Research, Engineering, and Development Advisory Committee (REDAC) Subcommittee on Aircraft Safety (SAS)
- Summer/Fall 2023 -

FY2024 Aviation Safety Research Portfolio - President's Budget

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Domain: Aircraft Safety Assurance Program Area/BLI: Fire Research and Safety						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11A.FCS.7	1.3 Safe Shipment of Hazardous Materials in Aircraft Cargo Compartments	Reduce the risks due to cargo fires by performing tests to support the development of new standards for fire detection, containment and suppression in cargo containers, and tests to evaluate new fire suppression agents and systems for aircraft cargo compartments. This includes tests as necessary to characterize the hazards posed by various cargo commodities. The Research Question is What are Technologies and methodologies to safely ship hazardous materials in aircraft cargo compartments? The Research Project Design are to develop standardized hazardous materialtest methods for Fire Resistant Containers and Fire Containment Covers, to develop technologies that can provide early detection of fires within containers, and to develop standards for packaging materials to contain lithium battery shipments.	FY16	FY28	Y	This work supports the Fire Lab. Prior to FY23, the work performed at the Lab had been broken out into individual projects as best as could be predicted. That effort now is rolled up into one large requirement that supports ongoing work yet remains agile to address popup demands (COVID, etc.).
A11A.FCS.6	1.2 Aircraft Level Fire Detection, Mitigation, and Suppression	Reduce the risks due to cargo fires by performing tests to support the development of new standards for fire detection and containment and suppression in cargo containers, and tests to evaluate new fire suppression agents and systems for aircraft cargo compartments. This includes tests as necessary to characterize the hazards posed by various cargo commodities. The Research Question is What are the fire threats, and available mitigation and suppression technologies at the aircraft level? The Research Project Design is to design test methods that can be part of Minimum Performance Standards that evaluate suppression agents and systems' performance against hazardous material fires.	FY18	FY28	Y	
A11A.FCS.13	3.1 Aircraft Materials Flammability Assessment Considering Advances in Fuels and Power Sources	The ability to prevent or minimize the effects of inflight or post-crash fire on crew/passenger survivability given evolving aircraft technology. The Research Question is Are materials flammability standards commensurate with fires that are likely to occur considering the evolution of aircraft technology and advancements in fuels and power? The Research Project Design is to perform research and test the constantly evolving materials and fire threats in aircraft using the appropriate small, intermediate, or full-scale fire test methods. Update test methods as necessary to ensure adequate results for current fire threats and repeatability and reproducibility.	FY16	FY28	Y	
A11A.FCS.5	1.1 Characteristics and Classification of Hazardous Materials Fires Including Lithium Batteries	Reduce the risks due to cargo fires by performing tests to support the development of new standards for fire detection and containment and suppression in cargo containers, and tests to evaluate new fire suppression agents and systems for aircraft cargo compartments. This includes tests as necessary to characterize the hazards posed by various cargo commodities. The research question is "what are the characteristics and classification of the fire threats presented by hazardous materials including lithium batteries?" The Research Project Design is to design a test method to classify the fire threat posed by the hazardous material by identifying key characteristics.	FY16	FY27	Y	

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A11A.FCS.10	2.2 Effectiveness of Non-Halon Fire Suppression Agents in Advanced Aircraft Propulsion & Power Syste	The ability to safely fly passengers and cargo given changes in the means of aircraft propulsion (such as electric engines/ fuel cells), fuels used (such as batteries or hydrogen) and environment impact on design (such as Halon replacement). Given the potential for different fire threats as a result of new fuels, the Research Question is How well do non- halon, environmentally friendly powerplant fire suppression agents ensure equivalent or improved performance when compared with Halon, considering evolving technologies in aircraft propulsion and power systems? The Research Project Design will involve the development of test fixtures to evaluate the effectiveness of currently approved agents against new propulsion fuel fires. If current agents are found to be inadequate against new fuels, the development of new updated methods of evaluating agent effectiveness will be researched.	FY16	FY28	Y	
A11A.FCS.15	3.3 Mitigation Techniques for In-Flight Fires Resulting from Portable Electronic Devices (PEDs)	The ability to prevent or minimize the effects of inflight or post-crash fire on crew/passenger survivability given evolving aircraft technology. The Research Question is Are techniques for the mitigation of in-flight fires resulting from personal electronic devices (PEDs) considering evolving portable power sources, new battery chemistries, and increasing power density readily available? The Research Project Design is to test existing extinguishing methods on fires from new PEDs and new power source designs. If the methods prove to be inadequate, develop improved techniques for extinguishing these fires.	FY18	FY28	Y	
A11A.FCS.8	1.4 Information on Fire Risks of Shipping Hazardous Materials	Reduce the risks due to cargo fires by performing tests to support the development of new standards for fire detection and containment and suppression in cargo containers, and tests to evaluate new fire suppression agents and systems for aircraft cargo compartments. This includes tests as necessary to characterize the hazards posed by various cargo commodities. The Research Question is Is information on the fire risks of shipping hazardous materials and potential mitigation strategies readily available? The Research Project Design is to develop task groups to get feedback from industry on modifying website content to provide valuable information to operators transporting hazardous materials.	FY17	FY27	Y	
A11A.FCS.9	2.1 Appropriate Performance Standards & Test Methods for Designated Fire Zones in Propulsion Systems	The ability to safely fly passengers and cargo given changes in the means of aircraft propulsion (such as electric engines/ fuel cells), fuels used (such as batteries or hydrogen) and environment impact on design (such as Halon replacement). Given the potential for a different fire threat as a result of new fuel(s), the Research Question is What are the appropriate performance standards and test methods for materials and components in designated fire zones in propulsion systems, key parameters that most influence material and component fire performance, and will harmonize standard settings, equipment, and procedures for performing propulsion fire tests? The Research Project Design is research and development of test fixtures and appropriate methods to conduct tests on new propulsion materials and components while collaborating with partners.	FY16	FY26	Y	

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A11A.FCS.14	3.2 Effectiveness of Non-Halon Fire Suppression Agents in Handheld and Lavatory Extinguishers	The ability to prevent or minimize the effects of inflight or post-crash fire on crew/passenger survivability given evolving aircraft technology. The Research Question is How effective are halon-free, environmentally-friendly fire suppression agents for use in handheld fire extinguishers and lavatory trash receptacles? The Research Project Design is to evaluate environmentally friendly fire extinguishing agents in handheld extinguishers and lavatory fire extinguishers to determine if they meet the minimum performance standard.	FY16	FY28	Y	
A11A.FCS.16	3.4 Molecular-Level Research for Detecting Material Formulation Changes that Impact Flammability	The ability to prevent or minimize the effects of inflight or post-crash fire on crew/passenger survivability given evolving aircraft technology. The Research Question is What materials fire research tools and techniques at the molecular level exist to for analyzing materials and detecting changes in material formulation that practically impact flammability performance important for safety? The Research Project Design is to evaluate aircraft materials for flammability using developmental and established test methods. Correlate data generated with chemical structure to elucidate mechanisms and to demonstrate similar or improved performance with respect to flammability.	FY16	FY28	Y	
A11A.FCS.11	2.3 Fire Threats of On-Board Fuel Sources Including Petroleum Fuels, Lithium Batteries, and Hydrogen	The ability to safely fly passengers and cargo given changes in the means of aircraft propulsion (such as electric engines/ fuel cells), fuels used (such as batteries or hydrogen) and environment impact on design (such as Halon replacement). The Research Question is What are the in-flight fire threats posed by on-board fuel sources including petroleum fuels, lithium batteries, gaseous and liquid hydrogen, and other novel fuels and power sources? The Research Project Design is to formulate a test method to evaluate the hazardous effects of failure of new fuel sources within an aircraft. This may involve bench- scale tests of representative fuel systems or full-scale tests in an aircraft environment.	FY16	FY29	Y	
A11A.FCS.12	2.4 Hazard to Occupants of Post-Crash Fires Caused by Novel Aircraft Fuel Sources	The ability to safely fly passengers and cargo given changes in the means of aircraft propulsion (such as electric engines/ fuel cells), fuels used (such as batteries or hydrogen) and environment impact on design (such as Halon replacement). The Research Question is What are the characteristics of the post-crash fire threat and hazard posed to occupants by aircraft fuel sources, including petroleum fuels, lithium batteries, gaseous and liquid hydrogen, and other novel fuels and power sources? The Research Project Design is to design a test configuration to determine how new fuel sources affect post-crash occupant survivability and compare to survivability from traditional fuel fires.	FY24	FY28	Y	

Domain: Aircraft Safety Assurance
Program Area/BLI: Propulsino and Fuel Systems

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11B.PS.1	Advanced Damage Tolerance and Risk Assessment Methods for Engine Life- Limited Parts	Service experience of aircraft turbine engines has demonstrated that manufacturing and service-induced anomalies still occur which can degrade the structural integrity of turbine engine rotors. Recent NTSB findings from AA Flight 383 in Chicago demonstrate shortcomings of our understanding of how nickel material anomalies behave under cyclic loading. Likewise, the 2017 uncontained fan disk failure on an Air France flight highlight the need to better understand the conditions in titanium alloys which can lead to cold dwell fatigue and its detrimental impact on service life. The objective of this work is to gather mechanical testing data on nickel and titanium rotor materials with anomalies to develop advanced damage tolerance and risk assessment methods that can be used to reduce the risk of failures of high-energy rotors (life limited engine parts). These developed methods and data will provide the basis for new or revised engine certification and continued airworthiness standards and Advisory Circulars. This research also supports the development of a probabilistic design code called DARWIN that takes into account the rare occurrence of manufacturing and service induced anomalies on part life. This research, together with A11B PS.4 "Improved Nondestructive Evaluation (NDE) to Prevent Uncontained Engine Failures", offer a holistic approach to reducing engine rotor failures due to material anomalies by improving the design, manufacturing, and inspection of these critical parts.	FY19	FY26	Y	Elements that complete needed data for AC33.17 will be funded, driving toward project completion.
A11B.PS.4	Improved Nondestructive Evaluation to Prevent Uncontained Engine Failures	Service experience of aircraft turbine engines has demonstrated that manufacturing and service-induced anomalies still occur which can degrade the structural integrity of turbine engine rotors. Recent NTSB findings from AA Flight 383 in Chicago demonstrate the shortcomings of available nondestructive evaluation (NDE) methods to ensure the structural integrity of these components. Another recent example is the fan disk failure of Air France Flight 66 in 2017 which was caused by the presence of microtexture regions (MTRs). Improved NDE methods are needed to detect anomalies in life-limited parts (LLPs), validate process improvements, and to develop POD curves to enable accurate risk assessments. This R&D effort will be addressing NTSB and BEA safety recommendations resulting fron the events identified above. Guidance and technical information, including data to support addressing the NTSB and BEA recommendations and future FAA rulemaking on damage tolerance and NDE compliance requirements, are needed for critical nickel and titanium life limited rotors. This proposed research, together with A11B PS.1 "Advanced Damage Tolerance and Risk Assessment for Engine Life Limited Parts", offers a holistic approach to reducing engine rotor failures due to material anomalies by improving the design, manufacturing, and inspection of these critical parts.	FY20	FY28	Y	Will continue to fund in support of NTSB Safety Recs

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A11B.PS.2	Advanced Analysis Methods for Impact of Aircraft Materials from Rotor Burst and Blade Release - OC2	Uncontained engine failures occur when turbine engine rotating components fail, fragmenting into high energy debris that escapes the engine case and may hit other parts of the airplane. Such events pose a serious threat to passengers and the safe return flight of the aircraft. Several recent events have occurred involving the release of high energy blade or rotor fragments. Notably, since 2016, five in-flight fan blade out (FBO) occurrences have resulted in severe damage to the surrounding engine nacelle structure and separation of large pieces of the inlet and/or cowl – in one instance resulting in a passenger fatality. Uncontained rotor failures continue to occur from disk burst events as well, with several events in recent years releasing multiple large and small fragments. An uncontained turbine disk failure in 2010 released fragments that impacted the aircraft in multiple locations, disabling many systems. This event exposed the need for improved vulnerabiliy analysis tools and guidance which account for the multiple fragment threat. Additionally, industry is rapidly pursuing certfication of new propulsion concepts such as the CFM RISE open rotor (or unducted) engine and electric propulsion systems which the FAA will need to ensure are introduced safely. This research task develops data and analysis methods to produce publicly available tools as well as to establish a technical basis to support FAA rules, policy, and guidance for certification and continued airworthiness. The research products are used to design, analyze, and evaluate turbine engine blade containment systems using dynamic finite element analysis (LS-DYNA) and to minimize the hazards to the airplane and protect critical systems in the event of an uncontained failure using the Uncontained Engine Debris Damage Assessment Model (UEDDAM). This research also works to address safety risks of blade release for new technology open rotor (unducted) engines and electric propulsion systems which lack containment around the most energetic blades.	FY21	FY24	Y	Undetermined
A11B.PS.6	Engine Safety Event Prevention thru EHM (engine health monitoring)	The purpose of this research is to facilitate implementation of On-board Engine Health Alerts using Analytics and Artificial intelligence that would help detect unsafe conditions and precursors before they propagate to major engine events. The approach will establish robust methodologies to detect abnormal engine performance deterioration and vibration signatures in-flight that will enable onboard alerts to the crews to trigger maintenance inspections to verify engine condition prior to the next flight. The robustness of the onboard thresholding analytics is important in order to detect impending hazards while minimizing false positives and unnecessary maintenance actions.	FY23	FY27	Y	Undetermined

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A11B.PS.7	Electric Propulsion	This project will focus on developing standardized tests for evaluating the durability, endurance and reliability of electric engines. Current policy and standards are not well suited for addressing the durability, endurance and reliability requirements of electric engines. The difference in which stress parameters and their respective magnitudes affect these attributes are currently unknown between piston and turbine engines, and electric engines. This limits the FAA's ability to extend existing policy to electric engines, and research must be conducted to develop such tests. Since the application of electric engines in aviation has spawned revolutionary aircraft designs, there will be new mission profiles and therefore new propulsion power demand profiles. This project will begin by defining the various mission profiles (e.g. VTOL, CTOL, etc.) foreseen to be used by electric aircraft and then this information will be correlated to classes of electric engines. This categorization allows for a starting point to identify test cycle parameters such engine loads, durations, temperatures, etc. Once these fundamental pieces of information are established, the FAA will generate test plans and a test rig design for conducting this research.	FY24	FY27	N	EP remains a high priority for AIR. EP projects are being reevaluated for current applicability and to address Certification Readiness of new emerging tech

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A11C.SIC.17	Administration of the FAA Joint Centers of Excellence for Advanced Materials (JAMS)	This project is solely to fund the administration and continued operations of COE JAMS as mandated by the FAA Reauthorization Act of 2018. JAMS is co-led by the University of Washington and Wichita State University and administrative funds are split between them. Research grants are administered to all JAMS member schools. There are currently nine core JAMS member universities, which include Wichita State University (Co-Lead), University of Washington (Co-Lead), University of California San Diego, Auburn University, Mississippi State University, University of Utah, Oregon State University, Washington State University, and Florida International University. The research funded through the JAMS COE is designed to evaluate and advance new materials, processes, and structures for safe integration into aviation products. Output of JAMS research will help support development of performance based guidelines (industry documentation) and guidance (FAA documentation). While current advanced material and process guidance is already performance-based, because practices are proprietary and non- standardized, there is much to be gained from sponsoring research to publish best practices and guidelines that ensure successful and safe integration. The FAA COE framework requires %100 matching contributions from non-federal sources for every dollar awarded to COE research. FAA uses this framework to engage with industry through COE schools. Through COE the framework, our industry research partners invest in FAA research. In addition to bringing non-federal resources to the table and doubling investment on FAA dollars spent on COE research, this engagement with public and private partners also enables FAA to leverage other related external research efforts thereby avoiding duplication. This project is an enabler that allows FAA to maintain the COE JAMS framework and use it as a funding vehicle to sponsor research grants through the JAMS COE with dollar-for-dollar industry cost match. In prior years this administrative grant was awarded under A11C SIC 2 for composite	FY16	FY30	Y	The vast majority of these projects are developed at Congressional request and in support of JAMS COE. The FAA and the COE have worked very well together in identifying projects that are value added to the FAA and Industry.
A11C.SIC.14	Evaluate fatigue and damage tolerance behavior of bonded joints	In a cost-share partnership (50/50) with Boeing, address safety and structural integrity issues of bond joints and repairs. Current focus is assessing the fatigue and residual strength performance of bonded repair size limits (BRSL) for panels representative of composite wing structures. This task will leverage resources with Boeing to support this research and help establish additional structural test capabilities for the FAA	FY17	FY24	Y	

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A11C.SIC.12	Develop Certification Protocols for Advanced Materials	This research investigates new material forms and new manufacturing processes that are being introduced into aviation products. This addresses AVS goals for both safety and innovation by investigating fundamental material behaviors and developing standard approaches for specifications, testing protocols, and data reporting. The first requirement of introducing any new material or process is to ensure it is characterized and under control. Different material forms, such as composite prepreg, bonded joints, polymer fused filament additive manufacturing (AM), metal powder bed fusion AM, resin transfer molding (RTM) composite, etc., require different testing protocols to meet regulatory requirements. This research helps establish minimum criteria that are acceptable to the FAA for various material and process combinations. This process of creating initial databases, and publishing the characterization protocols in FAA and industry standards, was successfully used in the mid-90's for prepreg carbon epoxy material forms. Since 2016, FAA has been funding many similar projects to develop databases and protocols for materials such as ceramic matrix composites, thermoplastic composites, polymer AM, and adhesives. This research is expected to be open for many years as FAA selects and investigates various materials from the new ones being proposed by applicants. Work that meets this scope has been funded through SIC.12 (planned budget) and SIC.13 (congressional plus-up funding). For FY24, we are continuing investigation of discontinuous fiber reinforced composites that exhibit unique behaviors compared to "traditional" continuous fiber composites. These unique behaviors affect design performance through relationships with structural geometrical details, material characteristics and the necessary process controls. The design space of practical interest to the industry will require different testing and analysis strategies for material characterization and design value development as a function of allowed process variables. This is primarily due to size effects and interactions with part design variations. For	FY20	FY30	Y	

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A11C.SIC.1	Evaluate Aging Effects on Selected Material or Structural Detail	Many advances with manufacturing methods are inducing part-specific characteristics that require careful consideration for long-term effects. For decades, rotor blades (tail and main) have both metal and composite bonded details in a critical single load path that, if failed, may cause a catastrophic rotorcraft crash. Specific blade locations and history leading to a disbond growth varies along the length of the blade and loading history. In some cases, events can yield slow disbond growth and noises that self-inspect a problem that safely leads to blade retirement. Other disbond locations may generate faster blade growth that, without arrestment features, can be catastrophic. Different parts (segments) of the blade have enough differences in the specific history of loads leading to disbonding that specialized bench tests may be defined to substantiate the design's life in separate bench tests suitable for that segment of the blade. In addition, the specific usage spectrum has been found to make a difference and the largest blades often have different test spectrums based on specific applications. When the rotorcraft is sold to a new owner, there is the possibility that usage changes and potential history-dependent behavior may arise, stymying attempts to certify varying applications. This is further complicated realizing that polymer adhesives used for bonding metals and composites have behaviors that are highly non-linear, viscoelastic and plastic (with strong environment and load history dependence). Recently, it has also been realized that the sandwich cuff portion of the rotorblade, which is often repaired sandwich structure, may also have complex contributions to blade failures. This research will use an integrated product team approach to safety involving interested regulatory, OEM and maintenance organizations to first identify possible root-cause effects and then support laboratory bench tests and analyses to show the failure can be replicated in a test, which has practical acceleration parameters to assess life at the time of blade certification.	FY20	FY27	Y	
A11C.SIC.3	Evaluate Analytical Methods for Composite Seat Performance	Current industry standards and test methods for seating systems were developed assuming metallic structure in the load path. Composites are now proposed for application and the current guidance material needs to be expanded to describe how static and dynamic certification test methodologies should be adapted. This research will evaluate comparable composite and metallic seating systems and use that information to update industry guidelines and practices for seat design and certification, as well as FAA guidance documentation and training materials. Research activities will focus on developing data that supports performance based guidelines (industry documentation) and guidance (FAA documentation). The data will be used to support safe test methodologies for seating systems. The outcomes support developing guidance material that will be incorporated in FAA AC's and in industry standards documents such as CMH-17 and SAE. FAA's AC 20-146A will be expanded after successful completion of this project to allow the use of analytical models in seat certification projects. This research supports advanced manufacturing by supporting safe integration of composite seating systems into aircraft, rotorcraft, and personal vehicles. It may also be applicable to space vehicles, which are also implementing composite seating systems.	FY23	FY27	Y	

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A11C.SIC.16	Element-level Test Standards for Aviation Composites	Test standards exist for very simple composite configurations at the lamina or laminate level; however many properties developed at these levels are not useful for composite design. In many cases, an industry company or group of companies will note that they are substantiating structure using "analysis supported by testing". The analysis is often not to predict strength but rather load paths in real structure. This research creates a new set of test standards at middle level complexities to help standardize structural substantiation processes and provide tools to better understand composite structural behavior. Primarily it will support the building block approach identified in AC 20-107B with more detailed guidelines on mid-level test standards and best practices. In practice, it will allow sufficient knowledge sharing in engineering handbooks, accepted as practical and cost-effective as related to non-recurring development costs for time-critical design/build applications, and workforce education. This research will help the FAA and cost-sharing industry partners to promote higher-level configuration standardization at element or detail levels that can be used for multiple purposes, including the generation of design values and proof of structure. It will support developing new industry standards for implementing composite and other advanced material forms into aviation products, ensuring the coverage for many challenging problems for defects and damage. Standardization promotes efficiency by allowing third parties to build more effective support platforms, such as structural analysis software, semi- empirical data generating procedures for the related engineering analyses (with sufficient accuracy to ensure failure is avoided) and other practical engineering tools that shortens the time and cost to introducing new structures made with advanced materials. This research supports introduction of new advanced material forms into aviation products in a safe and efficient manner by developing test standards and associated methodologies that can be used across the industry, rather than rely on each company having to develop their own test requirements This will be one option	FY21	FY25	Y	
A11C.SIM.3	Evaluate fatigue behavior of metallic AM materials	This research is to investigate fatigue and age-related behavior of metallic additively manufactured materials to safely implement them into fatigue-sensitive structures. While some fatigue data will be developed as part of initial material characterization under BLI Item 1.1, it will not be complete in all aspects necessary to safely implement metal AM into fatigue critical structures. This is expected to be an ongoing project to evaluate behavior of various material/process combinations and may include evaluating existing tools. In FY24, this will include two tasks: · Sensitivity Study for Static and Fatigue Behavior of Anomalies and Part/Substrate Interface in Direct Energy Deposition (DED) · Evaluation of Structural Integrity Assessment Tools for Higher-Criticality Metal AM Parts (DARWIN)	FY19	FY30	Y	

A11C.SIC.18	Develop educational and training materials	Advanced material and structures are largely proprietary. This means the FAA and industry largely publish best practices and lessons learned, rather than data that can be directly used for regulatory compliance. This BLI item supports educational activities such as training development and lessons learned databases to promote safe incorporation of advanced materials and structures in aviation products. For FY24, the one project that will be funded is continued development of a public lessons learned database for additively manufactured materials	FY23	FY30	N	

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A11C.SIM.2	Evaluate key process parameters, key characteristics, and manufacturing control and inspection metho	This research focuses on evaluating scalability of new materials and processes to provide public knowledge and guidelines on best practices and effectiveness (or ineffectiveness) of selected manufacturing and quality assurance techniques. Material data is typically developed at a coupon level, which may not reflect behavior of full scale structure. In addition, manufacturing techniques used to make test coupons may not be effective when producing full scale structure or unique parts with complex geometries. Key characteristics and key process parameters that are tracked and controlled at small scale may need to be adjusted for real production parts.	FY23	FY30	N	

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A11E.SIM.5	Damage Tolerance and Durability Issues for Emerging Technologies	This research addresses certification and continued airworthiness issues arising from the introduction of emerging metallic structures technologies (EMST) used for aircraft structures in new fatigue critical applications. It leverages FAA resources through cost-share cooperative research and development agreements (CRADAs). In partnership with industry, damage tolerance and fatigue behavior of EMST is being assessed through test and analysis of fuselage structure using the FAA's FASTER and Structures and Materials labs. Fuselage panel test data is being generated to assess the effect of EMST fuselage concepts on damage tolerance performance as compared to the current baseline aluminum fuselage structures. This proactive work provides FAA certification engineers with the insights necessary to assess these emerging technologies, so that the appropriate questions can be posed to the applicants for certification, to ensure acceptable levels of safety and risk mitigation	FY16	FY25	Y	This BII is currently being reviewed for replanning. This will affect projects in FY24. The current state for all projects in this BLI is undetermined.
A11E.RS.9	Loss of Control (LOC-I)	This research will examine models, methods, and means that would indicate to a rotorcraft pilot the onset, presence, and potential severity of an impending loss of control condition. Loss of Control in a helicopter can take many forms, however, the most prevalent ones seen in the latest United States Helicopter Safety Team's (USHST) fatal accident analysis highlighted loss of tail rotor effectiveness (LTE), vortex ring state (VRS) or settling with power/insufficient power, dynamic rollover, retreating blade stall, mast bumping, and low rotor rpm conditions. As an example of one of these unsafe conditions, LTE appears suddenly without indication to a pilot upon reaching the performance limitation of the helicopter's tail rotor in various flight/wind conditions. The goals of this research (using LTE as an example) are to: 1) develop and refine existing models to detect the presence of the onset of LTE, 2) provide a warning to pilot(s) of the impending condition and potential severity, 3) create/test potential mechanical and electronic systems that could provide a degree of tail control input to arrest this condition.	FY22	FY27	Y	

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A11E.ES.9	High Voltage Electric Aircraft System	This requirement will provide data to identify the best possible configuration of High Voltage Electric Aircraft System for small, helicopters and airplanes and large transport airplanes. These will require megawatt-range power consumption and MW-hr distribution capacity. Safe design, validation and maintenance will be a new challenge. These system may include several system inovation and implementation of modularized dtributive system and design/validate in a practical method that ensure safe installation and containment of possible failures. This effort will provide data on the feasibility and advantage of modularizing the High voltage Electric Aircraft System. The data will be used for certification and industry standards to maintain or increase the current level of safety. This data would apply to unmanned aerial vehicles, small airplanes, rotorcraft, and transport. In the United States and abroad, experimental prototypes are pushing the envelope of electric propulsion to new limits in hopes of understanding more about its potential and capturing greater market appeal. High voltage electric systems, such as those proposed on the new eVTOL UAM vehicles such as the Joby aircraft, MagniX electric propulsion unit (EPU) have introduced new hazards that are currently not fully understood. We need to work with industry, academia, and standard organizations to establish a knowledge base and support the development of consensus sbased standards to support fielding of such systems in the near future. Hybrid-electric part 23 commuter airplanes and transport category regional airplanes are in conceptual design. High voltage electric aircraft systems introduce new safety challenges for electrical energy management. This is a disruptive technology that is a key enabler for More Electric Aircraft, new Urban Air Mobility and eVTOL vehicle systems as well as UAS.	FY22	FY25	Y	
A11E.FCS.2	Generalized Occupant Safety in Multiple Configurations	Crash dynamics requirements today are based on extensive research, both experimental and from actual accidents. The current safety standards were developed independently for different types of aircraft and different loading directions. As such, there are many competing requirements and methods of testing and evaluating depending on both the impact direction and seating orientation. A comprehensive set of identified injury criteria is needed for an overall crashworthiness certification program regardless of aircraft type and loading direction. This would support the move to performance based regulations and directly support new classes of aircraft such as Advanced Air Mobility which share many of these common orientations with traditional aircraft.	FY24	FY26	Y	
A11E.FCMS.13	Transfer of New Technologies for Enhancement of GA Safety	There are new and innovative safety systems available that could dramatically improve GA aircraft safety. Some of these systems are small, lightweight, and inexpensive. Lessons learned from previous research shows that these new safety devices can easily be retrofit into existing GA aircraft	FY18	FY24	Y	

Domain: Aircraft Safety Assurance Program Area: Continued Airworthiness						
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A11E.FCS.1	(Should be A11E.FCS.1 from FY24) Dynamic Crash Conditions for Supersonic Transports	The regulations currently base the crash impact conditions on conventional airplanes with relatively low stall speeds and modest flare during landing using a tubular fuselage and wings more or less centrally mounted. Based on this, a crash impact pulse was developed to assess occupant protection. There is a different pulse for small airplanes and rotorcraft. For supersonic transports, some of the original assumptions may not be valid which could result in a lower level of occupant protection if nothing is done.	FY23	FY26	N	
A11E.RS.5	Wire Strike Avoidance	Wire Strike Avoidance research addresses one of the key causal factors of the 3rd leading accident precursor of helicopter fatal accidents – Low Altitude Operations. Wires are incredibly difficult to discern, especially at low altitudes where a majority of helicopter operations take place. They are often impossible to see at night, but can also be tough to pickup during daylight conditions and if they impact a helicopter's main rotor or tail rotor blades, the result is almost always catastrophic. Thus, research is needed to examine and approve cost-effective technologies to enhance safety of helicopter low altitude flight operations such as search and rescue, helicopter air ambulance, law enforcement, aerial application, corporate/VIP transport, and others. Research activities will focus on two areas of wire strike avoidance: wire detection and crew alerting and wire cutting. They will comprise trade studies of new technologies and the certification considerations for these technologies, the design and evaluation of new wire cutting technologies utilized as part of drop testing of actual helicopter airframes, examination of new databases of wires and other obstacles/hazards in the low altitude environment, plus human-in-the loop simulation and flight-testing to examine the safety benefits of new alerting detection and alerting tools on helicopter avionics, heads-up/head-worn/helmet-mounted displays, and electronic flight bags. These activities will contribute to the development of recommendations for safety enhancing technologies that could be implemented through future certification applications and/or Technical Standard Orders (TSO's) to increase safety and provide operational benefit to the vertical flight community.	FY19	FY26	Y	
A11E.SIM.12	Probabilistic Damage Tolerance Based Fleet Risk Management for Small Airplanes	This activity finalizes the development of a risk assessment and risk management software for metallic structural fatigue issues of general aviation fleets. Under this requirement, advanced probabilistic methods have been combined with Fatigue and Damage Tolerance analysis techniques. FY 2024 is the last year of this activity when a graphic user interface will be developed and validated in addition to training materials and a user manual.	FY18	FY24	Y	

Domain: Aircraft Safety Assurance Program Area: Continued Airworthiness						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11E.SIM.13	Development of Control Surface and Stabilizer Freeplay Limits	To obtain data and develop the methodology and nonlinear models required to establish safe and realistic limits that will support the development of consensus-based standards for transport category aircraft; with the objective to preclude freeplay-induced vibrations (also known as limit cycle flutter) in operating airplanes and thereby eliminating related dangerous COS issues. The limits will be established for both legacy aircraft and new airplanes equipped with emerging technologies of active flutter suppressions. The result will include numerical models and a fully aeroelastic aircraft wind-tunnel model that could be used as a testbed for developing consensus standards for aeroelastic-related COS issues.	FY19	FY24	Y	
A11E.SIM.4	MMPDS Support and Design Values for Emerging Materials	The Metallic Materials Properties Development and Standardization (MMPDS) is a collaborative government – industry effort to develop and improve the standardized process to generate statistically-based proprieties for metallic materials and fasteners used in commercial and military aerospace systems worldwide. This proposal addresses the need to have properly vetted compliance data and tools that the aviation industry can use to certify products in a consistent, safe and uniform way. This collaborative process to develop data and tools promotes efficient, standardized certification of aircraft structure and leverages resources via government and industry consortium	FY16	FY31	Y	
A11E.RS.10	NVG-LED Obstruction Light Compatibility	The objective of this research is to find a means of “seeing” LED obstruction lights while wearing Night Vision Goggles (NVG). Replacement of incandescent obstruction lights with LEDs with little or no IR signature has caused obstructions so lit to “disappear” when viewed through NVG, causing a hazard of collision. Developing a method to regain the visibility to these obstructions is key to the continued use of NVG and the safety enhancements they otherwise bring to EMS and other night VFR operations. This will be accomplished by laboratory and field testing of technology solutions with actual LED light testbeds on helicopters equipped with pilots flying with NVG's. The results of this research may be used to update TSO-C164a.	FY19	FY24	Y	
A11E.FCS.4	Evaluating Potential Crash Impact Conditions for eVTOL	The regulations currently base the crash impact conditions on conventional airplanes with relatively low stall speeds and modest flare during landing using a tubular fuselage and wings more or less centrally mounted. Many electric vertical takeoff and lift (eVTOL) designs include multiple rotors, overhead structures, asymmetric rotor locations relative to the cabin, smaller passenger compartments, swept designs, and new seat designs. Some of the original assumptions used for seat certification may not be valid which could result in a lower level of occupant protection if nothing is done.	FY24	FY26	Y	

Domain: Aircraft Safety Assurance Program Area: Continued Airworthiness						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11E.FCS.3	Evaluating Vertical Seat Testing for General Aviation Aircraft	Crash dynamics requirements today are based on extensive research, both experimental and from actual accidents. Based on FAA and NTSB data at the time, dynamic load factors were adopted for all general aviation aircraft. Since that time, the FAA has issued exemptions for certain classes of aircraft from these dynamic seat testing requirements which were identified as the third most costly part of the aircraft. These exemptions are based on the performance of the aircraft, the likely exposure, and the safety risk involved. There are currently proposals being developed to extend these dynamic seat testing exemptions to additional aircraft while including other mitigation features. These methods would be incorporated into the ASTM F44 standard which is an acceptable means of compliance for Part 23 aircraft.	FY24	FY26	N	
A11E.SIM.11	Effect of Turbulence on Aircraft Structural Loading	To examine the current Part 23 and Part 27 loads rules for electrical vertical takeoff and landing (eVTOL) systems to identify the need to relax or strengthen them.	FY19	FY27	Y	
A11E.SIM.19	Thermal Residual Loads in Metal-Composite Hybrid Structure	This proposal is aimed at developing data needed to evaluate methods used by industry to account for thermally induced loads in hybrid metallic-composite structure during full-scale test. It supports ARAC recommendations on the damage tolerance and fatigue requirements of 14 CFR part XX.571 to more represent a performance-based standard or an industry or consensus standard and associated guidance material. This effort is a continuation of a task initiated under A11E.SIM.16 in FY21	FY21	FY25	N	
A11E.SIM.9	NASGRO Enhancement, Standardization, and Material Database Generation for Damage Tolerance Analysis	Collaborative government – industry effort to enhance the material databases and damage- tolerance assessment (DTA) tools' capabilities included in the NASGRO suite of software. The output of the research helps to promote consistent and uniform level of safety throughout the aviation industry through standardization of validated DT fracture compliance material data and tools. Standardization of the data and tools enable the FAA and industry to safely and efficiently address compliance to Title 14, Code of Federal Regulations (14 CFR) 25.571.	FY23	FY30	Y	
A11E.SIM.14	Reliability of Structural Health Monitoring (SHM)	Continued operational safety (COS) is dependent on robust maintenance and inspection practices with defined Probability of Detection (PoD). The goal of this research is to ensure the reliability and detection capability of Structural Health Monitoring (SHM) technologies are equivalent or better than the traditional non-destructive inspection techniques that they are replacing on transport category aircraft. This is accomplished through the generation of data to verify certification and maintenance methodologies to ensure safe and efficient use of SHM. This research will provide the FAA with detailed (inspection capability and PoD) information to determine the appropriateness of SHM techniques and technologies and will provide guidance and training to prepare the industry for implementation of SHM technologies.	FY21	FY27	N	

Domain: Aircraft Safety Assurance Program Area: Continued Airworthiness						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11E.SIM.15	Inspection Challenges of Emerging Structural Technologies	This research looks to generate data to verify certification and maintenance methodologies to ensure safe and efficient use of existing and advanced inspection technologies. The first is to ensure the reliability of advanced inspection technologies, and the second is to assess the applicability of traditional and advanced inspection technologies on emerging materials and structures. These products are being introduced without the benefit of the in-service experience on the existing configurations, materials, and operational conditions the operators provide. This research will provide FAA with detailed information to determine the appropriateness of inspection techniques and technologies and will provide guidance and training to prepare the industry for the implementation of these materials and technologies.	FY24	FY27	N	
A11E.SIM.20	Airframe Structure Model and Simulation Validation	This proposal uses existing testing facilities at the FAA Tech Center to generate data necessary to evaluate the effectiveness of experimental validation frameworks for advanced Modeling and Simulation (M&S) applications. This work will be informed by the outcomes of the industry-government Airframe M&S working group developing a Credibility Assurance Framework (CAF), and will be performed in close collaboration with industry partners. The outcome is intended to support industry and FAA confidence in the more extensive use of M&S tools for assessment of aircraft structures using the CAF	FY24	FY27	N	
A11E.SIM.18	Automated Nondestructive Inspection (ANDI)	This research looks to generate data to verify certification and maintenance methodologies to ensure safe and efficient use of advanced inspection or monitoring technologies. Continued operational safety (COS) is dependent on robust maintenance and inspection practices with defined Probability of Detection (PoD). The proposed research has two goals. The first is to ensure the reliability of advanced inspection and monitoring technologies, and the second is to assess the applicability of traditional and advanced inspection technologies on emerging materials and structures. These products are being introduced without the benefit of the in-service experience on the existing configurations, materials, and operational conditions the operators provide. This research will provide FAA with detailed (inspection capability and PoD) information to determine the appropriateness of inspection techniques and technologies and will provide guidance and training to prepare the industry for the implementation of these materials and technologies. This research proposal will address advanced inspection practices including Structural Health Monitoring (SHM), inspection challenges of Emerging Metallic Structural Technologies (EMST), and Automated Nondestructive Inspection (ANDI). Large area inspection of aircraft skins for dents, cracks and other defects is time consuming, repetitive, and often dangerous to the inspector. The aviation industry is looking to use automation, such as UAS/UAV and robots with cameras and other inspection sensors, to inspect large areas and reduce variability due to human factors. Industry expects automation to result in higher reliability of detecting damage and to also reduce maintenance costs.	FY24	FY27	N	

Domain: Digital Systems Technologies Program Area: Digital Systems						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11DS.SDS.7	Aircraft PNT Cyber Safety	GPS and FAA's WAAS transmit unencrypted, unauthenticated digital data messages. Open public standards and products enable spoofing. What once required expensive military assets is now achievable using legal, hobby-grade devices and software. These avionics are essentially networked computers and the antennas are unsecured entry ports for potential threats—comparable to an internet connection with no firewall or virus protection. These research projects address specific DOT tasks assigned in U.S. Space-Based Positioning, Navigation, and Timing Policy (Space Policy Directive 7, the National Implementation Plan signed by OST-R in May 2021, and the Aug 2021 OSTPNational Research and Development Plan for Positioning, Navigation and Time Resilience to pursue GPS and WAAS authentication and advanced antenna technologies to enable resilient and responsible use such that disruption or manipulation does not undermine aviation safety or national economic security. This research enables the assessment of FAA requirements and technical capabilities to enable avionics processing of authenticated WAAS and GPS services and advanced antenna to detect and preclude aircraft/pilot use of USG recognized threat capabilities to manipulate or simulate (i.e., false) GPS and WAAS/SBAS signals and data messages that appear to the aircraft and pilot as valid positioning, navigation, timing and safety system data. Currently there are no aircraft or avionics requirements for detection of this hazardously misleading data. The risk is widespread and has potential broad impacts to aviation operations including accidents with catastrophic results and multiple fatalities in the absence of appropriate mitigations. The aircraft GNSS avionics receiver requirements for processing GPS and WAAS signal and data authentication and civil anti-spoofing antenna are critical tools to address existing avionics requirements safety shortfalls. Planned activities are in collaboration with the FAA WAAS Program Office, DOT OST-R , and AF Research Laboratory as providers of the authenticated signals and data messages,	FY21	FY27	Y	This BII is currently being reviewed for replanning. This will affect projects in FY24. The current state for all projects in this BLI is undetermined.
A11DS.SDS.6	Develop a closer relationship between safety and certification along a safety continuum	The development categories currently in use are labeled and divided into four. The risks levels are continuous but are also divided into distinct levels. These distinctions do not map well in real-world situations where the risks and development techniques are a lot more nuanced. A mechanism should be developed where the certification work should have a more flexible mapping to the risk reduction thereby raising confidence in the software based system without resorting to a "checklist mentality".	FY24	FY26	Y	

A11DS.SDS.10	Develop a better understanding of ML based generalization and rigor	Data is used to train an AI, M/L system. The training data is always incomplete and new meaning must be extracted from the training data in a manner that reduces to total data stored without losing the essence that is required. This is called generalization and is fundamental to the effectiveness of the resulting inference system. The balance between the generalization and the resulting rigor of the resulting system needs to be better understood. While a number of statistical and other techniques have been attempted, the system is is still "surprised" by anomalies in the model that are not visible during the verification process. For AI M/L systems to be trusted, this phenomena must be better understood when it affects risk.	FY24	FY26	Y	

Domain: Digital Systems Technologies Program Area: Digital Systems						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11DS.SDS.11	Develop an approach to scale upwards from low-criticality advisory systems to safety critical system	The training of AI M/L systems is typically accomplished through labeled data, where training data sets consist of inputs and their anticipated outputs. For large data-sets this becomes expensive, so success measures are developed so that AI/ML networks learn from alternative reward systems. As simple advisory systems are introduced, training can continue through experience using combinations of data inputs. An autonomous pilot assistant may initially be trained on individual control instruments, but through subsequent observation can continue to learn from the pilot to build habits that mimic the good behaviors of the pilot. This learning mode needs to be controlled so that bad habits are not rewarded. We need to explore further and assess the safety implications of using this approach.	FY24	FY26	Y	
A11DS.SDS.13	Develop an approach that supports explainability of an AI M/L system.	A complete AI M/L based system has many components from Data Management (including Training, Validation and Testing), to Model Development, Transfer (which may include many optimization steps) and deployment on an inference processor. The computers on many of these steps may be different, and many software transformations may be performed. These steps may enhance our visibility into the system or they may conceal it. To understand what is going on the system should be explainable. The explanations should be such that they are understood by humans. As sophistication of the system grows, the risk is that the explainability suffers. Explainability may put a limit on what can be achieved unless a mechanism is found that reduces the risk of not knowing. A bound on explainability needs to be developed.	FY24	FY26	Y	
A11DS.SDS.12	Develop an approach that permits trust in the model development and model verification processes tha	The training of AI M/L models are typically performed using huge computing resources. Typically such systems are provided by large companies that have built vast networks of specialized processors that operate on data in parallel and replicate their processing using simple but vectorized capabilities in-the-cloud. Existing guidance for using such development and verification tools do not exist, and it is unknown how this should be addressed in a certification environment.	FY24	FY26	Y	
A11DS.SDS.8	Develop understanding of software safety at lower levels of criticality	This requirement (FY22-FY26) will analyze airworthiness and certification aspects of highly integrated, complex digital aircraft systems, including the software and airborne electronic hardware. Aircraft Software, Programmable Hardware, Artificial Intelligence and Machine Learning based systems provide tremendous flexibility and power to express how aircraft systems should behave using these technologies. This permits us to add functionality that would be impossible without these technologies, but faults in design and implementation using these technologies can be difficult to eliminate and be disastrous if present. Due to the growth in size and complexity of these systems, our traditional development and verification approaches may reach a point when we are unable trust them. These "soft" technologies are already forcing us to choose between deployment and risks. The diversity of future systems will need new guidance to ensure growth can continue without compromising safety. A research program is needed to understand how industry and regulators can establish confidence in flying vehicles in the presence of rapid technological developments.	FY24	FY26	Y	

Domain: Digital Systems Technologies Program Area: Digital Systems						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11DS.SDS.9	Develop improvements of software safety through the use of architectural means	This requirement (FY22-FY26) will analyze airworthiness and certification aspects of highly integrated, complex digital aircraft systems, including the software and airborne electronic hardware. As the availability of computing power continues, the use of more resources to cross-check and mitigate potential vulnerabilities improves. While this seems compelling, the monitoring systems and their effects on overall safety may themselves introduce problems. Are the monitors trustworthy? Are the selection mechanisms trustworthy. Can a safety monitor cause more problems? Such questions need to be understood, and solutions need to be developed before we fully trust the safety systems that make the results more safe.	FY24	FY26	Y	

Domain: Environment and Weather Mitigation Program Area: Aircraft Icing						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11DA.AI.11	High Altitude Ice Crystal Icing Effects on Aircraft – Q2.3 Atmospheric Characterization	Conduct research to maintain safe, unrestricted flight through high altitude ice crystal environments. This research requirement addresses current shortfalls in policy and guidance for glaciated and mixed-phased icing conditions and their effect on turbine engine damage and resulting powerloss, along with air-data probe fowling. This activity supports current ice crystal icing ARAC tasking.	FY19	FY25	Y	This BII is currently being reviewed for replanning. This will affect projects in FY24. The current state for all projects in this BLI is undetermined.
A11DA.AI.9	High Altitude Ice Crystal Icing Effects on Aircraft - Q2.1 Small scale simulation	Conduct research to maintain safe, unrestricted flight through high altitude ice crystal environments. This research requirement addresses current shortfalls in policy and guidance for glaciated and mixed-phased icing conditions and their effect on turbine engine damage and resulting powerloss, along with air-data probe fowling. This activity supports current ice crystal icing ARAC tasking.	FY19	FY24	Y	
A11DA.AI.15	Safe Operations and Take-off in Aircraft Ground Icing Conditions – Q1.4 Artificial Snow Machine	Conduct research to maintain safe winter ground operations, evaluate effects of changing ground operations and develop test and analyses methods to support these changes, and address effects of technology changes for fluids and de/anti-icing procedures. Develop a validated artificial snow machine for evaluating de-icing and anti-icing fluids will result in a more effective test method and provide significant savings to the FAA, fluid manufacturers and commercial airlines. Currently it is necessary to wait for natural snow conditions (e.g. very cold conditions) to evaluate fluids. FAA guidance requests calls for more extensive fluid evaluations for all snow conditions, which would be available using the artificial snow machine. Also, determine vertical tail surface ice contamination effects.	FY16	FY24	Y	
A11DA.AI.16	Urban Air Mobility (UAM) Icing – Q3.1 Icing Cloud Effects on Aircraft	Conduct research needed to develop aircraft regulatory requirements and guidance for Urban Air Mobility (UAM)/Advanced Air Mobility (AAM) to maintain safe operations in instrument meteorological conditions (IMC) and icing environments.	FY19	FY25	Y	
A11DA.AI.13	Safe Operations and Take-off in Aircraft Ground Icing Conditions – Q1.2 Allowance times in mixed ici	Conduct research to maintain safe winter ground operations, evaluate effects of changing ground operations and develop test and analyses methods to support these changes, and address effects of technology changes for fluids and de/anti-icing procedures. Develop a validated artificial snow machine for evaluating de-icing and anti-icing fluids will result in a more effective test method and provide significant savings to the FAA, fluid manufacturers and commercial airlines. Currently it is necessary to wait for natural snow conditions (e.g. very cold conditions) to evaluate fluids. FAA guidance requests calls for more extensive fluid evaluations for all snow conditions, which would be available using the artificial snow machine. Also, determine vertical tail surface ice contamination effects.	FY16	FY27	Y	

Domain: Environment and Weather Mitigation Program Area: Aircraft Icing						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11DA.AI.12	Safe Operations and Take-off in Aircraft Ground Icing Conditions – Q1.1 Vertical Surface Contaminati	Conduct research to maintain safe winter ground operations, evaluate effects of changing ground operations and develop test and analyses methods to support these changes, and address effects of technology changes for fluids and de/anti-icing procedures. Develop a validated artificial snow machine for evaluating de-icing and anti-icing fluids will result in a more effective test method and provide significant savings to the FAA, fluid manufacturers and commercial airlines. Currently it is necessary to wait for natural snow conditions (e.g. very cold conditions) to evaluate fluids. FAA guidance requests calls for more extensive fluid evaluations for all snow conditions, which would be available using the artificial snow machine. Also, determine vertical tail surface ice contamination effects.	FY16	FY24	Y	
A11DA.AI.17	Urban Air Mobility (UAM) Icing – Q3.2 Ice Detector Effectiveness in UAM	Conduct research needed to develop aircraft regulatory requirements and guidance for Urban Air Mobility (UAM)/Advanced Air Mobility (AAM) to maintain safe operations in instrument meteorological conditions (IMC) and icing environments.	FY23	FY24	Y	
A11DA.AI.18	Numerical Analysis of Ice Accretions on Ice-protected Surfaces – Q4.1	Critical surfaces of airplanes are covered with anti-icing/de-icing systems to protect them in icing environments. These systems are applied only to the forward portion of the surface, hence, they cannot eliminate the icing threat completely. With a thermal ice protection system (IPS), the supercooled liquid water impinging on the surface, if not fully-evaporated, will run back and freeze, leaving the protection surfaces clean but the unprotected part ice- contaminated. IPSs other than thermal systems can also produce ice build-up in normal operation, both on the protected area and just aft of the protected area at total temperatures near freezing. A similar ice accretion may also occur if the aircraft encounters supercooled large drop (SLD) conditions, where larger droplets impinge directly behind the protection surfaces and form ice protrusions. Most of the aircraft icing research up to now has focused on aircraft surfaces that are unprotected from ice accretions. This proposed research, however, aims to investigate the ice build-up on protected surfaces where anti-icing/de-icing systems are operating, but do not always completely remove the icing on the surface. In this study, the operational safety risks due to icing on ice protected surfaces will be evaluated using both numerical modeling and tunnel testing together as part of the same engineering analysis framework to benefit from advantages of each analytical tool. The research will be completed in three phases: numerical analysis, experimental analysis, and model validation where predicted results will be validated against the test data collected during tunnel tests. This research will strengthen the scientific basis for development of means of compliance for aircraft icing regulations and certification standards. In addition, it will lead to publicly disseminated data that can be used to develop new design and certification tools. The ultimate goal of this research is to reduce certification costs while at the same time improving aircraft safety operating in adverse weather conditions.	FY22	FY27	Y	

Domain: Environment and Weather Mitigation Program Area: Aircraft Icing						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11DA.AI.14	Safe Operations and Take-off in Aircraft Ground Icing Conditions – Q1.3 Residual Thickened Fluids Up	Conduct research to maintain safe winter ground operations, evaluate effects of changing ground operations and develop test and analyses methods to support these changes, and address effects of technology changes for fluids and de/anti-icing procedures. Develop a validated artificial snow machine for evaluating de-icing and anti-icing fluids will result in a more effective test method and provide significant savings to the FAA, fluid manufacturers and commercial airlines. Currently it is necessary to wait for natural snow conditions (e.g. very cold conditions) to evaluate fluids. FAA guidance requests calls for more extensive fluid evaluations for all snow conditions, which would be available using the artificial snow machine. Also, determine vertical tail surface ice contamination effects.	FY16	FY24	Y	
A11DA.AI.10	High Altitude Ice Crystal Icing Effects on Aircraft – Q2.2 Larger Scale Simulation	Conduct research on a larger scale compressor rig for assessment of ice accretion conditions to allow safe, unrestricted flight through high altitude ice crystal environments. This research requirement addresses current shortfalls in policy and guidance for glaciated and mixed-phased icing conditions and their effect on turbine engine damage and resulting powerloss, along with air-data probe fowling. This activity supports current ice crystal icing ARAC tasking.	FY24	FY27	Y	
A11DA.AI.19	Experimental Analysis of Ice Accretions on Ice-protected Surfaces – Q4.2	Critical surfaces of airplanes are covered with anti-icing/de-icing systems to protect them in icing environments. These systems are applied only to the forward portion of the surface, hence, they cannot eliminate the icing threat completely. With a thermal ice protection system (IPS), the supercooled liquid water impinging on the surface, if not fully-evaporated, will run back and freeze, leaving the protection surfaces clean but the unprotected part ice- contaminated. IPSs other than thermal systems can also produce ice build-up in normal operation, both on the protected area and just aft of the protected area at total temperatures near freezing. A similar ice accretion may also occur if the aircraft encounters supercooled large drop (SLD) conditions, where larger droplets impinge directly behind the protection surfaces and form ice protrusions. Most of the aircraft icing research up to now has focused on aircraft surfaces that are unprotected from ice accretions. This proposed research, however, aims to investigate the ice build-up on protected surfaces where anti-icing/de-icing systems are operating, but do not always completely remove the icing on the surface. In this study, the operational safety risks due to icing on ice protected surfaces will be evaluated using both numerical modeling and tunnel testing together as part of the same engineering analysis framework to benefit from advantages of each analytical tool. The research will be completed in three phases: numerical analysis, experimental analysis, and model validation where predicted results will be validated against the test data collected during tunnel tests. This research will strengthen the scientific basis for development of means of compliance for aircraft icing regulations and certification standards. In addition, it will lead to publicly disseminated data that can be used to develop new design and certification tools. The ultimate goal of this research is to reduce certification costs while at the same time improving aircraft safety operating in adverse weather conditions.	FY23	FY26	N	

Domain: Environment and Weather Mitigation Program Area: Aircraft Icing						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11DA.AI.20	Validation of Engineering Tools for Ice Accretions on Ice-protected Surfaces – Q4.3	Critical surfaces of airplanes are covered with anti-icing/de-icing systems to protect them in icing environments. These systems are applied only to the forward portion of the surface, hence, they cannot eliminate the icing threat completely. With a thermal ice protection system (IPS), the supercooled liquid water impinging on the surface, if not fully-evaporated, will run back and freeze, leaving the protection surfaces clean but the unprotected part ice- contaminated. IPSs other than thermal systems can also produce ice build-up in normal operation, both on the protected area and just aft of the protected area at total temperatures near freezing. A similar ice accretion may also occur if the aircraft encounters supercooled large drop (SLD) conditions, where larger droplets impinge directly behind the protection surfaces and form ice protrusions. Most of the aircraft icing research up to now has focused on aircraft surfaces that are unprotected from ice accretions. This proposed research, however, aims to investigate the ice build-up on protected surfaces where anti-icing/de-icing systems are operating, but do not always completely remove the icing on the surface. In this study, the operational safety risks due to icing on ice protected surfaces will be evaluated using both numerical modeling and tunnel testing together as part of the same engineering analysis framework to benefit from advantages of each analytical tool. The research will be completed in three phases: numerical analysis, experimental analysis, and model validation where predicted results will be validated against the test data collected during tunnel tests. This research will strengthen the scientific basis for development of means of compliance for aircraft icing regulations and certification standards. In addition, it will lead to publicly disseminated data that can be used to develop new design and certification tools. The ultimate goal of this research is to reduce certification costs while at the same time improving aircraft safety operating in adverse weather conditions.	FY23	FY26	N	

Domain: Environmental and Weather Impact Mitigation Program Area: Alternative Fuels for General Aviation						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11M.PS.6	Alternative Fuels for General Aviation	The purpose of this program is to address the number one issue facing General Aviation; that is, how to safely transition the fleet of approximately 190,000 piston engine aircraft, away from the use of leaded aviation gasoline (avgas). Currently 100 octane low lead (100LL) avgas is the most commonly used and reliable fuel for general aviation that meets the necessary octane and energy performance needs for the current safe operation of the general aviation fleet. Lead is added to avgas to prevent damage to the engine at higher power settings. However, lead exhaust emissions have an adverse negative health impact on public health, climate, and the environment. The overarching question that we are address in this proposal is this; "Are the fit-for-purpose, chemical constituents, and other operating characteristics of the candidate unleaded fuels, within allowable safety tolerances compared to a minimum specification 100LL aviation fuel?" This overarching question is addressed by three research questions within the OC. Furthermore, the program has submitted a 2nd FY24 proposal for additional technologies to support other pathways to an unleaded GA future. To accomplish the overarching research question, in FY24, this program will collaborate with industry partners under the Piston Alternative Fuel Initiative (PAFI), to conduct research and testing to validate and verify final unleaded fuel candidates in several areas of testing as follows. -Engine performance, detonation, durability and other operating characteristics as well as detonation damage effects, conducted in engine test cells -Flight testing to document ground and flight operational characteristics under standard, hot, and cold day conditions, and to verify the performance of aircraft on candidate fuels. -Laboratory/chemical analysis data on the properties of candidate fuels that ensures sufficient compositional and performance properties control to support alternative fuel co- mingling and safe operations relative to 100LL avgas. By FY24 the program will have completed research on materials compatibility.	FY21	FY29	Y	This BII is currently being reviewed for replanning. This will affect projects in FY24. The current state for all projects in this BLI is undetermined.

Domain: Environmental and Weather Impact Mitigation Program Area: Alternative Fuels for General Aviation						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11M.PS.7	Alternative Fuels for General Aviation	The overarching question addressed in this proposal is "What propulsion technologies will expand the use of unleaded avgas in the GA fleet and reduce other environmental impacts of GA on the environment." This is addressed by four research questions within the OC. One research question is not addressed in this proposal. The four remaining questions are so tightly integrated as to be impractical to separate for technical, schedule, and cost factors. This is the second proposal the program is submitting in FY24 proposal, the 1st addresses the core question of identifying safe unleaded fuels. To answer the overarching question of this proposal, this program will collaborate with industry partners under the Piston Alternative Fuel Initiative (PAFI), to conduct research and testing to validate and verify other technologies to support final unleaded fuel candidates in several areas of testing as follows. - Identify alternative propulsion technologies that can be incorporated into existing engines to support the use of unleaded fuels, reducing environmental impacts. - Identify renewable and/or sustainable fuel components, or additives, that can be used in unleaded fuels to produce fewer climate and environmental emissions. - Identify the key characteristics of fuels used in reducing environmental impacts, Also, technologies that can be incorporated into new aircraft designs such as hybrid/ electric propulsion systems, fuel-cell propulsion systems, compression ignition engines running on Jet-A or other fuels.	FY22	FY25	Y	

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.19	Integrating HF into Operational Evaluations & Flight Standardization Board Process (ACSAA Related)	This requirement supports and addresses multiple sections of HR 133-3 – 116th Congress (2021) Consolidated Appropriations Act, 2021 Division V -Aircraft Certification, Safety, and Accountability Act (ACSAA), which invokes recommendations for FAA to better integrate human factors throughout design and certification of aircraft. These recommendations were informed by recent aviation accidents and incidents, including the Boeing 737MAX (e.g., Lion Air 610, Ethiopian 302), and provided by multiple entities: The National Transportation Safety BoardThe Joint Authorities Technical ReviewThe Inspector general of the Department of Transportation.The Safety Oversight and Certification Advisory Committee This requirement will 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. In the field, documentation will be used by multiple AFX and AIR personnel who jointly work with aircraft manufacturers and modifiers throughout the service life of a product including development (design, production), certification (Flight Standardization (FSB)), and operations (operational suitability, airworthiness directives). Current FAA human factors documentation to support these personnel is limited and the processes followed can vary by location, including regional:Aircraft Certification Offices (ACO) who conduct AIR evaluations of airworthiness requirements and human factors considerations – e.g., airworthiness determination of minimum flightcrew based on flight deck design and layout, system-safety/risk assessments, evaluation of design assumptions, etc.Aircraft Evaluation Divisions (AED) who conduct AFX evaluations of operational requirements and human factors considerations – e.g., operational determination of crew complement, operational suitability assessments, FSB Operational Evaluations [T-Tests], OE of AIR assumptions, etc. To holistically integrate human factors within and across these areas, FY24 research will:Examine the HF literature, current FAA guidance and regulations, industry standards (if	FY21	FY25	Y	

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.18	Integrating HF into Aircraft Design, Certification, Training, & Operations (ACSAA related)	This requirement supports and addresses multiple sections of HR 133-3 – 116th Congress (2021) Consolidated Appropriations Act, 2021 Division V - Aircraft Certification, Safety, and Accountability Act (ACSAA), which invokes recommendations for FAA to better integrate human factors throughout design and certification of aircraft. These recommendations were informed by recent aviation accidents and incidents, including the Boeing 737MAX (e.g., Lion Air 610, Ethiopian 302), and provided by multiple entities: The National Transportation Safety BoardThe Joint Authorities Technical ReviewThe Inspector general of the Department of TransportationThe Safety Oversight and Certification Advisory Committee This requirement will 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. In the field, documentation will be used by multiple AFX and AIR personnel who jointly work with aircraft manufacturers and modifiers throughout the service life of a product including development (design, production), certification (as evaluated by both Aircraft Certification and also as part of the Flight Standardization Board (FSB)), and operations (operational suitability, airworthiness directives). Current FAA human factors documentation to support these personnel is limited and the processes followed can vary by location, including regional:Aircraft Certification Offices (ACO) who conduct AIR evaluations of airworthiness requirements and human factors considerations – e.g., airworthiness determination of minimum flightcrew based on flight deck design and layout, system-safety/risk assessments, evaluation of design assumptions, etc.Aircraft Evaluation Divisions (AED) who conduct AFX evaluations of operational requirements and human factors considerations – e.g., operational determination of crew complement, operational suitability assessments, Flight Standardization Board (FSB) Operational Evaluations [T-Tests], operational evaluations of assumptions (e.g., 25.1309), etc.	FY21	FY26	Y	
A11G.HF.22	Human Factors Safety Considerations and Criteria for Reduced Crew in Transport Aircraft	Manufacturers are proposing increasing automation technology in transport aircraft. The FAA needs criteria for determining when/how to allow reduced minimum crew or autonomous flight while maintaining or improving the current level of safety. This research will investigate the safety considerations and criteria for reduced crew and increased automation in transport aircraft. This includes identifying pilot contributions to safety, especially those of the second pilot, and to assure that any changes in crew minimums will mitigate any associated risk. Most importantly, the research data will support the development of effective pilot training, updating industry standards, revising human factors regulatory and guidance material, and responding to Congressional recommendations related to Boeing 737 MAX accident investigations. Operational Capability #7: Advances and Innovation in New Technologies and Operations (ACSAA related) Research Question 7.4: How can we safely enable autonomous flight or reduced crew?	FY23	FY26	Y	

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.23	Human Factors Design Standards for New and Advanced Flight Deck Alerting Systems (ACSAA related)	Manufacturers often add new systems or equipment to the flight deck without considering their consistency and compatibility with existing flight deck designs, or their impact on human performance. Accidents, such as Air France 447, Lion Air JT610, and Ethiopian Airlines 302 demonstrate the importance of understanding the human-machine interface and the underlying automation systems that drive it. This research will investigate the impact of new technologies in flight deck alerting systems to update design standards are appropriate for modern alerting systems. Most importantly, the research data will support the development of effective pilot training, updating industry standards, revising human factors regulatory and guidance material, and responding to Congressional recommendations related to Boeing 737 MAX accident investigations. Operational Capability #7: Advances and Innovation in New Technologies and Operations (ACSAA related) Research Question 7.6: How should alerting system design standards be updated to reflect new technology and functionality in flight deck alerting systems?	FY24	FY26	Y	
A11G.HF.24	Control Automation and Information Automation (ACSAA related)	Manufacturers often add new systems or equipment to the flight deck without considering their consistency and compatibility with existing flight deck designs, or their impact on human performance. Accidents, such as Air France 447, Lion Air JT610, and Ethiopian Airlines 302 demonstrate the importance of understanding the human-machine interface and the underlying automation systems that drive it. This research will investigate how pilots interact with and understand automation including control automation, such as autopilots and other systems whose functions control the aircraft. As well as, information automation, such as the maneuvering characteristics augmentation system (MCAS) which is a means for the pilot to manage and understand relevant information related to the automation. The research data will support the development of guidance for aircraft certification, effective pilot training, updating industry standards, revising human factors regulatory and guidance material, and responding to Congressional recommendations related to Boeing 737 MAX accident investigations. Operational Capability #7: Advances and Innovation in New Technologies and Operations (ACSAA related) Research question 7.5: What human factors issues and data are associated with automation, including control automation and information automation?	FY23	FY26	Y	

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.21	Pilot Visual Scanning Techniques of Instruments, Systems and References for Flightpath Management	Manufacturers often add new systems or equipment to the flight deck without considering their consistency and compatibility with existing flight deck designs, or their impact on human performance. Accidents, such as Air France 447, Lion Air JT610, and Ethiopian Airlines 302 demonstrate the importance of understanding the human-machine interface and the underlying automation systems that drive it. This research will investigate 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, and impact on pilot training. Most importantly, the research data will support the development of effective pilot training, updating industry standards, revising human factors regulatory and guidance material, and responding to Congressional recommendations related to Boeing 737 MAX accident investigations. Operational Capability #7: Advances and Innovation in New Technologies and Operations (ACSAA Related) Research Question 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 and pilot training?	FY23	FY26	Y	
A11G.HF.27	Operational Acceptability of New Automatic Takeoff and Landing Operations Performed by a Single Pilo	This project will provide research and engineering data to support the human factors needs of FAA personnel who evaluate, approve, and oversee flight deck technologies and procedures for low visibility flight operations. Research will examine whether single pilot workload and optional dual pilot crew (split location) workload is operationally acceptable during new automatic takeoff and new autoland operations not currently authorized. This project is time critical. Results are needed to inform equivalent level of safety decisions for imminent technologies and operational concepts that have outpaced FAA documentation:No automatic takeoff guidance or criteria exists.Current autoland guidance pertains specifically to its use in order to facilitate operations in the lowest visibilities. Further guidance will be required to expand the use of autoland to other types of operations and crew complements. FAA continues to receive applications at an unexpected rate for these technologies and operations. If this project is not funded, then Flight Standards operational approvals will be delayed due to a lack of human factors data. The lack of data will also add time and cost to multiple certification projects.	FY21	FY25	Y	

		This project will result in 6 technical reports: . Funded Research:Report #1: Automatic takeoff conducted by a single pilot using natural vision. FY24 RequestReport #2: Autoland conducted by a single pilot using natural vision to monitor the operation.Report #3: Automatic takeoff conducted by dual pilot crews (split location) using natural vision to monitor the operation.Report #4: Autoland conducted by dual pilot crews (split location) using natural vision to monitor the operation. FY25 Planned (final project phase)Report #5: Automatic takeoff and autoland conducted by dual pilot crews (split location) using sensor-based technologies to monitor the				

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.20	Pilot Interactions with Advanced Technologies (ACSAA related)	Manufacturers often add new systems or equipment to the flight deck without considering their consistency and compatibility with existing flight deck designs, or their impact on human performance. Accidents, such as Air France 447, Lion Air JT610, and Ethiopian Airlines 302 demonstrate the importance of understanding the human-machine interface and the underlying automation systems that drive it. This research will investigate how pilots interact with and understand these technologies, regardless of aircraft type (general aviation, transport, or rotorcraft). Most importantly, the research data will support the development of guidance for aircraft certification, effective pilot training, updating industry standards, revising human factors regulatory and guidance material, and responding to Congressional recommendations related to Boeing 737 MAX accident investigations. Operational Capability #7: Advances and Innovation in New Technologies and Operations (ACSAA related) Research question 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)?	FY23	FY26	Y	
A11G.HF.26	Empirical Basis for Minimum Visual Features and Aids a Pilot Must See During Lower Than Standard Tak	Per the A11G ACSAA replan AVS agreed to fund this project in FY24. This project was originally funded in FY20; however, funds were pulled back and redirected to ACSAA related projects. Current requirements for lower than standard takeoff minima operations are based on experience and expert judgment, and an empirical basis for the minimum visual features a pilot must see to takeoff at various low visibility values was never established. Outputs from this research will help AFS establish an empirical basis for these operations, address pilot performance and human factors considerations, and inform potential changes to operational policy, operational standards, and approval criteria for lower than standard takeoff minima operations. This project will result in 1 technical report, and it is listed below.Report #1: 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 system on a HUD.	FY24	FY24	Y	

Domain: Human and Aeromedical Factors Program Area: Flightdeck/Maintenance/System Integration Human Factors						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11G.HF.25	Pilot/Crew Assessment of Flight Visibility and Enhanced Flight Visibility at DA/DH and MDA on Approach	Descent below DA/DH or MDA down to 100' and decision criteria to continue and land or execute a missed approach requires further research. This project will examine how pilots comply with flight visibility requirements, what method(s) they are using to comply, and what contribution flight visibility makes to safety of the operations. Research is needed to examine pilot perception of visual cues and flight visibility at DA/DH or MDA on an approach. This includes identification of measures used to evaluate and determine operational effectiveness of training. Research data will be obtained and analyzed on visibility assessment accuracy, pilot decision-making factors, physiological limitations, and environmental considerations. Data will be compiled to understand how often flight visibility and enhanced flight visibility is assessed, the accuracy of those assessments, whether assessment results in compliance, and current limitations of this requirement. Results of this research will help inform data on the use of EFVS-HDD (and other technology implementations) in low visibility operations. 91.175(c)(2) is potentially difficult to comply with and to enforce. As a result, safety benefits provided by this provision are undetermined. The flight visibility requirement would be an impediment to implementation of real-time, synthetic, or combined imagery displayed anywhere other than in a traditional head up manner to an on-board pilot. A reexamination of 91.175(c)(2) must occur before wide-spread implementation of new technologies is possible. Pilot performance and human factors data are needed to evaluate whether EFVS operations using a head-down display can be safely conducted to 100' in various low visibilities, decision altitudes, and approach offset angles expected to be encountered in §91.176(b) operations. Research will focus on the physical and cognitive transition and limitations of visual accommodation. Research will examine whether HDD visual imagery	FY24	FY25	Y	

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.11	Single Source Reference Document for Flight Standards Human Factors (RDFSHF) (ACSAA Related)	Research is needed to evaluate human factors and pilot/crew performance considerations associated with operational suitability, training, procedures, and operations in transport aircraft in Part 121 and 135 operations. Early integration of human factors principles into the evaluation of pilot training, flight deck operations, and pilot procedures has been identified as critical to aviation safety by the Aircraft Certification, Safety, and Accountability Act (ACSAA) and other recommendations following recent accidents and incidents, including those related to the Boeing 737 MAX. Human factors research data is critical to support Flight Standards human factors specialists and other aviation safety inspectors who must evaluate and approve operational suitability, training, procedures, and operations. Currently, human factors considerations for these processes are spread across a range of regulatory and guidance documents and can be difficult to find (or may not exist). Research is needed to collect, review, and synthesize up to date human factors considerations into a Single Source Reference Document for Flight Standards Human Factors (RDFSH). This research would provide input to the FAA on how to improve pilot training, qualification and procedures. It will inform relevant policy, operational requirements, standards, procedures, limitations, mitigations, and guidance materials and update industry recommended practices. In addition, the research results will provide data to support the FAA in responding to ACSAA and other formal recommendations to integrate human factors considerations throughout the design and evaluation process. Operational Capability #1: Improved Transport Pilot Training, Procedures and Operations (ACSAA related) Research Question 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?	FY18	FY26	Y	
A11G.HF.8	Fatigue Mitigation Flight Operations	Human factors research is needed to support FAA implementation of recent changes to 14 CFR Part 117 (Flight and Duty Limitations and Rest Requirements for Flightcrew Members) which introduces scientific concepts, performance-based concepts, and procedures for operators to safely conduct flight operations within and outside the table limits of 14 CFR Part 117. FY24 research will examine the operational effectiveness of human factors mitigations that could prevent or counteract the negative effects of multiple time zone shifts associated with long-haul and ultra-long-range flight operations on pilots' behavioral and physiological adaptations. Development and testing of mitigations will address impacts identified through past FAA fatigue research on:Multiple time zone shifts associated with long-haul and ultra-long-range flight operations.High frequency, multiple segment short haul flights within Part 117 limits. FY24 research will complete the final phase of work associated with this multi-year project. It will also support and address for the first time several elements in the Airline Safety and Federal Aviation Administration Extension Act of 2010, Public Law 111-216 Aug. 1, 2010, section 212 titled "Pilot Fatigue".	FY19	FY25	Y	

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.16	HF Data to Inform FAA Decisions on the Adequacy of Policy for Maintenance Training (ACSAA-Related)	This project will provide research and operational data to support the human factors needs of Federal Aviation Administration (FAA) personnel who evaluate, approve, and oversee aviation maintenance related procedures, operations, and training. Results will support and address specific 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 competencies (aviation safety inspectors, aviation safety engineers). Outputs from this project will be documented in 5 technical reports to inform evidence-based decisions on the adequacy of existing FAA policy, guidance, and assumptions related to aviation maintenance training (includes airplane differences). This project relates to HR 133-3 – 116th Congress (2021) Consolidated Appropriations Act, 2021 Division V - Aircraft Certification, Safety, and Accountability Act (ACSAA) which invokes human factors recommendations provided by multiple entities, including the Boeing 737 Max Joint Authorities Technical Review (JATR):JATR Report Section 11: Impact of Product Design Changes on Maintenance Training. Recommendation 11.1: "JATR team members recommend that the FAA conduct a study to determine the adequacy of policy, guidance, and assumptions related to maintenance and ground handling training requirements" If this requirement is not funded at the request amount in FY24 then on-going maintenance human factors research cannot continue. A summary of this project is provided: Funded Research:Report #1: Baseline Analysis-Training Requirements, Assumptions, and Supporting Data.Report #2: Global Accident/Serious Incident Data - Maintenance and Design for Maintainability Factors (2010–Present).Report #3: Training/Operational Policies and Procedures Used by Industry to Conform to FAA Requirements. FY24 Request:Report #4: Gaps in Guidance, Processes, and Data Used to Identify and Evaluate Design for Maintainability Considerations – New/Modified Products.	FY22	FY25	Y	

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.13	Human Factors Considerations and Emerging Trends Associated with Helicopter Air Ambulance Operations	Research is needed to evaluate human factors and pilot/crew performance considerations associated with Helicopter Air Ambulance operations (HAA). Helicopter air ambulances operate under challenging conditions. Their flights are often time-sensitive -- putting pressure on pilots and medical personnel -- they fly at low altitudes and under varied weather conditions, and they often land at unfamiliar, remote, or unimproved sites with terrain and obstacle hazards. This research will provide information that can be used to enhance the FAA's understanding of current HAA industry risks, and emerging issues and trends, reduce the number of accidents and incidents attributable to human factors considerations, improve strategies and procedures for controlling risks in HAA operations, and enable the development of fatigue risk measures for HAA operations that will inform improvements in the strategic use of rest facilities, fitness for duty requirements, and scheduling practices. This research will inform policy, operational requirements, standards, procedures, limitations, mitigations, and guidance material pertaining to helicopter air ambulance operations and updates to industry best practices. Funded Research:Report #1: Validated rotorcraft human factors analysis framework, results from the analysis of safety data, and high priority human factors issues.Report #2: Draft schedule-based fatigue risk baseline with a human factors research plan to validate results.Report #3: Validated fatigue risk baseline representative of HAA operations FY24 Request:Report #4: Emerging human factors issues, trends, and risk-based decision- making factors in HAA operations, including potential mitigations for identified issues. FY25 Planned:Report #5: Crew Resource Management in HAA Operations. FY26 Planned (final project phase): Report #6: Assessing and Mitigating Risk Factors in HAA Operations.	FY22	FY26	Y	

Domain: Human and Aeromedical Factors
Program Area: Flightdeck/Maintenance/System Integration Human Factors

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11G.HF.28	Unexepcted Airplane States: General Aviation	Under the Congress' Safer Skies Initiative (2011), the General Aviation Joint Steering Committee (GAJSC) was created to utilize risk management strategies collaboratively with industry to reduce the fatal accident risk and enhance the safety of the National Airspace System (NAS). One of the first actions of the GAJSC was to target the leading cause of fatal accidents—loss of control. Through analyzing fatal loss of control accidents the GAJSC was able to produce targeted intervention strategies to prevent future loss of control accidents. At the completion of its Loss of Control study, the GAJSC recognized the need to research and study how pilots respond to unexpected events and what additional training/outreach may be required to further reduce the fatal accident rate. As a result, the GAJSC has recommended a 3-part question to first investigate what skills pilots currently have, how effective those skills are during unexpected events, and a gap analysis to understand which skills are lacking. The scaffolded 3-part research project will permit targeted analysis of effective training techniques and skills to better equip pilots as they respond to unexpected events. In addition to responding to the conclusions of the GAJSC's Loss of Control study, this project builds on the mandates in the Safer Skies Initiative and updates work currently done by Abbott (2020) particularly in regards to Part 121 Commercial Aviation. While studying pilot response to unexpected events has been studied for Part 121 Commercial operations (including by the Commercial Aviation Safety Team (CAST)), similar research has not been completed for Part 91 and 135 operations. Research into pilot response to unexpected events is integral to reducing the fatal accident rate for General Aviation operations.	FY24	FY28	Y	

Domain: Human and Aeromedical Factors Program Area: Aeromedical Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11J.FCMS.2	Detection of bleed air contaminants in the cabin	This research is a continuation of Phase 1 research Tasks 1 through 3 (See entry 2.4 below identifying the tasks) started in FY'20 and completed in FY'21 to investigate bleed contaminants. Completion of Phase 1 research identified sensors that measure the specific signatures (i.e., range of particulates and selected chemical species) of these contaminants. The Phase 2 research Tasks 4 through 7 will conduct experiments by injecting oil, hydraulic fluid and deicing fluid contaminants into a ground test engine at KSU and selected aircraft using the sensors identified in previous research (Phase 1). If the ground test is successful, contaminant injection will continue on an airplane engine/APU to determine the interaction with airplane environmental control system (ECS) components (e.g., air cycle machines, ozone converter, etc.). Airplane tests will be conducted on an FAA owned airplane at the FAA Technical Center and/or an airline owned airplane. Measurements will be made at different ECS locations and in the cabin to determine the accuracy and reliability of the sensors. In addition, air samples will be provided to FAA/CAMI. FAA/CAMI will conduct a risk assessment of the contaminants measured in the engine bleed air and airplane cabin for health and safety (Task 8).	FY20	FY25	Work continuing based on previous year's funding.	
A11J.AM.12	Identify alternative neurocognitive tests & obtain pilot normative data for medical certification	The FAA is currently reliant on only one neurocognitive test (CogScreen – Aeromedical Edition [AE]) from a single vendor. CogScreen-AE is used as an initial screening tool to detect aeromedically significant cognitive deficits in aviators with certain medical conditions. The purpose of this study is to identify alternative neurocognitive test batteries for CogScreen-AE and to obtain updated pilot normative data for the legacy and alternative test batteries. Data and analyses will be used to potentially revise the Aviation Medical Examiners (AME) Guide, update clinical practices, and make changes to aviator medical certification protocols.	FY22	FY25	Y	This project concludes in FY24 per the current BLI plan.
A11J.AM.16	Quantitative risk-based aeromedical certification: Aviator health state forecasts	The FAA's Office of Aerospace Medicine seeks to leverage very large healthcare datasets assembled by private actors and current big data analytics and techniques to enable precision-based (i.e., more individualized vs. population-based) aeromedical risk assessments, which cannot be developed from existing agency medical certification data because of limitations in data quantity and quality. Additionally, calculating aeromedical risk estimates using commercial healthcare datasets provides a mechanism to synchronize aeromedical certification decision making with the current state of the art in clinical medicine, pharmaco-therapeutics, medical devices, etc. This research project will answer the question, how can a quantitative estimate for aeromedical risk over a medical certification interval be calculated for an individual aviator using commercially available healthcare claims data? This research project will be accomplished by developing an aeromedical research data analysis environment and then rapidly exploring the performance of prediction/forecasting algorithms from healthcare and non-healthcare domains using a commercial healthcare claims dataset. Promising solutions will be transitioned to the aeromedical certification functions within the Office of Aerospace Medicine for operational use.	FY23	FY24	Y	This project is subsumed in A11J.AM.43, which will largely be completed in FY23.

Domain: Human and Aeromedical Factors Program Area: Aeromedical Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11J.RS.1	Occupant protection for legacy rotorcraft	The goal of the research is to add safety to legacy rotorcraft but not necessarily to bring them up to the current certification basis (to do so would be cost prohibitive and require extensive redesign of the rotorcraft). This research will look at new safety equipment/technology that can be retrofitted onto legacy rotorcraft. Tasks include testing proposed alternate crash severities and testing of existing and prototype seating systems.	FY20	FY25	Y	This project continues through FY27 (NASA testing phase).
A11J.AM.10	Comparison across multiple types of sleep deprivation	This project seeks to identify associations between molecular biomarkers and performance under varying fatigue states (i.e., acute total sleep loss for two nights, multiple nights of short sleep, or multiple days with short sleep simulating shiftwork). The study will build upon prior work to identify gene expression patterns that correlate with fatigue-induced declines in cognitive performance, and develop a diagnostic biomarker panel for use in detecting fatigue-related cognitive performance deficits. Outputs will improve ability for detecting fatigue in accident investigation, and have applications for improving fatigue risk management towards accident prevention.	FY19	FY27	Y	
A11J.FCS.16	Develop modeling and simulation guidance for performance based rules for aircraft seating systems	Current safety standards for seats are partially prescriptive in that the crash condition is defined with no regard for the individual aircraft model's structural design features. Credible modeling and simulation (M&S) provides an opportunity to move the standards towards fully performance based. This project will support regulatory/guidance efforts to create standards for the use of M&S to certify seating systems using a performance based systems approach. Tasks include evaluation of existing model credibility standards and the development of new standards focused on aircraft cabin interiors.	FY23	FY25	Y	The first year of funding is FY24 and the last year of funding is FY26
A11J.FCS.10	Alternative test method for General Aviation seating	A major source of occupant injury in General Aviation is the result of vertical loading. The cost of existing test methods can sometimes exceed the benefit provided by the safety improvements. This research will investigate alternative testing methods that are less complicated than the existing methods and hold promise for establishing that General Aviation seats are safe. Tasks include testing the new methods and comparing the results to the existing test methods to determine if the new methods can provide the same level of safety.	FY20	FY24	Y	This project has not started and is dependent on non-A11J funding. It may start /finish in FY24.
A11J.FCS.15	Develop safety standards for omnidirectional seats to support urban air mobility/eVTOL	Current safety standards exist for seats installed 0-45 degrees and 90 degrees (with respect to aircraft centerline). Industry has proposed seats beyond 45 degrees and based on trends in all modes of transportation, UAS will likely allow for seats installed in any direction (0- 360 degrees). This project will support regulatory efforts to create a continuum of certification for 0-100 degrees. Tasks include evaluation of ATDs, review of injury criteria, and development of test methods.	FY23	FY25	Y	This project will start in FY24 and finish in FY26.

Domain: Human and Aeromedical Factors Program Area: Aeromedical Research						
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A11J.FCS.18	Delta wing airplane evacuation	Supersonic transport (SST) airplanes are being proposed that would have multiple exits using the delta wing as part of their egress pathway. This research project will look at the effect on an evacuation when multiple exit pairs use the same platform as part of their egress pathway, and the implications that may have for exit rating and allowable passenger limit onboard new SST airplanes. This research will use human subjects in comparative evacuations using aircraft cabin evacuation simulators with both single exit-per wing and multiple exits per wing to evaluate the differences in egress times and behaviors.	FY23	FY26	Y	AIR dropped this requirement for FY24.
A11J.FCS.19	Ditching exit ratings evaluation	The FAA needs the ability to determine the appropriate passenger credit for various exit types under ditching conditions. This research project will evaluate existing ditching exit ratings to see if they are still applicable or require updating. This requirement would derive the appropriate passenger credit for various exit types under ditching conditions. This project will involve a review of current ditching exit ratings and the recommendations of the Ditching ARAC, and may utilize human subjects testing to determine the influence of various factors of ditching evacuations on egress times.	FY22	FY24	Y	
A11J.FCS.17	Passenger retention of cabin safety information: luggage	The FAA desires to improve passenger performance during emergencies. This research addresses the question of how to improve passenger education to enhance passenger understanding and retention of cabin safety information, particularly about carrying baggage to the exits in an emergency. The FAA will conduct an analytical study to measure the effects on emergency deplaning times as a result of one or several passengers retrieving carry-on bags before proceeding to an exit. The FAA will determine a course of action based on the results of the research.	FY22	FY24	N	This project is planned for FY24; the contract was let this FY and only FED time is required in FY24.
A11J.AM.21	Postmortem blood genomics biorepository	This project seeks to develop of a long-term sample repository for investigating biomarkers of safety risks, such as fatigue, in postmortem samples. The result will be establishment of protocols and creation of a sample biorepository, or biobank, to archive aviation accident samples that are optimally preserved for use in forensic molecular analysis. This resource will enable expansion of CAMI's analysis of aviation accident autopsy specimens from its current focus on toxicology results, to molecular insights for reporting on additional human factors. Outputs of studying samples in the biobank will improve the FAA's ability to detect fatigue and other safety risks during accident investigation.	FY19	FY24	Y	The final year of funding is FY25.
A11J.RS.2	Rotorcraft injury mechanism analysis - procedure development and validation	Rotorcraft policy makers lack comprehensive accident investigation results to support safety analysis and cost-benefit analysis. This research aims to identify what kind of injuries are being sustained in crashworthy and non-crashworthy rotorcraft. This research proposes to develop and demonstrate procedures for identifying and gathering pertinent crash and injury information, with the goal of identifying safety improvements to reduce the fatalities and serious injuries occupants sustain in survivable crashes. Safety improvements identified and implemented by these analyses result in reduced deaths and injuries.	FY19	FY27	Y	This project requirement was cancelled by AIR

Domain: Human and Aeromedical Factors Program Area: Aeromedical Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11J.AM.19	Communicable disease preparedness: M&S framework for analyzing cabin health hazards	As evidenced during the SARS-CoV-2 pandemic, the federal government lacks suitable risk analysis tools to evaluate efficiently the health safety hazard posed by communicable diseases of potential heath significance in transport aircraft cabins. This research project will answer the question, what is a generalizable risk analysis framework and associated set of accepted and validated modeling, simulation, and analysis (MS&A) tools for determining baseline risk and evaluating the impact of risk control measures? The project will define an analysis framework for cabin health safety hazards; conduct a survey of existing MS&A tools, data sources, and non-destructive testing methods suitable for studying pathogen movement in transport aircraft cabins; select the preferred MS&A tool set and testing methods; and plan and conduct MS&A validation and analysis studies. The resulting analysis framework and associated MS&A tools and data will be transitioned for use in communicable disease transmission preparedness planning.	FY24	FY26	Y	This project was started in FY23.
A11J.AM.22	Metabolomic biomarkers for fatigue impairment	This project seeks to identify associations between blood metabolites and performance under varying fatigue states (i.e., acute total sleep loss for two nights, multiple nights of short sleep, or multiple days with short sleep simulating shiftwork). The study will build upon prior work to expand understanding of molecular changes under sleep disruption, and develop a diagnostic metabolomics biomarker panel for use in detecting fatigue-related cognitive performance deficits. Outputs will improve ability for detecting fatigue in accident investigation, and have applications for improving fatigue risk management and thus accident prevention.	FY23	FY26	Y	This project will finish in FY27.
A11J.AM.24	Proteomic biomarkers for fatigue impairment	Literature suggests proteins in human blood change during sleep disruption. This research will measure blood proteins from individuals subject to sleep loss and circadian disruption. The result will be a protein biomarker panel diagnostic of fatigue-related performance deficits and sleep loss. This will advance development of a molecular report of fatigue status for accident investigation, and could be applied by airlines toward accident prevention as an alternative method of compliance for fatigue risk management strategies.	FY24	FY26	Y	This project will finish in FY27.
A11J.FCS.21	Extended reality for cabin safety use in research and certification	Conducting cabin safety research and certification currently depends on data obtained from human subjects tests with physical assets, which can involve elevated risk for participant injury. Extended reality refers to technology that augments or replaces the real world with the digital world, including augmented reality and virtual reality. This research project will determine if extended reality can and should be used for cabin safety research and certification. This project will compare the results of cabin evacuation tests involving human subjects using physical mockups vs. extended reality.	FY24	FY27	Y	This project was only partially funded in FY24.

Domain: Human and Aeromedical Factors Program Area: Aeromedical Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11J.AM.11	Gene expression and biomarker utility in postmortem samples	There is currently a capability gap in the FAA forensic workflow; when drugs are detected in aviation accident victim autopsy samples, it is inferred that the presence of a given drug beyond a defined threshold has biological effects, and factors such as drug tolerance or susceptibility are estimable only through known previous instances of drug use. This research seeks to identify new molecular indicators of tetrahydrocannabinol (THC) use in forensic aviation accident samples, focusing on the biological response to cannabinoids. These molecular indicators may be useful in enhancing the FAA's ability to detect THC use and its relationship to aviation accidents. The outcomes of this research will serve as the basis for future research into molecular indicators of other widely-abused drugs, and potentially in determining an individual's tendency toward drug tolerance to indicate the extent of incapacitation produced by a given dosage.	FY19	FY24	N	Minimal FY24 funding is required to complete this project, so there will be no FY24 disruption.
A11J.AM.23	Microbiome biomarkers for fatigue impairment	This project seeks to identify associations between gut microbes and cognitive performance under varying fatigue states (i.e., acute total sleep loss for two nights, multiple nights of short sleep, or multiple days with short sleep simulating shiftwork). The study will build upon prior work to expand understanding of molecular changes under sleep disruption, and develop a diagnostic microbiome biomarker panel for use in detecting fatigue-related cognitive performance deficits. Outputs will improve ability for detecting fatigue in accident investigation, and have applications for improving fatigue risk management towards accident prevention.	FY23	FY26	N	This project was subsumed in A11J.AM.10
A11J.AM.14	Determine criteria for medical certification of aviators with chronic obstructive pulmonary disease	The FAA grants aviators with chronic obstructive pulmonary disease (COPD), or emphysema, a special issuance medical certificate based on a qualitative assessment of disease severity and stability. The purpose of this study is to identify performance-based, physiological criteria (e.g., respiratory/lung function metrics, blood oxygen saturation via pulse oximetry [SpO2]) to forecast if an individual is able to maintain adequate blood oxygen saturation at altitude without supplemental oxygen. These criteria will be transitioned to the Office of Aerospace Medicine to be used in the aeromedical disposition of aviators with COPD.	FY24	FY28	N	This project was cancelled by AAM-2.
A11J.FCS.22	Egress through furniture	Novel aircraft cabin configurations, which may include furniture installed immediately adjacent to an emergency exit or adjacent to evacuee seating, create uncertainty about cabin evacuation performance. This research project will evaluate what, if any, impact installed furniture in an airplane egress pathway would have on an airplane evacuation. This project will involve human subjects testing comparing a control evacuation (no furniture) to experimental furniture placements to determine the effect on evacuation on an individual and group basis.	FY24	FY26	N	This project will finish in FY27. FY24 only requires FED time and so the project will proceed as scheduled.

Domain: Human and Aeromedical Factors Program Area: Aeromedical Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11J.AM.20	Gene expression patterns in response to Modafinil as countermeasure to sleep deprivation	This project seeks to identify associations between gene expression biomarkers and performance under acute sleep loss for one night with and without a drug countermeasure (modafinil). The study will build upon prior work to identify gene expression patterns that correlate with fatigue-induced declines in cognitive performance, and develop a diagnostic biomarker panel for fatigue-related cognitive performance deficits during total sleep loss. This study will also produce insights on the impact of a drug countermeasure on fatigue and biomarker assessments. Outputs will improve the FAA's ability to detect fatigue in accident investigation, and have applications for improving fatigue risk management towards accident prevention.	FY17	FY24	N	This project will finish in FY25. The cost in FY24 is minimal and so the project will continue as planned.
A11J.AM.25	Wearables for understanding the effects of sleep loss	This project will complement a larger investigation of molecular biomarkers and performance under varying fatigue states (i.e., acute total sleep loss for two nights, multiple nights of short sleep, or multiple days with short sleep simulating shiftwork). Specifically it will analyze data of traditional gold standard and wearable devices (polysomnography, actigraphy) to improve understanding of the physiological impacts of different forms of sleep loss. Results will also improve understanding of changes in biomarker profiles during sleep loss.Outputs will improve ability for detecting fatigue in accident investigation, and have applications for improving fatigue risk management towards accident prevention.	FY23	FY26	N	This project will not start until FY25 and finish in FY28.
A11J.AM.26	DNA sequencing for individualized fatigue risk	The study will build upon prior research by adding understanding of individual susceptibility biomarkers to biomarkers for current fatigue status. It is known that individuals show different tolerance of sleep loss and that this is partially due to genetic variation. The proposed project will use whole genome sequencing to improve understanding of DNA biomarkers for individual variation in cognitive changes during sleep loss. Outputs will improve ability for detecting fatigue in accident investigation, and have applications for improving fatigue risk management towards accident prevention.	FY24	FY26	N	This project was subsumed in A11J.AM.10

Domain: Aerospace Performance and Planning
Program Area: System Safety Management/Terminal Area Safety

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11H.SSM.26	ANSP Sector Risk Profile Tool - Surface Safety (SRPT-Surface)	This research establishes a Sector Risk Profile (SRP) for airport surface safety that AOV will use to plan and prioritize safety oversight activities. The SRP helps AOV determine surveillance scope and frequency based on emerging safety risks and historical safety performance in concert with FAA commitments to Risk-Based Decision Making (RBDM) and an Integrated Oversight Philosophy (IOP). The initial focus is to model wrong runway landings and departures, runway incursions, runway excursions, and arrival / takeoff traffic conflicts to identify causal and contributing factors. Machine learning and other artificial intelligence algorithms will be developed and trained to detect patterns that contribute to associated safety risks for known incidents and applied to predict unknown, future cases so that the AOV can proactively coordinate corrective actions and risk mitigations.	FY21	FY24	Y	
A11H.SSM.9	Helicopter Flight Data Monitoring and Analysis	Helicopter Flight Data Monitoring (HFDM) and Analysis research addresses the issue of identifying and preventing the precursors of fatal accidents for rotorcraft via analysis of flight data records. The research project aims to develop novel analysis tools, metrics, and capabilities that joint industry and government safety teams, including the USHST (U.S. Helicopter Safety Team) and the Rotorcraft Issue Analysis Team (R-IAT) will use to tackle leading vertical flight accident causal factors. HFDM research will create these tools by collecting flight data, encouraging the adoption of flight recorders within the rotorcraft community, and examining/advancing the state of the art in data analytics, machine learning/artificial intelligence, and other areas relevant to this topic. This approach will enhance safety and mitigate risk for helicopter operators via advanced analytical techniques, safety analysis methods, and operational hazard identification; items designed to further reduce the fatal accident rate for rotorcraft/vertical lift.	FY22	FY26	Y	
A11H.TAS.5	Helicopter Enhanced Flight Vision Systems (H-EFVS)	Helicopter Vision Systems research assesses new operational concepts for the use of vision systems in all-weather conditions and varied mission environments during critical phases of flight (approach, departure, takeoff, landing, and hover). Helicopter Enhanced Flight Vision Systems (H-EFVS) research will examine performance criteria that will allow helicopters to achieve higher levels of safety and efficiency by using vision systems technologies. Research activities will comprise human-in-the loop simulation and flight-testing coupled with trade studies and workshops featuring significant contributions from industry and government partners. These activities will contribute to the development of operational specifications (Ops Specs), policy (FAA Orders), guidance (Advisory Circulars), and regulatory material (i.e. rule changes) to enable H-EFVS operations to increase safety and provide operational benefit to the vertical flight community.	FY16	FY27	Y	

Domain: Aerospace Performance and Planning
Program Area: System Safety Management/Terminal Area Safety

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11H.TAS.11	Immersive Flight Simulation	The purpose of this project is to reduce the accident rate via pilot training with emerging technologies that potentially enhance a pilot's immersive training experience. Specifically, the technologies investigated will be (1) virtual reality, in which a pilot dons goggles, and (2) simulated air traffic control, which uses voice recognition, voice synthesis, and artificial intelligence to mimic the external air-and-ground traffic environment. The research question will be to determine both the rules and guidance associated with the use of these specific technolgies, which are targeted for commericial operators and, in some instances, general aviation. The basic design is for the FAA to procure sets of these technologies, integrate them with its extensive simulation capability in Oklahoma City, and evaluate their strengths and weaknesses in piloted experiments.	FY23	FY25	Y	
A11H.SSM.32	Artificial Intelligence and Advanced Analytics to Estimate Collision Risk During Departure & Arrival	The initiative will develop advanced methods to improve the safety performance of the National Airspace System (NAS) and to enable implementation and integration of new operational concepts. Using artificial intelligence (software that learns), this research will enhance overall operational safety in the NAS by improving the quantification of aircraft-to- aircraft collision risk for proposed operational concepts to maintain a target level of safety (TLS) and prevent accidents and incidents in commercial, general aviation, and rotorcraft operations. Researchers will identify opportunities to apply advanced analytics, such as Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), Markov Chain Monte Carlo (MCMC), etc. to collision risk data modeling and safety data monitoring in the terminal environment.	FY22	FY26	Y	
A11H.SSM.33	Safety Culture Metrics for Ongoing Assessment	The purpose of this project is to develop metrics for assessing safety culture in the National Aerospace System through the aggregation of safety culture metrics used by product and service providers so that safety culture of the entire system of systems can be assessed. Safety culture is currently only assessed sporadically and at the individual service provider level. The intent of this research project is to develop a means to assess safety culture within the aerospace system and its component parts using data that is already being collected. The first step of this project is a review to determine what metrics are aggregated to assess ongoing safety culture in aviation product service providers as well as organizations in other high-consequence industries such as medicine, energy, and surface transportation.	FY24	FY27	Y	
A11H.TAS.12	Reducing Pilot Error Through Raising Awareness of Cognitive Biases	The purpose of this project is to develop flight simulator scenarios that show pilots, first hand, the insidious nature of cognitive biases that occur in aviation operations. The research question is how to competently create these scenarios such that they are both effective and can be easily implemented in today's part 121 training environment. The basic design of the project is to partner with academia and industry to first design a set of scenarios and then evaluate their potential effectiveness in the FAA's extensive flight simulation capability in Oklahoma City. If successful, the scenarios and associated guidance for their use will be transmitted to airline training centers.	FY23	FY26	Y	

Domain: Aerospace Performance and Planning
Program Area: System Safety Management/Terminal Area Safety

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11H.SSM.30	ANSP Sector Risk Profile Tool – Aeronautical Information Services (ANSP-SRPT-AIS)	This research initiative defines and develops a surveillance monitoring tool for Air Traffic Safety Oversight Services (AOV's) oversight of Aeronautical Information Services, including data, systems and applications. Aeronautical Information Services (AIS) ensure that aeronautical data and information necessary for the safety, regularity and efficiency of air navigation are suitable for pilot and air traffic management operational use. This research focuses on development of a sector risk profile for Aeronautical Information Services including identification and understanding of safety incidents where aeronautical information, distribution, and application problems are identified as causal or contributing factors. Artificial intelligence, including machine learning techniques, will be applied to identify aeronautical information hazard causal relationships, predict latent and emerging risks, and support proactive coordination of AOV surveillance and risk mitigation activities.	FY22	FY24	Y	
A11H.TAS.10	Improved Helicopter Simulation Models	In order to reduce the helicopter fatal accident rate, the FAA and industry need to improve the fidelity of simulator mathematical physics models present in Aviation Training Devices and Full Flight Simulators. Research is needed to effectively improve the modeling of outside the envelope flight conditions (i.e. Quick Stop/NOE Deceleration, Loss of Tail Rotor Effectiveness, Settling with Insufficient Power, Vortex Ring State, Low Rotor RPM, etc.) to enable more realistic training and facilitate the development of basic skills in a low-risk and safe operational environment. Research activities including simulator model development of various conditions of interest coupled with data obtaiend from flight testing, helicopter performance/certification, and simulation trials of a vast array of simulator/training device platforms to contribute to the development of revisions to FAA policy (FAA Orders), guidance (Advisory Circulars), and regulatory material (i.e. rule changes to 14CFR Part 60) related to ATD's, AATD's, and FFS's for helicopters.	FY20	FY26	Y	

Domain: Aerospace Performance and Planning
Program Area: System Safety Management/Terminal Area Safety

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11H.SSM.36	Develop Methods and Tools to Utilize Statistical Wake Encounter Data in Risk- Based Safety Decisions	This research develops new data analysis methods and decision support tools required to incorporate quantitative wake turbulence encounter data into NAS system level safety decisions and FAA automation systems. Monitoring and tracking of wake turbulence encounters is required to ensure operational safety in the NAS. For example, to determine if wake encounter risks decrease, remain the same or increase FAA Safety Management Systems (SMS) mandate monitoring of risks after procedural changes and/or modifications to wake turbulence separation minima are implemented. Today, the FAA must rely on subjective voluntary reporting systems to assess risks in the NAS associated with aircraft wake turbulence encounters. These voluntary reporting systems have known biases therefore assumptions must be applied to estimate both the frequency and severity of reported encounters. However, the FAA has developed a capability to directly acquire quantitative data by identifying potential encounters with wake turbulence in Flight Operations Quality Assurance (FOQA) data. The Screening Utility for Wake Vortex Encounters (SU) scans FOQA data post-flight without pilot or controller actions. The SU is capable of simultaneously processing thousands of full flights to detect potential wake turbulence encounters in any phase of flight. The SU provides quantitative data (normally in statistical form) regarding the frequency, severity, and phase of flight associated with potential wake turbulence encounters. Included in these data are potential wake encounters not likely to be reported by pilots and biases associated with the sources of FOQA data (e.g. due to the type(s) of aircraft contained in the scanned data set). To use these data in operational safety decisions severity thresholds, rare event data analyses, and methods to identify potential sampling biases must be applied. The proposed research is a methodology development project that results in new data analysis capabilities for assessing wake turbulence risks in the NAS.	FY24	FY27	Y	

Domain: Aerospace Performance and Planning Program Area: System Safety Management/Terminal Area Safety						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11H.SSM.34	Absolute metrics and/or algorithms to quantitatively determine wake turbulence risks	The proposed research develops absolute wake turbulence encounter metrics and/or algorithms to quantitatively assign wake turbulence risks in all phases of flight for all aircraft types. These absolute metrics encompasses physical impacts on the encountering aircraft (e.g. induced rolling moments) phase of flight operational considerations (e.g. height above the ground), and pilot perceptions of unacceptable risks (e.g. excessive roll and/or pitch rates). The end goal for these wake turbulence absolute metrics is to supplement and/or replace the relative risk assessments currently used in FAA wake turbulence safety risk management processes and development of wake risk mitigations. Currently, no accepted absolute metric for wake encounter risks exists. Surrogates such as induced rolling moment coefficient, strength of the wake vortex encountered, and percentage of roll control authority are used in various combinations in relative risk assessments. The initial data gathering phase of research will be conducted as Human-In- The Loop (HITL) studies in aircraft simulators equipped with modules to simulate encounters with wake turbulence at the Mike Monroney Aeronautical Center (MMAC). Previous HITL wake turbulence studies conducted at the MMAC developed the necessary wake turbulence encounter simulation modules. In follow on phases, these wake encounter simulation modules will be ported to commercial aircraft simulators for HITL studies involving more aircraft types. The analysis phase will distill candidate absolute metrics from data that includes both pilot subjective feedback regarding risks and quantitative aircraft encounter responses parameters. This knowledge will be extended to UAM/UAS aircraft where feasible. Existing FAA analytical tools for assessing impacts on aircraft that encounter wake turbulence will be modified/enhanced to utilize the new metric(s) for piloted and autonomous vehicles. These analytical tools are required to insure ATC's separation of the aircraft (especially new aircraft types and UAM/UAS) behind other aircraft will provide adequate wake encounter risk mitigation.	FY24	FY27	N	
A11H.TAS.13	Vertical Flight (i.e. Helicopter, Tilt-Rotor, eVTOL/UAM/AAM) IFR Infrastructure	Vertical Flight (i.e. Helicopter, Tilt-Rotor, eVTOL/UAM/AAM) IFR Infrastructure research is required to assess new operational concepts for the use of IFR heliports in all-weather conditions and varied mission environments during critical phases of flight (approach, departure, takeoff, landing, and hover). Research into Vertical Flight Infrastructure will examine performance criteria that will allow helicopters to achieve higher levels of safety and efficiency by operating to/from an IFR Heliport (Vertiport). Research activities will contribute to the development of operational specifications (Ops Specs), policy (FAA Orders), guidance (Advisory Circulars), and regulatory material (i.e. rule changes) for IFR Infrastructure.	FY24	FY27	N	

Domain: Aerospace Performance and Planning
Program Area: System Safety Management/Terminal Area Safety

CA#	FY 2024 Research Project Title	Executive Summary	First Fiscal Year of Programmed Funding	Last Fiscal Year of Proposed Funding	Currently Planned in President's Budget for FY24	AVS Sponsoring Service/Office Comments
A11H.SSM.35	General Aviation Safety Culture	The General Aviation Joint Steering Committee has enabled the Federal Aviation Administration to work in conjunction with general aviation industry partners to develop a nascent safety culture for non-part 121 operations. This research question will identify and develop metrics to better understand and standardize general aviation safety culture in order to implement targeted strategies to bolster safety within the general aviation community. The wide range of operations included under the umbrella of general aviation often requires disparate means of effectively addressing safety culture; however, research into methods and metrics intended to measure the efficacy of safety programs and internal safety cultures will facilitate a more robust education and outreach campaign tailored to the various sectors of the general aviation community. This research project will first identify key quantifiable metrics to expedite the standardization of safety culture within the general aviation community as well as encourage the efficient identification of gaps within safety cultures. Once the research project has identified key metrics for safety culture measurement, the research project will then look to identifying weaknesses within general aviation safety culture as well as developing interventions and mitigations for any identified weaknesses.	FY24	FY28	N	

Domain: Aerospace Performance and Planning Program Area: Unmanned Aircraft Systems Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11L.UAS.79	Demonstrate and Assess Technologies for Detecting and Mitigating Unauthorized UAS Near Airports	Consistent with Section 383 of the Federal Aviation Administration Reauthorization Act of 2018 (Public Law 115-254, Oct. 5, 2018), Airport safety and airspace hazard mitigation and enforcement, the FAA has launched an effort to test and evaluate technologies/systems that detect and mitigate potential aviation safety risks posed by unmanned aircraft systems (UAS), referred to as the "Airport UAS Detection and Mitigation Research Program." Section 383(a) of the FAA Reauthorization Act of 2018 created a new § 44810 in title 49 U.S.C. Section 44810(a) requires the FAA Administrator to work with the Secretaries of Defense, Homeland Security, and the heads of other relevant federal departments and agencies to ensure that technologies/systems that are developed, tested, or deployed by federal departments and agencies to detect and/or mitigate potential risks posed by errant or hostile UAS operations do not adversely impact or interfere with safe airport operations, navigation, air traffic services, or the safe and efficient operation of the National Airspace System (NAS). In addition, § 44810(b) requires the FAA to develop a plan for the certification, permitting, authorizing, or allowing of UAS detection and/or mitigation technologies/systems in the NAS. Section 44810(b) requires the FAA to take certain actions as part of or potentially informing the plan, including convening an Aviation Rulemaking Committee (ARC). Further, § 44810(c) requires the FAA to test and evaluate technologies/systems that detect and/or mitigate risks posed by UAS at five airports and § 44810(d) directs the FAA to use detection and/or mitigation technologies/systems to detect and/or mitigate the unauthorized operation of an unmanned aircraft that poses a risk to aviation safety in the course of the required testing and evaluation. It is anticipated that at the conclusion of this research program, (currently planned for	FY20	FY24	Y	

Domain: Aerospace Performance and Planning Program Area: Unmanned Aircraft Systems Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11L.UAS.108	Evaluate the Impacts and Operational System Needs to Support Deployment and Use of Counter-Unmanned	In accordance with Congressional mandates provided in the FAA Reauthorization Act of 2018 (sections 364-366, 372, and 383), the FAA must processes and plans to address the need for enhanced security associated with UAS integration. This includes interagency coordination to protect the safety of the NAS as well as people and property, enforcement requirements, and suggested recommendations for the effective deployment and use of systems to detect and mitigate wayward or non-compliant UAS operations. This research effort includes extensive coordination with other LOBs, internal and external stakeholders, and communities to identify risks created by errant and/or non-compliant UAS and develop recommendations to prevent UAS and related technologies from interfering with public safety operations, navigation, air traffic services, critical infrastructure or the overall safety and security of the NAS. The proposed long-term research effort initially consists of two phases. Phase I: The focus of Phase I is to understand the efficacy of UAS detection and mitigation systems using risk based analyses to determine potential impacts on UAS/AAM operations, UTM, and critical aviation infrastructure. This phase evaluate development of prototype systems and provide suggested guidance, in conjunction with Federal, State, Local, and Tribal (FLST) Law Enforcement Partners to address unauthorized UAS impacting public safety operations. Phase II: This phase of the research effort evaluates the supply chain and data collection associated with UAS and C-UAS activities. This includes evaluating the operational and system requirements needed for effective data exchange and protection in addition to the interoperability need of various C-UAS systems.	FY24	FY25	Y	
A11L.UAS.107	Develop Receiver Channel Model and Test Simulation for UAS C2 Radio Operating in C-Band	Integrated operations of large aircraft in controlled airspace require a reliable Command and Control (C2) link. C-band radio defined in RTCA DO-362A standards presents a desirable performance for this purpose. This research aims to advance the verification and validation requirements of receiver performance of C-band radio. It will also inform AIR on the process of approving a certified test lab to measure performance of UAS C2 radio receivers in simulated complex radio frequencey (RF) environment. FAA-AIR would use it to approve Technical Standard Order (TSO) applicant's radio with high levl of confidence that the radio will perform in real world RF environment.	FY24	FY26	Y	
A11L.UAS.53	Conduct Science Technology Engineering and Math (STEM) Outreach to Minority K-12 Students Using UAS	The FAA COE/ASSURE is conducting STEM minority outreach activities using UAS as the central learning platform.	FY16	FY24	Y	

Domain: Aerospace Performance and Planning Program Area: Unmanned Aircraft Systems Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11L.UAS.109	Identify and Evaluate UTM Risks and Establish Threat Management Mitigation Recommendations	FAA RE&D UAS Research requirements as outlined in the FY 2022 Budget Estimates highlights the continued need to provide UAS and related emerging technologies threat identification and analysis to support FAA decision-making and to safely integrate UAS into the NAS. As a result, The Office of Security and Hazardous Materials Safety (ASH) will use the outputs of this research to develop recommendations to support UTM development in support of interagency partners to support the safe and secure integration of UAS and AAM into the NAS. Phase I: The plan will be implemented in 2 phases. The first phase, developed in conjunction with other LOBs, will provide a complete ontology of UAS and C-UAS detection and mitigation terms and definitions to provide standardized UAS and C-UAS nomenclature as it relates to security. Task 2 of Phase I will expand on current AAM/UAM research to address electromagnetic interference (EMI) security vulnerabilities and impacts to and from UAS including, but not limited to, potential effects to critical and national security infrastructure. Phase II: The second phase, anticipated to start in FY 2025, will utilize data and some of the initial results from Phase I to expand awareness of UAS and Advanced Air Mobility (AAM) security issues and cybersecurity concerns. This research will incorporate ongoing research efforts being pursued by FAA (i.e., UAS.78_A38 and UAS.95_A58) and DHS as well as ICAO and EASA. As part of this effort, researchers will collaborate with U.S. and international partners to identify security issues, share information, and to develop recommendations for avoidance or mitigation as they apply to UTM, UAS, and AAM expansion and integration	FY24	FY25	Y	
A11L.UAS.110	Research Options for Development of Data Collection and Digital Investigation Tools to Support UAS	Investigative tools, techniques, and practices (TTPs) need to evolve with technological advances, to provide customers with the best evidence possible for safety regulation enforcement. This research will support the following: testing less invasive methods to acquire evidentiary data from UAS; understanding what data can be recovered from damaged aircraft; evaluating the impact on UAS evidence by tools designed to render an aircraft safe for individuals responding to UAS incidents. Results from the research will inform stakeholders across DOT and FAA, to include external federal partners such as NASA, NTSB, DHS, and the FBI, in addition to state/local partners. Findings will improve UAS digital investigations and evidence collection/processing, in support of strengthening the NAS via a stronger body of knowledge on the research topics.	FY24	FY27	Y	
A11L.UAS.111	Assess the Risk of Collision between Unmanned Air Mobility (UAM) vehicles, UAM and Unmanned Aircraft	This research will assess the risk of introducing and operating a UAM and propose guidelines for safer integration of UAM in to the NAS. Research funding will be used to make informed FAA policy decisions, provide Safety Risk Management (SRM) decisions, and enhance the completion of URAAT (UAS/UAM Risk Assessment Automated Tool) tool. The result will contribute in identifying risk of operating UAM in the NAS, and contribute in mitigating fatal accidents involving UAM.	FY24	FY25	Y	

Domain: Aerospace Performance and Planning Program Area: Unmanned Aircraft Systems Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11L.UAS.114	Develop small Unmanned Aircraft Detect and Avoid Human Factors Requirements	Detect and Avoid (DAA) industry standards for small Unmanned Aircraft Systems (sUAS) provide very little information pertaining to human factors requirements. This research will leverage existing human machine interface design guidance for large unmanned aircraft DAA systems and adapt it for sUAS DAA. The research effort will also propose new requirements as applicable to account for the unique ways in which sUAS DAA operations are likely to differ in the future from large unmanned DAA systems. This will include unique operations such as large numbers of simultaneous unmanned aircraft that are Beyond Visual Line of Sight (BVLOS) and managed by only a few operators. The purpose of this research is to develop human factors requirements that supports safe DAA operations, informs the FAA in assessing DAA systems and their concepts of operation, and accelerates the development of mature sUAS DAA industry standards.	FY24	FY26	Y	
A11L.UAS.112	Develop a Data Driven Framework to Inform SRM Mitigation Credit Estimates for UAS Risk Mitigations	Safety Risk Management (SRM) panels often resort to subjective evaluations for the amount of likelihood credit to grant each mitigation proposed in an operation. The inconsistency of these estimates requires research to provide data driven estimates for at least the commonly proposed mitigations	FY24	FY26	Y	
A11L.UAS.113	Develop Bird Strike Avoidance Requirements for UAS and Remotely Piloted Passenger Transport	Bird strikes are an existing aviation safety hazard. Certain Unmanned Aircraft System (UAS) Detect and Avoid (DAA) technologies have the potential for enabling both manned and unmanned aircraft to avoid flocks of birds and hazardous bird strikes with large birds. Bird Strike avoidance capabilities will help to safely enable a variety of Air Mobility concepts to include remotely piloted passenger transport operations. This research will propose technical requirements and explore the latent capabilities of DAA technologies to enable bird strike avoidance. Research findings will inform industry standards and FAA decisions pertaining to advanced DAA concepts that include Bird Strike Avoidance to support unmanned aircraft operations and also passenger transport.	FY24	FY26	Y	
A11L.UAS.82	Identify Weather Hazards for Unmanned Aircraft Systems	Weather hazards have historically impacted manned aviation operations in the National Airspace System (NAS). Thus, weather information and products have evolved overtime to help reduce these impacts. The unique characteristics of UAS, such as flying at altitudes below 400 feet with reduced speed capabilities and new control system design, introduce new weather hazards that are not fully understood. Research is required to understand the ability to detect and forecast UAS weather hazards so the NAS can maintain a high level of safety.	FY24	FY28	Y	

Domain: Aerospace Performance and Planning Program Area: Unmanned Aircraft Systems Research						
CA#	**FY 2024 Research Project Title**	**Executive Summary**	**First Fiscal Year of Programmed Funding**	**Last Fiscal Year of Proposed Funding**	**Currently Planned in President's Budget for FY24**	**AVS Sponsoring Service/Office Comments**
A11L.UAS.81	Identify Weather Research and Knowledge Gaps in the Boundary Layer for UAS	Weather gaps exist for UAS operations in the National Airspace System (NAS). Part 107 regulatory requirements only require UAS flight 500 feet below clouds, 2000 feet horizontally from clouds, and with 3 miles minimum slant range visibility. Currently, no other requirements exist for weather gathering or weather knowledge for Part 107 operations. Commercial UAS operations will be conducted under 14 Code of Federal Regulations (CFR) part 91, part 121 part 135, and part 137. Those regulations require approved sources of weather for aeronautical decision making. Few, if any, weather products exist for UAS flight planning. In addition, forecasting of weather at altitudes below 400 feet above ground level are outside of the current manned forecasting capabilities and currently do not exist. In addition, challenges exist with terrain variances, in geographically mountainous regions versus plains regions, as well as urban environments that pose a significant mechanical turbulence risk which is difficult to ascertain. Currently, no published standards or regulations exist to determine and mitigate the risk of weather incursion. Research is required to 1) develop and verify a Visual Weather Observation System (VWOS), 2) determine procedural changes for UAS operations in the NAS with respect to establishing a means to accept and/or approve weather detection, prediction, application, and integration systems for use in all UAS operations.	FY24	FY24	Y	
A11L.UAS.102	Evaluate the Applicability of Crashworthiness Standards for Advanced Air Mobility	Advanced Air Mobility (AAM) is a growing sector that will rely on a large range of complex vehicles that could incorporate helicopter and fixed-wing aircraft characteristics. These vehicles are also expected to operate in dense urban areas and in diverse weather conditions. For these reasons, crash-worthiness standards for AAM need to be assessed to ensure their applicability. This project will explore the applicability of current crash worthiness standards for AAM and identify gaps.	FY23	FY24	Y	