

REDAC / NAS Ops



***Name of Program: Flight Deck, Maintenance,
System Integration (“Core Flight Deck HF”)***

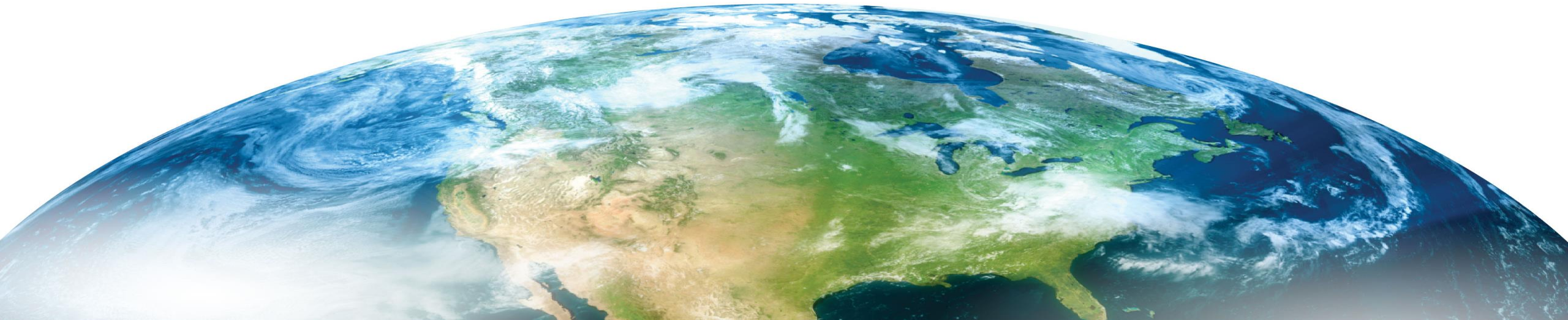
BLI Number: A11G (8AA)

Presenter Name: Chuck Perala

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

Date: September 1, 2021

***Review of FY 2021 - 2024
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 Program Managers and Performers

Program Managers

- Tara (Holmes) Gibson, Division Manager (Tara.M.Gibson@faa.gov)
- Chuck Peralá, Program Manager (Chuck.Peralá@faa.gov)

Performers and Laboratories

- FAA Civil Aerospace Medical Institute (CAMI)
- Volpe National Transportation Systems Center, DOT
- FAA Center of Excellence for Technical Training and Human Performance (COE TTHP)
 - Auburn University
 - Wichita State University
 - PEGASUS Consortium
- University of Central Florida
- University of Michigan



Advanced Vision Systems

Advanced Vision Systems (EFVS, EVS, SVS, CVS), Head-Up Displays (HUD), and Head Mounted Displays (HMD): Operational Standards & Approval Criteria

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

- Head Up Display (HUD) Operational Criteria Research
- Performance and Operational Impacts of Approach Lighting Conditions
- Development of Pilot Evaluation Tools



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	<ul style="list-style-type: none"> – 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	FY2022 Q4
Pilot Performance Using HUD, SVGS, and Flight Director During the Instrument Segment of an Approach	<ul style="list-style-type: none"> – 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	FY2022 Q3
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	FY2022 Q3
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	FY2022 Q4

Advanced Vision Systems

On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
<p>Development of Aircraft Evaluation Group (AEG) Pilot Evaluation Tools for new EFVS Systems</p> <p>Development of Aircraft Evaluation Group (AEG) Pilot Evaluation Tools for new SVGS Systems</p>	Develop AEG 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 Q3
Establish an Empirical Basis for the Minimum Visual Features & Visual Aids a Pilot Must See to Safely Takeoff During Lower than Standard Takeoff Minima Operations Using Natural Vision (HUD, no HUD) or Advanced Vision Systems	Examine whether the visual aids currently required for low visibility takeoff operations are necessary, whether these operations could be implemented on narrower runways with fewer visual aids, & whether the use of advanced vision systems, which have limited fields of view but increased forward sight distance, impact what a pilot must see in any substantive way over that of natural vision	CAMI	FY2023 Q4

Advanced Vision Systems

Potential Program Plans (FY22 – FY23+)

* 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*
- SVGS for Lower than Standard Localizer Performance with Vertical Guidance (LPV) Minima*
- Use of SVGS as a CAT III Rollout Aid
- Use of an Enhanced Flight Vision System (EFVS) on a Head-down display (HDD) for Operations to 100 feet Above Touchdown Zone Elevation



Pilot Training and Checking Methods

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

- Training the Emerging Pilot Workforce
- Distance Learning
- Crew Resource Management (CRM)



Pilot Training and Checking Methods

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 (RDFS HF)	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

Pilot Training and Checking Methods

Potential Program Plans (FY22 – FY23+)

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

Planned Research Portfolio Topics

- Pilot Training for Responses to Failures
- Reference Document for Flight Standards Human Factors (RDFS HF)*
- Crew Resource Management (CRM) Performance Indicators*
- Adapting Training and Flight Operations to Emerging Risks



Maintenance Human Factors

Maintenance Risk-Based Decision Making, Safety Culture

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	FY2022 Q1
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 (FY22 – FY23+)

Planned Research Portfolio Topics

- Analysis of Data to help FAA Assess Adequacy of Policy, Guidance, and Assumptions Related 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	FY2023 Q4

Fatigue Mitigation in Flight Operations

Potential Program Plans (FY22 – FY23+)

* 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 range / ultra long-range (LR/ULR) Study*



Avionics and New Technologies

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

- Electronic Flight Bag (EFB) Research
- Updates to General Guidance Document
- Visual Scanning Research



Avionics and New Technologies

On-going research in FY22+

Project	Description/Product	Vendor	Est. Completion
Electronic Flight Bag Survey and Additional Survey Data Analysis	Gather human factors data to understand how pilots access and manage information used for EFB functions	Volpe	FY2021 Q3
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

Avionics and New Technologies

Potential Program Plans (FY22 – FY23+)

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

Planned Research Portfolio Topics

- Pilot Interaction with Advanced Technologies
- Pilot Visual Scanning Techniques – Rotorcraft*
- Human Factors General Guidance Document*
- Reduced Crew Operations
- Control Automation and Information Automation





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Thank you

