Federal Aviation Administration

AVS Research, Engineering and Development

AVS RE&D Portfolio:

BLI – Flight Deck, Maintenance, System Integration, Human Factors (A11G)

Research Plan: 2022- 2027

February 1, 2022

Part 1: BLI Definition and Scope

Program Area: Flight Deck/Maintenance/System Integration/Human Factors

FAA Domain: Human Performance and Aeromedical Factors

BLI Scope:

The Flight Deck/Maintenance/System Integration Human Factors program addresses research and development requirements defined by technical sponsors in the FAA's Aviation Safety Organization. The majority of these research requirements have been submitted by sponsors within Aircraft Certification and Flight Standards who are responsible for the certification and approval of equipment and continued airworthiness of aircraft, as well as the certification of pilots and mechanics, and approval of certain flight operations. This human-centered approach will address the issues associated with regulatory aspects of design, training, operations, and maintenance, including complex systems and human-system integration, and it will provide strategic solutions to improve aviation safety. Additionally, one operational capability was submitted by the FAA's office of Accident Investigation.

Part 2: Service/Office Research Requirements and Research Gap Analysis

1.0 Operational Capability: Improved Transport Pilot Training, Procedures and Operations (ACSAA related)

Definition:
Update regulatory and guidance material related to pilot training, procedures, and operations to improve safety. Supports H.R. 133, Division V-Aircraft Certification, Safety and Accountability Act (ACSAA) Section 126.

Primary S/O: Barbara Adams (AFS-280)
Secondary S/O: AVS Kathy Abbott

S/O Priority:

Outcomes:

- **Regulatory and Guidance material:** Data-driven training guidance based on the findings of the research will be added to 14 CFR Part 121 and Part 135, as appropriate. As results become available, AFS will update the following guidance as appropriate :
  - AC 120-51E Crew Resource Management Training
  - AC 120-FPM Flight Path Management (New AC under development)
  - AC 91-79A Mitigating Risks of a Runway Overrun Upon Landing
  - AC 120-71B Standard Operating Procedures and Roles and Responsibilities of Pilot Monitoring
  - FAA Order 8900.1 (FSIMS guidance to inspectors)

Reduce the risk of commercial transport accidents through updated inspector regulatory and guidance materials associated with pilot training, procedures and operations for transport aircraft in Part 121 and 135 operations.

Research Gap Analysis

Research Questions	Contribution	Research Output
1.1 How and why do pilots react incorrectly to system malfunctions in transport aircraft, and what are potential mitigations to reduce these responses?	20%	Technical Report on Training and Procedure Mitigation Effectiveness for Incorrect Pilot Response
1.2: What human factors research data would support the Flight Standards human factors specialists who must evaluate and approve operational suitability, training, procedures, operations, and maintenance?	20%	Material for Flight Standards Human Factors (RDFSHF) addressing: • Automation Management • Pilot/Crew Monitoring • Energy Management • Stabilized approaches

1.3: What are cognitive indicators of pilot performance in Crew Resource Management (CRM)?	20%	Technical Report on cognitive indicators of pilot performance for CRM
1.4: How effective are current pilot training programs, including those using new training technologies and methods? What technologies and methods are most appropriate for which pilot training tasks?	20%	Technical reports including: • Literature Review • Operator Policies/Procedures • Effectiveness of Human Factors Interventions
1.5 How should we adapt training and flight operations to respond to emerging risks, including pilot automation dependencies?	20%	Technical report including: • Annotated Bibliography • Operator Policies and Procedures

2.0 Operational Capability: Fatigue Mitigation in Air Carrier Flight Operations

Definition: Conduct research to support FAA implementation of recent changes to 14 CFR Part 117 which includes the introduction of scientific concepts, performance-based concepts, and procedures for operators to safely conduct flight operations within and those exceeding table limitations of 14 CFR Part 117.

Primary S/O: AFS-220, Chester Piolunek
Secondary S/O:

S/O Priority:

Outcomes:

- **Regulatory and Guidance material:** CFR parts 121 and 117; Advisory Circulars (e.g., AC 120-103 A)

Human factors evidence to inform FAA operational requirements, standards, conditions, limitations, and mitigations to manage the effects of short haul, long-haul, and ultra-long-range flight operations on pilot performance, alertness, and fatigue.

Research Gap Analysis

Research Questions	Contribution	Research Output
2.1 What standardized methods and analyses are needed to record and provide relevant FRMS data with FAA stakeholders?	60%	FRMS database with query tools for AFS use in determining operational approvals
2.2 What current and recommended mitigations effectively manage impacts to human factors and pilot performance caused by high-frequency, multiple	20%	Technical Report of relevant research outcomes and analyses

segment, short-haul flights that do not exceed the limitations of 14 CFR Part 117?		of data acquired during short haul flight operations
2.3 What mitigations effectively manage impacts to human factors and pilot performance caused by long-haul and ultra-long-range flight operations that exceed the table limits of 14 CFR Part 117?	20%	Technical Report of relevant research outcomes and analyses of data acquired during long haul and ultra-long-range flight operations.

3.0 Operational Capability: Supporting Improvements in Aviation Maintenance (ACSAA related)

Definition: Provide research data to support maintenance human factors – related to Boeing 737 Max recommendations on FAA workforce (aviation safety inspectors, aviation safety engineers) competencies. Inform Flight Standards on what requirements and assumptions are currently in use for maintenance training, and how these relate to accidents and incidents.

Primary S/O: David Hoygn, AFS-330
Secondary S/O:

S/O Priority:

Outcomes:

- **ACSAA and MAX-related:** This requirement will provide research data to support the human factors needs of Federal Aviation Administration (FAA) personnel who evaluate, approve, and oversee maintenance – related procedures and operations, including training and certification projects. This requirement will provide research data to support maintenance human factors – related Boeing 737 Max Joint Authorities Technical Review (JATR) observations, findings, and recommendations, and Government Accountability Office (GAO) Report 21-94 recommendations on FAA workforce (aviation safety inspectors, aviation safety engineers) competencies.
    - ACSAA Section 135 (d)
    - JATR Recommendation 7, Recommendation 11.1, Recommendation 11.2
- **Regulatory and Guidance material:** Research data will inform as appropriate FAA personnel responsible for policy including:
    - AC 120-72A (Maintenance Human Factors Training);
    - ~~o~~ AC 120-115 (Maintainer Fatigue Risk Management [Training]);
    - Performance-based changes to 14 CFR Part 147 per the Promoting Aviation Regulations for Technical Training (PARTT) Act of 2019 (H.R.5427, S.3043);
    - Identification of FAA human factors aviation maintenance regulatory and guidance material gaps;
    - Aviation Safety Inspector (ASI) Guidance in FAA Order 8900.1, Flight Standards Information Management Systems (FSIMS); and potentially

- AC 121-22C Maintenance Review Boards, Maintenance Type Boards, and Original Equipment Manufacturer (OEM)/ Type-certificate Holders (TCH) Recommended Maintenance Procedures

Research Gap Analysis

Research Questions	Contribution	Research Output
3.1 What requirements and assumptions are currently used for AMT knowledge, skills, experience, and training for transport category aircraft and airplane differences?	20%	Annotated Bibliography
3.2 What is the role and frequency of factors involving AMT knowledge, skills, experience, training, assumptions, and design for maintainability in global transport category aircraft accidents 2010-present?	20%	Technical report on Maintenance Accident/Serious Incident Analysis
3.3 What training and operational policies/procedures are used by industry to conform to FAA AMT training requirements for transport category aircraft and airplane differences?	20%	Technical Report on Training Policies and Procedures
3.4 Are FAA regulatory materials, guidance, and assumptions for maintenance training requirements (includes differences training) for transport category aircraft adequate?	20%	Final technical report on AMT Training
3.5 What research and engineering data is needed to fill gaps in existing FAA guidance or to inform new guidance on design maintainability?	20%	Technical report

4.0 Operational Capability: Advanced Vision Systems, Head-Up Displays, and Head Mounted Displays: Operational Standards & Approval Criteria

Definition: Enable flight crews to safely conduct approach and landing (above 1000 RVR), and takeoff and ground operations under low visibility conditions using new flight deck technologies (supports low visibility CONOPS).

Primary S/O: Chris Hope, Flight Operations Group, AFS-410
Secondary S/O:

S/O Priority:

Outcomes: Develop Operations Specifications (OpSpecs) guidance and criteria for use in the operational approval process.

- **Regulatory and Guidance material:** Research for all of the tasks included in this multi-year research requirement will be used to develop and/or revise the following specific items::
  - 14 CFR Parts 1, 61, 91, 121, 125, and 135;
  - AC 90-106, Enhanced Flight Vision Systems;
  - Opspec C048, MSpec MC048, LOA C048;
  - OpSpec/MSpec/LOA C052, C054, C060, C062, C078, and C079;
  - FAA Order 8900.1 (FSIMS), multiple volumes and chapters, including inspector job aids;
  - FAA Order 8400.13, Procedures for the Evaluation and Approval of Facilities for Special Authorization Category I Operations and All Category II and III Operations;
  - AC 120-118, Criteria for Approval/Authorization of All Weather Operations (AWO) for Takeoff, Landing, and Rollout;
  - AC 120-57, Surface Movement Guidance and Control System;
  - AEG evaluation criteria;
  - Operational Safety Assessments;
  - Charting standards;
  - Aeronautical Information Manual (AIM);
  - Instrument Procedures Handbook (IPH);
  - Conditions and limitations for applications for waiver and petitions for exemption from the operating rules pertaining to EFVS or HUD operations; and
  - SAFOs and InFOs.

Research Gap Analysis

Research Questions	Contribution	Research Output
4.1 Can SVGS technology be used as a substitute for any of the equipage and/or NAS infrastructure required to conduct CAT III flight operations?	40%	Technical report
4.2 Does the use of EFVS on a head-down display to 100’ above TDZE support an equivalent level of safety and pilot performance versus EFVS on a head-up display?	15%	Technical report

4.3 Can SVGS technology can be used as a possible substitute for certain airport/runway infrastructure currently required to conduct lower than standard takeoff minima operations when using natural vision?	15%	Technical report
4.4 Is single/dual pilot workload acceptable during new low visibility automatic takeoff and landing operations in small aircraft using unassisted vision?	15%	Technical report
4.5 What are the minimum visual features and visual aids a pilot must see to safely takeoff in visibilities that range from 1600 RVR down to 300 RVR using both natural vision (with and without a HUD) and an advanced vision system (on a HUD)?	15%	Technical report

5.0 Operational Capability: Human Factors Considerations and Emerging Trends Associated with Helicopter Air Ambulance Operations

Definition: Assess current Helicopter Air Ambulance risks, emerging issues, and trends to reduce the number of accidents and incidents attributable to human factors, improve strategies and procedures for controlling risks, and develop fatigue risk measures including the strategic use of rest facilities, fitness for duty requirements, and scheduling practices.

Primary S/O: Thomas Luipersbeck, AFS-250
Secondary S/O: Wayne Fry (AFG-500), Jay Hiles (AFG-500), and AFS-800

S/O Priority:

Outcomes:
Research data will inform FAA regulations and guidance for training, procedures, and HAA operations to reduce the number of accidents attributable to human factors.

Regulatory and Guidance material:

- AC 120-96 (current version)
- AC 135-14 (current version)
- AC 00-64 (current version
- FAA Order 8900.1 (FSIMS)
- Aeronautical Information Manual (AIM)
- SAFOs and InFOs.

Research Gap Analysis		
Research Questions	**Contribution**	**Research Output**
5.1 What are causal or contributing human factors elements associated with HAA accidents and incidents?	20%	Technical Report on HAA Accidents and Serious Incidents, and Human Factors Evaluation Methods
5.2 What are the current fatigue risks for the HAA industry?	20%	Technical report on HAA Fatigue Risk Baseline Validation
5.3 What are human factors-related emerging issues and industry trends for HAA operations?	20%	Technical Report on Emerging Human Factors Issues and Trends in the HAA Industry
5.4 How should HAA operations address CRM research recommendations?	20%	Technical Report on HAA CRM Issues and Effective Human Factors Mitigations
5.5 What are the industry best practices for assessing and mitigating risk factors in HAA operations?	20%	Technical report on Human Factors Best Practices for HAA Operations

6.0 Operational Capability: GA pilots effectively respond to unexpected events through improved critical thinking and resilience-engineering based techniques.

Definition:

Develop science based techniques to improve pilots' abilities to respond rapidly and correctly to unexpected events not covered by checklist procedures.

Primary S/O: Shane Bertish (AVP-210), Corey Stephens (AVP-230), Erin DeYoung (AVP-230)
Secondary S/O: AFS, AAM

S/O Priority:

Outcome:

A measurable reduction of ineffective responses by GA pilots to unexpected events resulting in less GA accidents

Research Gap Analysis		
Research Questions	**Contribution**	**Research Output**
6.1 What problem solving/decision making/critical thinking skills should GA pilots have when unexpected events occur, and what procedures/techniques	33.3%	Technical report discussing the investigated skills and documentation of the considered procedures/techniques.

should those pilots apply when dealing with such events?		
6.2 How effective is current GA pilot training, guidance, and education against the startle and surprise reactions caused by unexpected events in flight.	33.3%	Gap analysis
6.3 Where should problem solving/critical thinking skills be emphasized during GA training, guidance, and education to best enable GA pilots to implement the necessary procedures/techniques in light of an unexpected event?	33.3%	Technical report

7.0 Operational Capability: Advances and Innovation in New Technologies and Operations (ACSAA related)

Definition: Support enhanced operations and capabilities for all types of aircraft (general aviation, rotorcraft, transport category, and drones) through the safe integration of new technologies and operations

Primary S/O: Cathy Swider (AIR-626), Kathy Abbott (AIR-602), Colleen Donovan (AIR-602), Barbara Adams (AFS-280)
Secondary S/O:

S/O Priority:

Outcomes:

- **Regulatory and Guidance material:** Update regulatory and guidance material for new technologies, including avionics, operations, and procedures.

Research Gap Analysis

Research Questions	Contribution	Research Output
7.1: What are the human factors issues with new voice controls, control inceptors, and other new flight deck technologies (e.g., integration, compatibility, workload, usability, etc. with flight deck display and controls)?	16.7%	Technical reports including: • Literature Review • Technology Review • Pilot Interactions with Advanced Technology Study
7.2: What human factors aspects are involved in and affect pilot visual scanning techniques of instruments, systems, and outside references for	16.7%	Technical report on existing training practices, pilot survey results, comparison of proposed

flightpath management? What implications do these human factor aspects have on display design?		training concepts; implications for display design.
7.3: What human factors research data would support the engineers, test pilots, and human factors specialists (in Aircraft Certification) who must evaluate and approve flight deck systems and equipment?	16.7%	Publish General Guidance Document, Version 4
7.4: How can we safely enable autonomous flight or reduced crew?	16.7%	Publish final report
7.5: What human factors issues and data are associated with automation, including control automation and information automation?	16.7%	Technical report on control and information automation
7.6 How should alerting system design standards be updated to reflect new technology and functionality in flight deck alerting systems?	16.7%	Technical reports including: • Literature review and analysis • Data and recommendations to inform updated standards

8.0 Operational Capability: Air/Ground Integration of Future Technologies, Systems, Operations, and Procedures for Trajectory-Based Operations (NextGen)

Definition: Ensure that human factors considerations are addressed for NextGen flight deck technologies, systems, operations and procedures that enable trajectory-based operations.

Primary S/O: AVS – Kathy Abbott, Colleen Donovan

Secondary S/O:

S/O Priority:

Outcomes:

- **Regulatory and Guidance material:** Data-driven guidance based on the findings of the research will be added to guidance for Aircraft Certification and Flight Standards, as appropriate.

Research Gap Analysis		
Research Questions	**Contribution**	**Research Output**
8.1 What are human factors design evaluation considerations for multimodal controls in a rotorcraft equipped with advanced communication, navigation, and surveillance capabilities?		Technical Report
8.2 What are the anticipated human-machine interface and pilot/crew interaction issues with novel control inceptors that support precise 4DT navigation accuracy requirements in highly automated rotorcraft and fixed-wing aircraft?		Technical Report
8.3 What requirements in avionics standards developed by RTCA (SC-186, SC-227) should be retained or modified to support combined use of flight deck interval management and time of arrival control functions?		Technical Report
8.4 What evaluation methods and human factors criteria are needed to identify pilot interaction issues with information automation systems wholly or partially derived from uncertified data?		Technical Report
8.5 What evidence-based criteria, data, and methods can be used to evaluate operational effectiveness of training and procedure mitigations for task management vulnerabilities which affect flight path management (FPM)?		Technical Report
8.6 What criteria, data, and methods can be used to evaluate information management vulnerabilities and operational acceptability of mitigations for design and use of highly integrated systems and enabling avionics equipment?		Technical Report
8.7 What are the resilient behaviors of automated flight deck systems and pilots/crews during aircraft operations in dynamic, trajectory-based operations?		Technical Report

8.8 What training and procedure mitigations can be used to avoid pilot errors related to the management of 4D-Trajectory clearance negotiation risks?		Technical Report
8.9 What research data is currently available to inform equivalent level of safety decisions for the operational use of digital communication technologies below FL180?		Literature Review Report
8.10 What tasks, knowledge, skills, and proficiency are needed to use systems and avionics equipment that enable Full/Dynamic trajectory-based operations (TBO), and the impact of these changes to pilot roles and expectations placed on them?		Technical Reports
8.11 What pilot tasks, knowledge, skills, and proficiency needs are impacted by the dynamic separation of airspace to enable integration of highly automated aircraft?		Technical Reports
8.12 What is the contribution of EFVS to pilot performance during low visibility approach, landing, and rollout operations in visibilities lower than 1,000 RVR, down to 600 RVR, and down to 300 RVR with/without runway visual aids?		Technical Reports
8.13 What is the contribution of a head-worn display (HWD) with and without EFVS to pilot performance during low visibility takeoff, approach, landing, and rollout operations in visibilities lower than 1,000 RVR?		Technical Report
8.14 What is the contribution of dual head-worn displays and hybrid head-up display/head-worn display installations to pilot/crew performance during low visibility takeoff, approach, touchdown, and rollout operations in visibilities lower than 1,000 RVR?		Technical Report
8.15 What human factors considerations should be included in a job aid for AEG pilots who evaluate Combined Vision System technologies and operations?		Technical Report

8.16 What are the flyability/human factors operational acceptability impacts of new arrival/departure procedure concepts enabled by performance-based navigation (PBN)?		Technical Report

9.0 Operational Capability: Integrating Human Factors into Aircraft Certification and Flight Standards Policy and Processes (ACSAA related)

Definition: Integrate human factors criteria, data and methods into regulatory and guidance materials and processes in Aircraft Certification and Flight Standards for all aircraft and operations.

Primary S/O: Christy Helgeson (AFS-100), Barbara Adams (AFS-280), Kathy Abbott (AIR-602), Colleen Donovan (AIR-602)
Secondary S/O: Cathy Swider, Kevin Gildea, Carrie Bell, Lauren Thomas (AIR-626)

S/O Priority:

Outcomes:
Regulatory and Guidance material: The proposed research will inform regulatory and guidance material for Aircraft Certification and Flight Standards. Reduce aviation accidents through improved integration of human factors in Aircraft Certification and Flight Standards policies, processes and oversight.

Improved safety resulting from integrating human factors into the FAA's guidance and processes for evaluating and approving aircraft, systems, equipment, training, procedures, operations and maintenance for both manned and unmanned aircraft systems. This requirement supports both Aircraft Certification and Flight Standards

Research Gap Analysis

Research Questions	Contribution	Research Output
9.1: What human factors data, processes, and procedures can support Aircraft Certification in human factors evaluations of aircraft design and certification?	50%	Technical report on Evidence-Based Criteria
9.2: What human factors data, processes, and procedures can support operational suitability evaluations and in the Flight Standardization Board process?	50%	Technical report on Evidence-Based Criteria

Part 3: RE&D Management Team Programming

BLI Planning 3 Year Funding Profile (FY22-24) as of 09/08/2021

YEAR	Appropriation or Formulation Contract Funding ($)	INITIAL BLI TEAM PLANNING CONTRACT FUNDING – AFN BLI Target minus the Hold Back ($)	AVS-1 APPROVED CONTRACT FUNDING ($)
FY22 formulation or appropriation (if known)	**$8,838,638**		
FY23 formulation	**$9,687,158**		
FY24 AFN funding allocation target		**$7,792,346**	**$9,138,976**

BLI Plan 5 Year Outlook (FY22-27)

Complete (C)	In Progress (IP)	Programmed (P)	Need (N)

Research Activities	FY22	FY23	FY24	FY25	FY26	FY27
Operational Capability 1: Improved Transport Pilot Training, Procedures and Operations (ACSAA related)						
1.1 How and why do pilots react incorrectly to system malfunctions in transport aircraft, and what are potential mitigations to reduce these responses?	*P*	*P*				
1.2: What human factors research data would support the Flight Standards human factors specialists who must evaluate and approve operational suitability, training, procedures, operations, and maintenance?		*P*	*N*	*N*		
1.3: What are cognitive indicators of pilot performance in Crew Resource Management (CRM)?	*P*	*P*				
1.4: How effective are current pilot training programs, including those using new training technologies and methods? What technologies and methods are most appropriate for which pilot training tasks?	*P*	*P*	*N*			
1.5 How should we adapt training and flight operations to respond to emerging risks, including pilot automation dependencies?	*P*	*P*				
Research Activities	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**
Operational Capability 2: Fatigue Mitigation in Flight Operations						
2.1 What standardized methods and analyses are needed to record and provide relevant FRMS data with FAA stakeholders?		*P*				
2.2 What current and recommended mitigations effectively manage impacts to human factors and pilot performance caused by high-frequency, multiple segment,	*IP*					

short-haul flights that do not exceed the limitations of 14 CFR Part 117?						
2.3 What mitigations effectively manage impacts to human factors and pilot performance caused by long-haul and ultra-long-range flight operations that exceed the table limits of 14 CFR Part 117?		*P*	*N*			
Research Activities	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**
Operational Capability 3: Supporting Improvements in Aviation Maintenance (ACSAA related)						
3.1 What requirements and assumptions are currently used for AMT knowledge, skills, experience, and training for transport category aircraft and airplane differences?	*P*					
3.2 What is the role and frequency of factors involving AMT knowledge, skills, experience, training, assumptions, and design for maintainability in global transport category aircraft accidents 2010-present?	*P*					
3.3 What training and operational policies/procedures are used by industry to conform to FAA AMT training requirements for transport category aircraft and airplane differences?		*P*				
3.4 Are FAA regulatory materials, guidance, and assumptions for maintenance training requirements (includes differences training) for transport category aircraft adequate?			*N*			
3.5 What research and engineering data is needed to fill gaps in existing FAA guidance or to inform new guidance on design maintainability?			*N*	*N*		
Research Activities	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**
Operational Capability 4: Advanced Vision Systems, Head-Up Displays, and Head Mounted Displays: Operational Standards & Approval Criteria						
4.1 Can SVGS technology be used as a substitute for any of the equipage and/or NAS infrastructure required to conduct CAT III flight operations?	*P*	*P*				
4.2 Does the use of EFVS on a head-down display to 100' above TDZE support an equivalent level of safety and pilot performance versus EFVS on a head-up display?			*N*			
4.3 Can SVGS technology can be used as a possible substitute for certain airport/runway infrastructure currently required to conduct lower than standard takeoff minima operations when using natural vision?	IP	IP	*N*			
4.4 Is single/dual pilot workload acceptable during new low visibility automatic takeoff and landing operations in small aircraft using unassisted vision?	IP	IP	*N*			
4.5 What are the minimum visual features and visual aids a pilot must see to safely takeoff in visibilities that range from 1600 RVR down to 300 RVR using both natural vision			*N*			

(with and without a HUD) and an advanced vision system (on a HUD)?						
Research Activities	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**
Operational Capability 5: Human Factors Considerations and Emerging Trends Associated with Helicopter Air Ambulance Operations						
5.1 What are causal or contributing human factors elements associated with HAA accidents and incidents?	*P*	*P*				
5.2 What are the current fatigue risks for the HAA industry?		*P*				
5.3 What are human factors-related emerging issues and industry trends for HAA operations?			*N*			
5.4 How should HAA operations address CRM research recommendations?			*N*			
5.5 What are the industry best practices for assessing and mitigating risk factors in HAA operations?				*N*		
Research Activities	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**
Operational Capability 6: GA pilots effectively respond to unexpected events through improved critical thinking and resilience-engineering based techniques						
6.1 What problem solving/decision making/critical thinking skills should GA pilots have when unexpected events occur, and what procedures/techniques should those pilots apply when dealing with such events?	*N*	*N*	*N*	*N*	*N*	*N*
6.2 How effective is current GA pilot training, guidance, and education against the startle and surprise reactions caused by unexpected events in flight.	*N*	*N*	*N*	*N*	*N*	*N*
6.3 Where should problem solving/critical thinking skills be emphasized during GA training, guidance, and education to best enable GA pilots to implement the necessary procedures/techniques in light of an unexpected event?	*N*	*N*	*N*	*N*	*N*	*N*
Research Activities	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**
Operational Capability 7: Advances and Innovation in Equipment, Technology, Systems, and Operations (ACSAA related)						
7.1: What are the human factors issues with new voice controls, control inceptors, and other new flight deck technologies (e.g., integration, compatibility, workload, usability, etc. with flight deck display and controls)?			*N*	*N*	*N*	
7.2: What human factors aspects are involved in and affect pilot visual scanning techniques of instruments, systems, and outside references for flightpath management? What implications do these human factor aspects have on display design?			*N*	*N*	*N*	
7.3: What human factors research data would support the engineers, test pilots, and human factors specialists (in		*P*		*N*		

Aircraft Certification) who must evaluate and approve flight deck systems and equipment?						
7.4: How can we safely enable autonomous flight or reduced crew?			*N*	*N*		
7.5: What human factors issues and data are associated with automation, including control automation and information automation?	*P*	*P*				
7.6 How should alerting system design standards be updated to reflect new technology and functionality in flight deck alerting systems?		*N*	*N*	*N*		
Research Activities	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**
Operational Capability 8:						
8.1 What are human factors design evaluation considerations for multimodal controls in a rotorcraft equipped with advanced communication, navigation, and surveillance capabilities?			*N*			
8.2 What are the anticipated human-machine interface and pilot/crew interaction issues with novel control inceptors that support precise 4DT navigation accuracy requirements in highly automated rotorcraft and fixed-wing aircraft?			*N*			
8.3 What requirements in avionics standards developed by RTCA (SC-186, SC-227) should be retained or modified to support combined use of flight deck interval management and time of arrival control functions?			*N*			
8.4 What evaluation methods and human factors criteria are needed to identify pilot interaction issues with information automation systems wholly or partially derived from uncertified data?			*N*			
8.5 What evidence-based criteria, data, and methods can be used to evaluate operational effectiveness of training and procedure mitigations for task management vulnerabilities which affect flight path management (FPM)?			*N*			
8.6 What criteria, data, and methods can be used to evaluate information management vulnerabilities and operational acceptability of mitigations for design and use of highly integrated systems and enabling avionics equipment?			*N*			
8.7 What are the resilient behaviors of automated flight deck systems and pilots/crews during aircraft operations in dynamic, trajectory-based operations?			*N*			
8.8 What training and procedure mitigations can be used to avoid pilot errors related to the management of 4D-Trajectory clearance negotiation risks?			*N*			

8.9 What research data is currently available to inform equivalent level of safety decisions for the operational use of digital communication technologies below FL180?			*N*			
8.10 What tasks, knowledge, skills, and proficiency are needed to use systems and avionics equipment that enable Full/Dynamic trajectory-based operations (TBO), and the impact of these changes to pilot roles and expectations placed on them?			*N*			
8.11 What pilot tasks, knowledge, skills, and proficiency needs are impacted by the dynamic separation of airspace to enable integration of highly automated aircraft?			*N*			
8.12 What is the contribution of EFVS to pilot performance during low visibility approach, landing, and rollout operations in visibilities lower than 1,000 RVR, down to 600 RVR, and down to 300 RVR with/without runway visual aids?			*N*			
8.13 What is the contribution of a head-worn display (HWD) with and without EFVS to pilot performance during low visibility takeoff, approach, landing, and rollout operations in visibilities lower than 1,000 RVR?			*N*			
8.14 What is the contribution of dual head-worn displays and hybrid head-up display/head-worn display installations to pilot/crew performance during low visibility takeoff, approach, touchdown, and rollout operations in visibilities lower than 1,000 RVR?			*N*			
8.15 What human factors considerations should be included in a job aid for AEG pilots who evaluate Combined Vision System technologies and operations?			*N*			
8.16 What are the flyability/human factors operational acceptability impacts of new arrival/departure procedure concepts enabled by performance-based navigation (PBN)?			*N*			
Research Activities	**FY22**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**
Operational Capability 9: Integrating Human Factors into Aircraft Certification and Flight Standards Policy and Processes (ACSAA related)						
9.1: How do we integrate of human factors in evaluations of aircraft design, certification, training, and operations?	*P*	*P*	*N*			
9.2: How do we integrate human factors in aircraft evaluation division's operational suitability evaluations and in the Flight Standardization Board process?	*P*	*P*	*N*			

Part 4: BLI Team Members

Participants Name	Role	Routing Symbol
Doug Rodzon	BLI Chair	AFS
Anthony Tvaryanas	REDMT Voting Member	AAM
Jorge Fernandez	REDMT Voting Member	AIR
Kathy Abbott	CSTA Flt Deck HF	AVS
Jeff Schroeder	CSTA Flt Simulation	AVS
Colleen Donovan	STS Human Factors	AVS
Carla Hackworth	HF Manager	AAM-500
Katrina Avers	HF Manager	AAM-510
Chris Hope	HF Sponsor	AFS-410
Barbara Adams	HF Sponsor	AFS-280
Larry McDonald	HF Sponsor	AFS-280
Pam Munro	HF SME	AFS-100
Christy Helgeson	HF Sponsor	AFS-100
Eric Roberts	HF SME	AFS-100
Clark Davenport	HF SME	AFS-100
Lauren Thomas	HF SME	AIR-626
Cathy Swider	HF SME	AIR-626
Kevin Gildea	HF SME	AIR-626
Dan Brock	BLI Manager/Facilitator	AFS-430
Tara Gibson	HF Manager	ANG-C1
Chuck Perala	HF Program Manager	ANG-C1