul Longitudinal Study	Collect objective data to characterize the impact of high frequency multiple segment flight operations, including early start times, nighttime arrivals, etc., to pilot fatigue and cumulative sleep loss across trips pairings.	**CAMI**	**FY2024 Q1**

Fatigue Mitigation in Flight Operations

Potential Program Plans (FY23 – FY25+)

*** Indicates research builds upon on a project within the current portfolio**

Planned Research Portfolio Topics

- Fatigue Risk Management System (FRMS) Database*
- Short Haul Fatigue Study*
- Long haul / ultra long-range (LH/ULR) Study*
- Human Factors Mitigations, LH/ULR Flight Operations*

Advances and Innovation in Equipment, Technology, Systems, and Operations

Research Requirement Overview

Objective

- Provide research data to support human factors needs of FAA personnel who evaluate and approve aircraft systems, displays, and controls, including their intended function and operation.

How Results are Used

- Research results inform FAA personnel who develop evaluation criteria for aircraft systems, displays, and controls and incorporate this information into human factors – related regulations, guidance material, and other FAA work products.

Current Research Portfolio Topics

- Updates to General Guidance Document
- Visual Scanning Research

Advances and Innovation in Equipment, Technology, Systems, and Operations

On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
General Guidance Document Update, Version 3.0	Review FAA rules, guidance, Technical Standards Orders (TSOs), industry documents, and human factors literary sources to incorporate relevant changes into Version 3.0 of the General Guidance Document (GGD)	**Volpe**	**FY2023 Q2**
Visual Scanning Techniques in Transport Category Aircraft	Understand the visual scanning techniques used by pilots in transport category aircraft to provide the FAA with a data-driven foundation for identifying the acceptability of design assumptions and mitigations for new flight deck layouts/designs	**University of Michigan**	**FY2023 Q2**

Advances and Innovation in Equipment, Technology, Systems, and Operations

Potential Program Plans (FY23 – FY25+)

*** Indicates research builds upon on a project within the current portfolio**

Planned Research Portfolio Topics

- Pilot Interactions with Advanced Technologies
- Pilot Visual Scanning Techniques of Instruments, Systems, and Outside References for Flightpath Management*
- Human Factors General Guidance Document Version 4 update*
- Human Factors Safety Considerations and Criteria for Reduced Crew in Transport Aircraft (airworthiness considerations)
- Control Automation and Information Automation
- Human Factors Design Standards for New and Advanced Flight Deck Alerting Systems

Improved Integration of Human Factors into Aircraft Design, Certification, Training, and Operations

Research Requirement Overview

Objective

- Provide research, engineering, and operational data to inform Flight Standards (AFX) and Aircraft Certification (AIR) personnel who will clarify and expand policy, guidance, processes, procedures, and criteria to better integrate human factors throughout design and certification of aircraft.

How Results are Used

- Research data will facilitate better integration of human factors into the policy, processes and criteria for aircraft certification and operational evaluations, which have been identified by the FAA Administrator, Congress, and a variety of Boeing 737 MAX related reports, as critical for aviation safety.

Current Research Portfolio Topics

- Human Factors Gap Analysis

Improved Integration of Human Factors into Aircraft Design, Certification, Training, and Operations

On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
Human Factors Gap Analysis	Review existing guidance, policy, processes, and data for Aircraft Evaluation Division (AED) functions which include T-Tests to determine levels of differences (Flight Standardization Board [FSB] Operational Evaluation [OE]), determination of crew complement based on operational requirements (e.g., Part 91, 121, 135, etc.), and operational suitability assessments. Provide research data to fill identified gaps, and document gaps that could not be addressed with existing data sources.	**Volpe**	**FY2024 Q1**

Improved Integration of Human Factors into Aircraft Design, Certification, Training, and Operations

Potential Program Plans (FY23 – FY25+)

*** Indicates research builds upon on a project within the current portfolio**

Planned Research Portfolio Topics

- Integration of Human Factors into Operational Evaluations (OE) and Flight Standardization Board (FSB) Process*
- Integrating Human Factors into Aircraft, Design, Certification, Training, and Operations*

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Questions?