FY 2017 REDAC Aircraft Safety (SAS)

FAA Research FY17 Report

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Total Actuals	FY17 Contract Funding	FY18 Request	FY18 Contract Request	FY19 Target	FY19 Contract Target
Fire Research and Safety	$6,550	$2,715	$6,352	$2,481	$7,425	$3,402	$7,043	$3,000	$7,154	$3,000
Propulsion and Fuel Systems	$2,000	$1,185	$2,034	$1,475	$2,074	$1,780	$2,269	$1,200	$3,014	$1,100
Advanced Materials/Structural Safety	$2,809	$1,905	$7,409	$6,169	$6,500	$5,348	$4,338	$3,305	$3,994	$2,979
Aircraft Icing/Digital System Safety/Aircraft Cyber	$5,664	$3,579	$5,450	$3,309	$5,102	$2,553	$9,260	$6,815	$9,116	$6,358
- Aircraft Icing		$1,697		$2,165		$953		$3,740		$3,023
- Digital System Safety & Cyber Security (ASISP)		$1,882		$1,144		$1,600		$3,075		$3,335
Continued Airworthiness	$9,232	$5,610	$8,810	$5,311	$9,269	$6,093	$10,430	$7,251	$12,367	$8,896
- Systems		$1,204		$2,870		$3,487		$4,340		$4,746
- Structures		$4,406		$2,441		$2,606		$2,911		$4,150
Aircraft Catastrophic Failure Prevention Research	$1,500	$1,109	$1,433	$1,020	$1,528	$1,147	$1,570	$1,200	$0	$0
System Safety Management/ Terminal Area Safety	$7,770	$5,070	$5,939	$3,058	$6,500	$4,073	$4,149	$1,647	$5,011	$2,284
- System Safety Management		$2,536		$801		$2,425		$1,197		$1,784
- Terminal Area Safety		$2,534		$2,256		$1,648		$450		$500
Aeromedical Research	$8,300	$2,942	$8,467	$2,902	$8,538	$2,641	$9,765	$2,857	$10,753	$4,032
Unmanned Aircraft Systems Research	$14,974	$12,204	$17,635	$14,865	$20,035	$17,946	$6,787	$4,824	$4,130	$2,454
	$58,799	**$36,319**	**$63,528**	**$40,590**	**$66,971**	**$44,984**	**$55,611**	**$32,099**	**$55,539**	**$31,102**
Flight deck/Maintenance/System Integration Huma	$5,959		$5,000		$7,305		$6,825		$7,546	
Alternative Fuels for General Aviation	$6,000	$5,534	$7,000	$6,183	$7,000	$5,879	$5,924	$5,539	TBD	TBD
Weather		$3,500		$3,500		$3,150		$3,150		$3,150

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Fire Research and Safety (A11A)

Technologies, procedures, test methods, and fire performance criteria that can prevent and, where necessary, mitigate aircraft fires and improve survivability during a post-crash fire.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Reduce fire fatalities and injuries in the event of an accident, and reduce risk of accidents due to fire, based on improved regulatory standards, with no reduction in fire safety as a result of new materials and technologies.	**Aircraft Fire Safety**	1. Methodology to safely mitigate fire hazards of lithium batteries (that have been characterized as cargo and in electrical devices) including packaging, cargo loading devices, cargo compartment fire suppression systems, and procedures for occupied areas (**FY17**) 2. Performance standards for packaging designed to contain the hazards of lithium batteries in thermal runaway (**FY17**) 3. Technical data to support evaluation and test technologies and procedures to detect, control and characterize in-flight incidents of fire, smoke and fumes, and sensors (**FY17**) 4. Improved aircraft material heat release rate test specified in 14 CFR Part 25.853 (**FY17**)	1. On Schedule. Testing continues to document the effectiveness of industry proposed mitigation methods. Fire Safety Branch personnel also support an Aviation Rulemaking Committee to develop training guidance for responding to inflight incidents of personal electronic device fires in aircraft passenger cabins 2. Support for the ICAO requested SAE packaging standard continues in the form of attendance at SAE standard development committee meetings and testing of proposed standard test procedures and pass/fail criteria. The actual finalization of the standard is controlled by the SAE committee 3. On Schedule. In service incidents of fire, smoke, and fume events have been documented and a grant to the University of Maryland to evaluate suitable detection technologies for aircraft applications was awarded. 4. Testing of the impact of proposed improvements in the heat release rate test methodology are on schedule. The NPRM that these activities were intended to support has not yet been issued due to delays in the regulatory process.

Fire Research and Safety (A11A)

Technologies, procedures, test methods, and fire performance criteria that can prevent and, where necessary, mitigate aircraft fires and improve survivability during a post-crash fire

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Reduce fire fatalities and injuries in the event of an accident, and reduce risk of accidents due to fire, based on improved regulatory standards, with no reduction in fire safety as a result of new materials and technologies.	**Aircraft Fire Safety**	5. Standardization of new flammability test methods, advisory circulars and training guidance for planned Notice of Proposed Rulemaking to revise and upgrade the current flammability regulations for interior materials. (**FY17**) 6. Validated computational fluid dynamics model for heat, smoke, combustion gas and fire suppression agent movement through the interior spaces of aircraft using experimental data. (**FY17**) 7. Technical data to support small-scale test procedures that exhibit the production of incomplete products of combustion experienced by interior materials in a fire to evaluate the effectiveness of non-halogen flame retardant replacements for U.S Environmental Protection Agency-banned brominated flame-retardants. (**FY17**) 8. Eighth Triennial International Fire & Cabin Safety Research Conference Coordination, Two (2) International Aircraft Materials Fire Test Working Group Meeting participation and One (1) International Aircraft Systems Fire Protection Working Group Meeting participation. (**FY17**)	5. Research to support the output continues in the form of training videos, development of a new vertical flame propagation test method, and testing of various magnesium alloy shapes. The NPRM that these activities were intended to support has not yet been issued due to delays in the regulatory process. 6. On Schedule. Triplicate experiments were conducted with a repeatable controlled heat source in an area above the cabin ceiling of the main passenger deck of a 747SP aircraft. The measured temperature rise, recorded by an array of thermocouples throughout the space compared very favorably to the output of the National Institute of Standards Fire Dynamics Simulator simulations of the same heat source in the same geometric shape. 7. On Schedule. Results obtained to date were presented at the Combustion Conference in Manchester, England in July. 8. Completed.

Fire Research and Safety (A11A)- *Continued*

Technologies, procedures, test methods, and fire performance criteria that can prevent and, where necessary, mitigate aircraft fires and improve survivability during a post-crash fire

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Total Actuals	FY17 Contract Funding	FY18 Policy	FY18 Contract Request	FY19 Target	FY19 Contract Target
Fire Research and Safety	$6,550	$2,715	$6,352	$2,481	$7,425	$3,402	$7,043	$3,000	$7,154	$3,000

People	Facilities	Partnerships	Highlights
• 25 GOV FTEs and 17 CTR FTEs in various technical disciplines including engineering, analytics, material science, chemistry, lab testing, etc.	• FAA Full Scale Fire Test Facility • FAA Component Fire Test Facility • FAA Fire Chemistry Lab • FAA Material Fire Test Facility • FAA Pressure Vessel • B-747, B-737, and B-727 aircraft.	• FAA Office of Hazardous Materials (ADG), • ICAO, • SAE, • EASA, • Boeing, • University of Maryland	Challenges include • Lithium Batteries shipped as Cargo on Passenger Aircraft • Implementing standards to include risk mitigation • Shipment of lithium batteries on Freighter Aircraft • The use of non-traditional materials in aircraft construction, aircraft systems and cabin furnishings. • Composite aircraft structure • Newer magnesium alloys • Use of fuel cells powered by compressed hydrogen or hydrocarbons Will seek a better understanding of aircraft manufacturer's intentions for future materials and systems as well as other fire safety related emerging challenges for continued efficient planning in this Program

Propulsion and Fuel Systems (A11B)

This research develops and/or enhances technologies, procedures, test methods, and risk assessment methods to enhance airworthiness, reliability, and performance of engines, propellers, fuels, and fuel systems

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Reduce the risk of failures of high energy rotors and other life-limited engine components.	**Advanced Damage Tolerance and Risk Assessment Methods for Engine Life-Limited Parts**	1. Technical report detailing capabilities within the DARWIN code to enable probabilistic damage tolerance and fleet risk analysis of rotor blade attachment slots in support of AC 33.70-4 (**FY17**)	1. During FY17, the Fleet Assessment Module (FAM) was implemented into DARWIN version 9.2. The FAM assesses the risk of one or more fleets of aircraft based on disk risk results associated with individual DARWIN project files. This enhancement allows for simultaneous inspection of an entire fleet of aircraft and enables the user to perform inspection-based corrective actions across the entire fleet in accordance with AC 39-8, "Continued Airworthiness Assessment of Powerplant and Auxiliary Power Unit Installations of Transport Category Airplanes". In collaboration with the Rotor Integrity Steering Committee (RISC), DARWIN 9.2 was also enhanced to allow analysis of rotor blade attachment slots in support of AC 33.70-4 "Damage Tolerance of Blade Slots in High Energy Rotors".
	Propulsion and Fuel Systems Volcanic Ash Engine Ingestion	1. Technical report detailing risks to continued airworthiness of turbine engines associated with the inadvertent flight through and	1. A draft report on the ground-based volcanic ash engine ingestion experiments conducted as part of the joint NASA-USAF-FAA Vehicle Integrated Propulsion Research (VIPR)

		ingestion of various concentrations of volcanic ash (**FY17**)	Phase 3 is being reviewed internally by the VIPR 3 partners. This study subjected a F117 turbofan engine to ash concentrations of 1 and 10 mg/m^3 and described the damages found by a teardown inspection.

Propulsion and Fuel Systems (A11B) - *Continued*

This research develops and/or enhances technologies, procedures, test methods, and risk assessment methods to enhance airworthiness, reliability, and performance of engines, propellers, fuels, and fuel systems

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Propulsion and Fuel Systems	$2,000	$1,185	$2,034	$1,475	$2,074	$1,780	$2,269	$1,200	$3,014	$1,100

People	Facilities	Partnerships	Highlights
• 1 FTE	• FAA Aviation Fuel Research Lab • FAA Propulsion & airpOWer Engineering Research (POWER) Lab	• Rotor Integrity Steering Committee (RISC) Rotor Manufacturing (RoMan) Sub-team • DARWIN Code Development Steering Committee • Jet Engine Titanium Quality Committee (JETQC) • USAF AFRL on Sonic Infrared NDE Development, NDE for Residual Stress Profiling, and Cold Dwell Fatigue Research • NDE for Residual Stress Profiling • NDE Communications Group • Air Force and NASA for Volcanic Ash	• Challenges involving development of Probabilistic Damage Tolerance Design Code (DARWIN) for Critical Life Limited Components that implement zoned, stress intensity factor mechanics-based solutions for blade slots and turned surfaces for advisory circulars and fleet assessments are occurring within this Program

Advanced Materials / Structural Study (A11C)

This research assesses safety implications and techniques associated with composites and structures that can help to reduce aviation fatalities

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Broaden awareness of the related critical safety and certification issues, Standardize the certification approach across the Certification Service, while benchmarking best industry practices in meeting existing regulations and/or special conditions.	**Crashworthiness Issues Unique to Composite Materials**	1. Updated composite crashworthiness safety awareness training module to reflect changes in regulation, materials, processes, guidance and practices. (**FY17**) 2. Standardized dynamic test methods that determine composite material properties (**FY17**) 3. Modeling guidelines and best practices that support certification requirements (**FY17**) 4. Technical report identifying issues and limitations associated with structural scale and boundary effects on crash analysis best practices to support certification requirements (**FY17**) 5. Technical report identifying data gaps that affect the use of modeling and simulation for crashworthiness analysis. (**FY17**)	1. The comments from the instructors and the students after each course was taught has been incorporated in the course. New course offering in September 2017. 2. Completed – Method to determine dynamic tension properties of composite materials. Report on round robin testing in final review. 3. Draft report on modeling guidelines and best practices on schedule for the end of August. 4. Included in Item 3. 5. Included in Item 3
	Composite Maintenance Practices	1. Technical data supporting evaluated repair trials, inspections and structural integrity data those serve as proof of consistent and reliable composite maintenance practices used by the industry. (**FY17**) 2. Technical data supporting evaluated field bonded and bolted repair practices to update related guidance and training for composite aircraft structures. (**FY17**)	1. Complete round robin testing of bonded repairs at different depots to evaluate the existing Commercial Aircraft Composite Repair Committee (CACRC) standards. Final report, which documents key elements supporting quality assurance of bonded repairs, is being reviewed and will become available in the near future. 2. Included in Item 1.

Advanced Materials / Structural Study (A11C)

This research assesses safety implications and techniques associated with composites and structures that can help to reduce aviation fatalities

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Broaden awareness of the related critical safety and certification issues, Standardize the certification approach across the Certification Service, while benchmarking best industry practices in meeting existing regulations and/or special conditions	**Continued Operational Safety and Certification Efficiency for Emerging Composite Technologies**	1. Technical report documenting performed studies to understand key issues associated with the introduction of composite materials in large scale aircraft structures (**FY17**) 2. Gap Analysis on the critical parameters and protocols for developing policy and guidance on the effect on the performance of composites; lightning effects on structures, carbon fiber production control and of new fuel chemistries. (**FY17**)	1. Research is ongoing to address the failure analysis of composite aircraft structure after post-crash fire. A test plan has been formulated and is being carried out at the FAA Tech Center. The necessary equipment is being purchase. The outcome of this research will be published in A Failure Analysis Handbook by FY2021 2. Complete literature reviews to identify research area addressing lightning strike protection of composite structures. The goal is assess the existing 200 µJ energy threshold is adequate and sufficient for composite aircraft structures.
	Transport Airplane Ditching	1. Technical report detailing parametric studies against identified ditching conditions with developed ranges of ditching scenarios and corresponding airframe damage with an aircraft ditching simulation model. Where applicable, the model will be used to address issues brought up by the aviation rulemaking advisory committee's team on aircraft ditching. (**FY17**)	1. The finite element model of a narrow-body transport aircraft to perform the ditching scenarios has been completed. A study to determine actual water impact/ditching scenarios has been completed and results have been presented to the ARAC committee. The ARAC will meet in Sept to discuss baseline water impact/ditching scenarios. Flight 1549 into the Hudson will be one of the several scenarios to be modeled.
	Damage Tolerance of Composite Structures	1. Technical report documenting severe impact damage mechanisms from simulated service vehicle collisions and effect on structural properties (**FY17**)	1. Investigated the severe impact of carbon/epoxy composite fuselage structures by ground service equipment (GSE) having soft/rubber-covered bumpers constitutes the high energy wide area

		2. Technical data supporting investigated, tested and analyzed guidelines assuring designs are resistant to operational damage to establish future certification policies. (**FY17**) 3. Technical data identifying critical damage and defect types for dynamic components, including focused studies on safety issues derived from service isolation. (**FY17**) 4. Technical report supporting the evaluation of advances in analysis methods, failure criteria and test procedures applied to composite fatigue and damage tolerance (**FY17**)	blunt impact (HEWABI) problem. Blunt impact from HEWABI events can cause significant internal damage with little to no external visually-detectable indicators. Draft report, which documents results of this study, is being reviewed and will become available in the near future 2. Single cantilever beam testing and analysis have been underway to characterize the damage tolerance of composite sandwich structures. This work will establish ASTM standard to test for sandwich fracture toughness properties and create analysis methods. 3. Per AVS input, this work is not started in FY17. 4. Performed testing to understand the material science associated with matrix compression damage. Test data determines the effects of the new compression damage model on predicted failure loads using design-of-experiment techniques, and the contribution of matrix-compression damage to mixed-mode (compression combined with shear) loading cases. Conducted fatigue testing to investigate composite damage growth of hybrid metal/composite structures under variable amplitude cycling.

Advanced Materials / Structural Study (A11C)

This research assesses safety implications and techniques associated with composites and structures that can help to reduce aviation fatalities

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Broaden awareness of the related critical safety and certification issues, Standardize the certification approach across the Certification Service, while benchmarking best industry practices in meeting existing regulations and/or special conditions	**Structural Integrity of Adhesive Joints**	1. Technical data supporting collected structural integrity data for composite and metal bonded structure that is representative of the design and processing variables used for aircraft structures currently in service. (**FY17**) 2. Technical report supporting evaluation of industry process quality control procedures and their tests and analysis methods used for structural integrity that yields an assessment of the strengths and limitations (**FY17**) 3. Training and best industry practices to support guidelines for expanding applications and new rules, policies and guidance (**FY17**)	1. This research output has 3 components: 1) Coordinate a development plan for Bond Process Qualification with AVS and CHM-17 – Completed. 2) Conducting tests and collecting data to characterize amine blush phenomena and analysis of data to identify correlations among critical parameters that effect the event – On schedule with an expected completion date of September 30, 2017. 3) Testing and data collection to characterize Surface Preparation Techniques using Advanced Surface Energy Measurements –Inverse Gas Chromatography. Delayed due to test equipment issues. Revised completion date: Dec, 2017. 2. Research activities identified for FY 2017 is completed. Two technical reports are expected by September 30, 2017 – On schedule: 1) Durability of Adhesively Bonded Joints for Aircraft Structures and 2) Durability of Durability of Bonded Aerospace Structures. 3. Coordinated a development plan on related content for the CMH-17 handbook. Work on contend

			development on the training requirements and best practices for the next revision of the handbook is ongoing.

Advanced Materials/ Structural Study (A11C)- *Continued*

This research assesses safety implications and techniques associated with composites and structures that can help to reduce aviation fatalities

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Advanced Material's/Structural Safety	$2,809	$1,905	$7,409	$6,169	$6500	$5348	$4,338	$3,305	$3,994	$2979

People	Facilities	Partnerships	Highlights
• 7 FTEs in various technical disciplines including engineering, analytics, material science, non-destructive evaluation, etc.	• FAA FASTER • FAA Aircraft Structural Test Evaluation and Research Lab • FAA Material and Structures Lab	• Academia (JAMS COE): Wichita State University, University of California, University of Washington, Oregon State University, Florida International University, University of Utah • Industry: Boeing, Hexcel, Cytec, United Airlines, Airbus, Textron Cessna, Delta Airlines, Spirit Aerosystems, SAE International, ASTM, CMH-17 • Govt: NASA, Army, Air Force Research Lab	• Composite Material Handbook – 17 (CMH-17) updates include additional volumes for covering new material systems

Aircraft Icing (A11D.AI)

This research enhances the understanding of risks of failures or malfunctions of software and digital systems.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Mitigate hazardous impact of ice accretions on engine core components, promote safer winter weather ground operations and streamline the methods of compliance for the new Super cooled Large Droplets (SLD) regulations	**SLD engineering tools development and validation**	1. Coordinated research plans for SLD engineering tolls with aerospace industry manufacturers and the European Union (**FY17**)	1. The European Union is no longer supporting SLD engineering tools, but the FAA is formulating an internal research plan Industry remains very interested, as this relates to CBA, and has formed a CBA panel which encompasses SLD engineering tools in which the FAA is participating
	PCA Simulation Methods Development and Valid to Support Appendix C Icing Cert and COS	1. Technical report documenting testing of swept wing model with 3-D ice shapes in ONERA F1 pressurized tunnel (**FY17**)	1. The testing in the ONERA F1 was significantly delayed due to scheduling conflicts and tunnel issues operability issues. Consequently, reporting is delayed until FY2018
	Research on Ice Crystal Icing Conditions to Support Means of Compliance	1. Technical report detailing of ice formation in warm environments simulating an engine compressor (**FY17**)	1. Technical reports utilizing results from static testing have been published. The research now focuses on rotating rig testing, but this requires completion of the rig, and this work has been somewhat delayed due to funding issues and a fabrication mishap, now resolved.
	Safe Operations and Take-off in Aircraft Ground Icing Conditions	1. Technical data in support of Flight Standards annual winter notice that provides guidance for airlines on issues to be addressed in their required ground deicing plan. (**FY17**)	1. Data used in publication of Flight Standards winter notice August 2017

Aircraft Icing (A11D.AI)- *Continued*

This research enhances the understanding of risks of failures or malfunctions of software and digital systems

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Aircraft Icing	$3,117	$1,882	$2,328	$1144		$1,600	-	$3075	-	$3,335

People	Facilities	Partnerships	Highlights
• 8 FTEs in various technical disciplines including engineering, analytics, atmospheric science, etc	• FAA CASSIE (For CFD modeling)	• NASA Glenn Research Center • Transport Canada • National Research Council (NRC) of Canada • Environment and Climate Change Canada (ECCC) • ONERA (France) • Finnish Transport Safety Agency	• Two additional appendices to 14 CFR Part 25, Appendix O - for super cooled large drop (SLD) icing, mainly on aircraft surfaces, and Appendix D - for engine ice crystal icing (ICI) were enacted in 2015. • Development and validation of means of compliance through testing and analysis for these appendices is a major challenge for industry and the FAA. • Certification by analysis (CBA) has been a major focus of industry in recent years, including certification for aircraft icing. The FAA Icing Research Program has increased its capability in computational fluid dynamics (CFD) partly in response to the emerging issue. • This enhanced capability is proving valuable in the swept wing icing project (SWIP); • The research will provide new test methods and a 3-D ice accretion database to support validation of computer codes and means of compliance for certification. • It will also play an important role in the development of engineering tools for SLD conditions

Digital System Safety (A11D.SDS)

This research enhances the understanding of risks of failures or malfunctions of software and digital systems.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Obtain insights into information security protection vulnerabilities of, and risks to, aircraft systems, components, networks, and interfaces	**Onboard Network Security and Integrity**	1. Technical report identifying the potential associated risks with ASISP access points or apertures (**FY17**)	1. A parallel independent research process was executed across 4 research organizations through the 2-year first phase (FY16-17) of the ASISP program. The first Safety Risk Assessment (SRA) Methodology was delivered in FY16 by Microsystems Automation Group (MSAG), along with an SRA for the Aircraft Addressing and Reporting System (ACARS). In FY17, two additional researcher organizations, Lincoln Laboratories (LL) and Astronautics Corporation of America (ACA), have completed development of SRA methodologies, both of which also were applied to ACARS to produce SRA reports. Additionally, ACA conducted an SRA on Aircraft Interface Devices (AIDs), the primary area of concern for Electronic Flight Bags (EFBs), as identified in the FAA Aviation Rulemaking Advisory Committee (ARAC)'s ASISP report - recommendation #24. A fourth independent methodology draft was delivered by Johns Hopkins Applied Physics Laboratory (JHU/APL) in FY17, with a final version with ACARS SRA to be delivered in early FY18.

Digital System Safety (A11D.SDS)

This research enhances the understanding of risks of failures or malfunctions of software and digital systems

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Recommendations and technical data to support the development of standards, policy, guidance, and training material for complex airborne hardware/software systems	**Development Assurance Techniques for System Elements**	1. Technical report on System-Level Assurance of Airborne Electronic Hardware (AEH) with recommendation on suggestions to assure COTS products. (**FY15**) 2. Technical report on the Assurance of Multicore Processors in Airborne Systems. (**FY15**) 3. Technical report on the Multicore Processor Worst Case Execution Time and Dynamic Allocation of Code. (**FY15**) 4. Report on draft set of Overarching Properties for alternate means of compliance. (**FY15**)	1. The Assurance of AEH task is now deemed completed. 2. This is one of the final deliverables and the task is now deemed completed. 3. Draft final report submitted to the sponsor. The final report will be published after the FAA team's review. 4. This is an interim report and refinement of Overarching Properties is continuing.
	System Considerations for Complex Software Intensive Systems	1. System Architecture Virtual Integration (SAVI) interim phase summary report documenting the Virtual Integration and Consistency Check results. (**FY16**) 2. Technical report on System Complexity Effects on Aircraft Safety and Complexity Measurement. (**FY16**)	1. Draft final report completed and delivered to the sponsor in March 2017. The report illustrates how the SAVI Virtual Integration Process (VIP) was advanced with a primarily focus on validating the core SAVI concepts of the VIP, Model Repository/Data Extraction Layer, dependency identification, and consistency checking within the context of extended Fit and behavior analysis capabilities built upon those developed in previous SAVI efforts. 2. Draft final report submitted to the sponsor. The final report will be published after the FAA team's review.

Digital System Safety (A11D.SDS)- *Continued*

This research enhances the understanding of risks of failures or malfunctions of software and digital systems

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Digital System Safety & ASISP	$2,548	$1,697	$2165	$1,144		$953	-	$3,740	-	$3,023

People	Facilities	Partnerships	Highlights
• 8 FTEs in various technical disciplines including engineering, analytics, computer science, etc	• Boeing 757 Aircraft	• NASA Langley • Aerospace Vehicles Systems Institute (AVSI	• Retired aircraft with active avionics onboard, used as a test bed for ASISP, in partnership with DHS • Collaborative relationship between FAA and NASA Langley to develop educational material and technical data for Aviation Safety Engineers training on Assurance Case application to DO-178C Standards. • NASA compliments with in-depth analysis and experience on similar training and challenges within the space program. • FAA/AVSI cooperative consists of cooperative consists of eleven aerospace corporations and three government organizations and includes Airbus, BAE Systems, Boeing, European Aeronautic Defense and Space Company, Eurocopter and Military Airbus, Honeywell International, Inc., Lockheed Martin Aeronautics, Rockwell Collins, General Electric Aviation Digital Systems, Rolls Royce, United Technologies Corporation Aerospace Systems, and (DoD) Defense Standardization Program Office (DSPO), (NASA), and Jet Propulsion Laboratory.

Continued Airworthiness – Systems (A11E.SYS)

This research enhances the decision making processes and addressing safety risks related to aircraft structures, engines, and systems.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
ES- New and modified airplanes utilizing More Electric Airplane (MEA) concepts and technologies and certified FCMS - Significant reduction of CFIT and Loss of Control accidents in GA. Reduced accident rates due to loss of airplane state awareness (ASA) and loss-of-control (LOC)	**ES- Fuel Cell Systems for Aircraft Applications**	1. Technical report documenting tests conducted to provide feasibility data of using fuel cell systems for aerospace applications while retaining or improving the current level of safety in commercial transport aircraft (**FY17**) 2. Technical report identifying and quantifying the short and long term safety risks associated with fuel cell aerospace applications including a potential failure mode and effect (**FY17**)	1. Projects are proceeding as planned interim draft reports have been provided to the sponsor and the Energy Storage Device Aviation rulemaking committee 2. Projects are proceeding as planned interim draft reports have been provided to the sponsor and the Energy Storage Device Aviation rulemaking committee
	ES- Rechargeable Lithium Batteries and Battery Systems for Aircraft Applications	1. Technical data evaluating the feasibility of using non-flammable electrolytes for rechargeable lithium battery systems for aerospace applications (**FY17**) 2. Technical report identifying and quantifying the short and long term safety risks associated with rechargeable lithium batteries and battery systems for aerospace applications (**FY17**)	1. Effect of the different reduced Flammability (RF) formulation on exothermic heat was evaluated. The RF formulations were showing lower heat generation compared to the baseline formulation. Draft data has been given to the sponsor 2. Projects have been slightly delayed due to funding and contracting issues. However, they are progressing as planned with the delay. The sponsor has accepted the delay
	FCMS Stall Model Identification, Recognition and Recovery	1. Criteria that describes stall departure trigger and characteristics for transport airplanes (**FY17**)	1. Research is complete, stall departure triggers and characteristics were identified. Final report was delivered to the FAA. Report was accepted by FAA sponsor
	FCMS Tire Failure Characteristics	1. Technical report cataloguing all data on existing tire failure characteristics such as tire burst plumb, thrown tire debris and flailing tire thread. (**FY17**)	1. Finalizing Interagency Agreement between FAA and USAF. Agreement between AF legal department and FAA contracts office

			is taking longer than expected. FAA sponsor is aware of delays
	FCMS Integrated Flight Path Control to Address GAJSC and FAA GA Safety Interventions	1. Technical Report identifying design and certification requirements for flight path control auto pilot technology in GA aircraft. (**FY17**) 2. Technical data categorizing system faults or pilot errors that have resulted in GA accidents and incidents. (**FY17**)	1. Research on this task is complete. Design and certification requirements for flight path control auto pilot technology have been identified. Final report has been delivered to the FAA and accepted by the sponsor. 2. Research on this task is complete, technical data has been identified, and the final report was delivered to the FAA. This task is part of an ongoing larger research effort to reduce loss of control accidents is GA aircraft.
RS- Diminish wire strikes and fatalities by implementing procedures and/or improving the certification basis for new helicopters and/or new technologies to alert pilots to the proximity of wires	**RS-Continued Operational Safety of Rotorcraft**	1. Preliminary Design Review (PDR) of an avian radar system to detect birds while in flight (**FY16**) 2. Identification of locations to test lighting system based on migration patterns. **(In-house)**	1. The PDR is being used to design a prototype avian radar system. The plan to use FAA Flight Program's helicopter located at WJHTC to test prototype system. 2. Testing of prototype light will be conducted at various locations to gather data on bird reactions

Continued Airworthiness – Systems (A11E.SYS)- *Continued*

This research enhances the decision making processes and addressing safety risks related to aircraft structures, engines, and systems

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Continued Airworthiness - Systems	-	$1,204		$2,870		$3487	-	$4340	-	$4746

People	Facilities	Partnerships	Highlights
• 5 FTEs in various technical disciplines including engineering, mathematics, material science, sensor technology, etc.	• FAA Air Fault Evaluation Lab/Electric and Flight Controls Test Capabilities	• NASA, DOD • Society of Automotive Engineers (SAE) industry and academia • Will rely on existing CRDAs with, e.g., Boeing, Astronics, and Ametek.	• The FAA conducts unique aspects of aerospace electrical systems research in the ES lab using collaborative partners. The test capabilities at the WJHTC ES are unique and are designed so research can take place in a collaborative manner with the aviation partners in an environment that tests the safe installation of these new and unusual technologies while protecting the intellectual property of each organization. Safety results regarding the safety of implementing hybrid and electric prolusion (i.e. lithium batteries, nonflammable lithium electrolytes, fuel cells, advanced aircraft power protection and switching, carbon nanotubes wire,... etc.) into the more electric aircraft architecture can be shared while the intellectual property of each partner is protected .

Continued Airworthiness – Structures (A11E.STR)

This research enhances the decision making processes & addressing safety risks related to aircraft structures, engines, and systems

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Efficient certification of Active Flutter Suppression (AFS) systems and Promote standardized acceptable design and certification compliance data and tools necessary to enable the FAA to operate in cost effective and efficient manner, while providing a level-playing field and uniform standards for all certification agents	**Continued Airworthiness of Composite Structures**	1. Representative Sample of a documented bonded field repair with a service history (**FY17**) 2. Technical report in support of mechanical characterization test articles by performing non-destructive evaluation and tear down of specimens (**FY17**)	1. Completed. 29 aircraft structural parts with documented service history have been procured in support of this research output. The current inventory of the procured parts includes various flight control surfaces, such as flaps, ailerons, and horizontal stabilized among others, harvested from retired Boeing aircraft (767-300 and 757-200). These parts are currently being used in destructive/ nondestructive tests and other coupon and subcomponent level structural tests to support the second research output. 2. The technical report will include a detailed analysis of results of the tests currently being perform on the procured parts (see Research Output 1) and a set of recommendations for composite bonded repair guidance. The technical report is due September, 30, 2017. The final technical report will be delivered to the AVS sponsor
	Emerging Technology- Active Flutter Suppression	1. Refined FAA active flutter suppression research plan (**FY17**)	1. Completed – tasking and research partners identified and project schedule defined
	Metallic Materials Properties Development and Standardization (MMPDS) Support and Design Values for Emerging Materials	1. Updated MMPDS Handbook and derivative products (**FY17**)	1. Completed – released MMPDS-12 and derivative products for public distribution

Continued Airworthiness – Structures (A11E.STR)

This research enhances the decision making processes & addressing safety risks related to aircraft structures, engines, and systems

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Efficient certification of Active Flutter Suppression (AFS) systems and Promote standardized acceptable design and certification compliance data and tools necessary to enable the FAA to operate in cost effective and efficient manner, while providing a level-playing field and uniform standards for all certification agents	**Damage Tolerance and Durability Issues for Emerging Technologies**	1. Technical Report assessing bonded repair technology to generic beam structures in partnership with Boeing. (**FY17**) 2. In partnership with Boeing, develop test capability for structure representative of aircraft wings – Airframe Beam Structure Test (ABST) fixture. (**FY17**) 3. In partnership with ALCOA and Embraer, generate data to assess emerging metallic structures technology for fuselage structures using the FAA's Full Scale Aircraft Structural Test and Evaluation Research (FASTER) fixture (**FY17**) 4. Technical report assessing Aluminum-Lithium for aircraft applications in partnership with Bombardier and Constellium (**FY17)** 5. Preliminary procedures and guidelines establishing design values for highly process-dependent emerging metallic-based materials including metal additive manufacturing. (**FY17**)	1. Completed – draft final report submitted and paper provided at the International Committee on Aeronautical Fatigue Conference (IFAC2017) held in Nagoya, Japan, June 5 - 9, 2017 2. Completed – ABST fixture commissioned May 2017 and housed in the new FAA Structures and Materials (SML) lab. Will be used to continue ongoing effort with Boeing to assess bonded repairs to representative composite wing panels 3. Ongoing – Supplemental testing done on coupon and subcomponents for material characterization and to develop the load spectrum used in full-scale testing using the FASTER fixture. First baseline Panel fabricated and preparation for tested completed. 4. Completed – draft final report submitted for the initial phase of work focused on material characterization. Follow-on efforts to assess built-up structure are underway 5. Ongoing - working with the Emerging Technology Working Group (ETWG) of the MMPDS, developed an approach for material equivalency testing. Documented in MMPDS Agenda Item 11-40

Continued Airworthiness – Structures (A11E.STR)

This research enhances the decision making processes & addressing safety risks related to aircraft structures, engines, and systems

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Efficient certification of Active Flutter Suppression (AFS) systems and Promote standardized acceptable design and certification compliance data and tools necessary to enable the FAA to operate in cost effective and efficient manner, while providing a level-playing field and uniform standards for all certification agents	**Metal Additive Manufacturing (AM) for Airplane Structures**	1. AM Consortia Partnership (**FY17**) 2. Methodology for creating special factors and generating design values. (**FY17**) 3. Technical Report in support of Powder Reuse for Static Strength Applications (**FY17**)	1. Complete – KART and CMU consortia members. Ongoing effort to leverage resources with existing consortia addressing certification, manufacturing, and continued airworthiness of metal AM 2. Ongoing effort working within the KART consortium. An initial draft test plan and matrix was developed and is under review by KART members 3. Ongoing effort working within the KART consortium. A literature survey was initiated.

Continued Airworthiness Structures (A11E.STR) - *Continued*

This research enhances the decision making processes & addressing safety risks related to aircraft structures, engines, and systems

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Continued Airworthiness -Structures	-	$4406		$2441		$2,606	-	$2,911	-	$4,150

People	Facilities	Partnerships	Highlights
• 8 FTEs in various technical disciplines including engineering, analytics, material science, non-destructive evaluation, etc.	• FAA Full-scale Aircraft Structural Test Evaluation and Research (FASTER) Lab • FAA Structures and Materials Lab • FAA Airframe Beam Structural Test (ABST) fixture	• Boeing, Arconic, Bombardier, Constellium, Embraer, Kansas Aviation Research Technology (KART), Textron, Airbus, Spirit Aerospace, Bombardier • Metallic Material Properties Development and Standardization (MMPDS)	• Processing Emerging Issues • Being Proactive to keep pace with industry advances through partnerships to obtain data • Lack of standards and public specifications for emerging materials • Data and specifications for emerging materials held proprietary by industry • Difficulties establishing partnerships with OEMs as FAA is primarily viewed as regulating body.

Aircraft Catastrophic Failure Prevention Research (A11F)

Standardize analysis methods and tools for evaluating potential hazards and risks related to engine rotor burst and fan blade failure to assure that regulatory compliance findings are accurate and consistent.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Engine containment and uncontained engine fragment threats technology Refresh	**Advanced Analysis Methods for Impact of Composite Aircraft Materials in Rotor Burst and Blade Release**	1. Updated and revised impact and failure models available in LS-DYNA through the LS-DYNA Aerospace Users Group (**FY17**) 2. Technical report detailing the evaluation of the MAT213 composite modeling and properties available in LS-DYNA to assess the improvement in predictive modeling. (**FY17**) 3. Technical report addressing Australian Transportation Safety Board recommendation on the Airbus A-380 uncontained engine failure by incorporating any lessons learned from this accident into revision of the FAA Large Engine Uncontained Engine Debris analysis Report. (**FY17**)	1. The LSDYNA Aerospace working group Engine Related Impact and Failure FAA/NASA/Industry/Academia team met on March 16th at LSTC. MAT_264 was approved for public release in the next revision to LSDYNA. It has been available as a beta version and has passed QA. MAT213 for composite is being fully integrated into the beta trunk version for users to evaluate under the NASA Advanced Composite Consortium. 2. A draft report of the PhD thesis documenting the development of MAT_213 is in the FAA editing process. Also three refereed journal articles have been published on this work 3. A draft report has been delivered to the sponsor for approval.

Aircraft Catastrophic Failure Prevention Research (A11F)- *Continued*

Standardize analysis methods and tools for evaluating potential hazards and risks related to engine rotor burst and fan blade failure to assure that regulatory compliance findings are accurate and consistent

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Aircraft Catastrophic Failure Prevention Research	$1,500	$1,109	$1,433	$1,020	$1,528	$1,147	$1,570	$1,200	-	$0

People	Facilities	Partnerships	Highlights
• Two FTEs	• FAA in house Material Testing. • Via FAA CASSIE and High Performance Computing..	• NASA • LS-DYNA Aerospace Working Group • Naval Air Warfare Center • Academia: Ohio State University, George Mason University and Arizona State University	• This program began in FY2013 with a planned 4 phased effort. As of today, this Program is in Phase 3 and FY19 will begin the final phase of this program- developing guidance for aircraft certification by analysis. • Accomplishments within Program has produced 6 PhD's, 17 Masters students and 30 refereed journal papers • Since 1996, the Program has published 63 FAA reports related to uncontained engine failure, fuselage shielding and engine containment modeling. • Tabulated test data has been compiled for multiple materials: Aluminum 2024, Titanium 6-4, Inconel 718 and testing is underway on T80/F3900 composite panels • LS- DYNA users currently have the following material models in their toolbox as a direct result of the research conducted within this BLI: • MAT_214-MAT_DRY FABRIC • MAT_224- Von Mises • MAT_224- Generalized Yield • MAT-_264- Tabulated Anisotropic Metal • MAT_213-Beta Version- Generalized Orthotropic Model • This program initiated the LS-DYNA Aerospace Working Group in 2003, which now has two sub groups working on certification by analysis.

Flight Deck/Maintenance/System Integration Human Factors (A11G)

This research enhances decision making related to human factors for flight deck systems, and establishing data to support risk management programs to address hazards in the maintenance environment.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Reduce HF-related accidents/incidents by incorporating human factors best practices, early in the design process. Increase safety, access, efficiency, capacity, and throughput in low visibility conditions using advanced vision systems, head-up displays, and head-mounted displays	**Enhancing Aviation Safety through Advanced Procedures, Training & Checking Methods, to include Loss of Control Detection, Avoidance and Recovery**	1. Technical report identifying those features of integrated Angle of Attack (AoA) instrumentation that are critical to providing usable data to the pilot for defined tasks 2. Technical Report surveying air carriers (US and abroad) and identifying the current state of CRM training and assessment 3. Technical Report on the evaluation of methods for a performance-based Air Transport Pilot (ATP) certificate	1. Completed study and provided report on AoA instrumentation features and provided guidance/recommendations for add-on angle of attack indicators in small GA aircraft. This is a high priority research topic for the General Aviation Joint Steering Committee and addresses one of the NTSB top ten most wanted issues "Prevent Loss of Control in Flight in General Aviation 2. There are differences in CRM training administration and assessment methods among airlines. As a result, there is a need to collect and compare information from airlines regarding their current CRM training curricula and assessment methods, and conduct surveys and, if possible, interview flightcrews and other CRM training professionals in order to identify gaps in training and assessment to help advance CRM towards the needs of the modern flightcrew. The University of Central Florida research team has been developing the survey and received permission from AFS-280 to begin its administration. A literature review is ongoing. Results will be used to update AC 120-51, Crew Resource

			Management Training. (est. AC revision FY19) 3. As a result of the US House Bill 5900 Air Safety and FAA Extension Act of 2010, the FAA increased the number of hours for an ATP license to 1500 hours. This research, along with other research programs, studied whether this number of hours is the best criterion for experience or whether a performance-based qualification system is superior. A delivered report described investigated methods of training a pilot for a specific professional flying position and evaluating the effectiveness of training methods to suggest additional paths that could be developed for obtaining an ATP certificate with restricted privileges that is performance based
	Human Factors Research and Development for Improved Rotorcraft Operational Safety	1. Technical Report documenting the research on increased and enhanced usage of full flight simulators (FFS), flight training devices (FTDs) and other FAA approved helicopter training devices for pilot training, currency and certification. 2. Technical data documenting research on Scenario Based Training for part 61, 91, 141 and 135 operations. 3. Technical data documenting research on helicopter Crew Resource Management (CRM) for part 91, 141 and 135 operations including HAA operations.	1. Training projects are addressing operational and technological challenges that may impact safety. A research plan is being executed to evaluate pilot decision making relative to onboard weather aiding resources and off-nominal event training 2. A literature review for Scenario Based Training and factors affecting pilot workload in rotorcraft operations 3. A research plan to evaluate CRM practices has started execution

Flight Deck/Maintenance/System Integration Human Factors (A11G)

This research enhances decision making related to human factors for flight deck systems, and establishing data to support risk management programs to address hazards in the maintenance environment.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Reduce HF-related accidents/incidents by incorporating human factors best practices, early in the design process. Increase safety, access, efficiency, capacity, and throughput in low visibility conditions using advanced vision systems, head-up displays, and head-mounted displays	**Fatigue Mitigation in Flight Operations**	1. Recommendations on the effectiveness of fatigue risk management approaches to improve flight crew member alertness 2. Technical Report documenting guidance and educational materials associated with Fatigue Risk Management Systems documentation	1. CAMI assists the Flight Standards Service as the scientific representative for Fatigue Risk Management System (FRMS) proposals. This includes routine review of proposals for scientific integrity during processes outlined in AC 120-103A. CAMI also assists with fatigue-related materials associated with Part 117 flightcrew member duty and rest requirements. In addition to these accomplishments, CAMI is concluding its evaluation of AFS-220 FRMS exemption review and analysis procedures for standardization and scientific validity on the effectiveness of fatigue risk management approaches to improve flight crew member alertness 2. Included in Item 1
Reduce HF-related accidents/incidents by incorporating human factors best practices, early in the design process. Increase safety, access, efficiency, capacity, and throughput	**Avionics & New Technologies – Certification and Operational Approval Criteria**	1. Recommendations to identify and document FAA human factors policies, guidance and other related research on a variety of flight deck systems (e.g., EFB/PED, Global Positioning System, and electronic map displays) in one document for use by Aircraft Certification personnel who are responsible for conducting human factors evaluations for certification of flight deck equipment	1. Completed version 2 of the General Guidance Document; also developed and completed the interactive website. The document is intended to facilitate and help standardize the identification and resolution of common human factors issues in avionics submitted to the FAA for approval. Sources of information include the CFRs, Technical Standards Orders, Advisory Circulars, industry documents, and general human factors texts.

Flight Deck/Maintenance/System Integration Human Factors (A11G)

This research enhances decision making related to human factors for flight deck systems, and establishing data to support risk management programs to address hazards in the maintenance environment.

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Flight deck/Maintenance/System Integration Human Factors	$5959	-	$5,000	-	$7305	-	$6,825	-	$7,546	-

People	Facilities	Partnerships	Highlights
• FAA project managers and principal investigators along with researchers and industry partners through contracts and agreements that include Human Factors Subject Matter Experts, Flight Deck Professionals, and Air Traffic Controllers	• Civil Aerospace Medical Institute (CAMI) • William J Hughes Technical Center (WJHTC) • Private Industry	• Industry • NASA • Volpe • Radio Technical Commission for Aeronautics (RTCA) • Universities	• Determine and develop information/measures/data criteria for on-going evaluation of the effectiveness of both Fatigue Risk Management Plan (FRMP) and Fatigue Risk Management Systems (FRMS) OpSpecs (A317 and A318) to mitigate flightcrew member fatigue and for the evaluation of improvements offered by the regulation • Develop data to support recommendations for updating fatigue mitigation guidance and educational materials • The General Guidance document and interactive web site are used extensively by the FAA and industry to apply the best guidance for the design and use of flight deck systems (https://www.volpe.dot.gov/sites/volpe.dot.gov/files/docs/Human Factors Considerations in the Design and Evaluation of Flight Deck Displays and Controls.v2.pdf)

System Safety Management – SSM (A11H)

Anticipation of system-wide operational risks, Additional data-driven approaches, Lower accident rate due to loss-of-control, Fewer runway excursions and Improved helicopter safety, Support Risk-Based Decision Making for oversight of the Air Traffic Organization

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Enhance use of Risk-Based Decision Making in Oversight of the Air Traffic Organization	**Safety Oversight Management System (SOMS)**	1. Technical report detailing user requirements and concept of operations and for the SOMS prototype (**FY17**)	1. Complete. The output is an intermediate output. It is being used to develop technical approach and the SOMS prototype
	Integrated Domain Safety Risk Evaluation Tool (ID-SRET)	1. Technical report detailing Concept of Operation (ConOps), a NAS critical systems model and methodology for ID-SRET (**FY17**) 2. Technical report describing Critical NAS Systems for Integrated Domain Safety Risk Evaluation Tool (ID-SERT) (**FY17**) 3. Updated version release of ID-SRET Prototype which includes 70 critical NAS systems. (**FY17**)	1. Complete. The output was used to guide the development of ID-SRET prototype 2. Complete. The critical NAS systems identified in the report were incorporated into ID-SRET prototype. 3. Complete. The prototype is used to test the prototype functions and user interfaces with the users and improve them if needed.
	Helicopter FDM Data Gathering and Analysis for ASIAS	1. Technical data describing standardized helicopter FDM parameters related to fatal risk occurrence categories for undesired events across various helicopter mission segments (**FY16/FY17**) 2. Safety analysis tools for use in the Helicopter Flight Data Monitoring (HFDM) repository and web application (**FY16/FY17**) 3. Release of updated version of Helicopter Flight Data Monitoring (HFDM) repository and web application (**FY16/FY17**)	1. Complete. The technical data were used to develop and enhance the HFDM repository and web application 2. Complete. The safety analysis tools were incorporated into the HFDM repository and web application 3. Complete. The HFDM repository and web application is available for the research team and participating operators use. 4. Complete. Published the research results for public use

		4. Publish "Helicopter Approach Stability Analysis Using Flight Data Records" (**FY16/FY17**) 5. Technical report detailing a review of flight data monitoring, risk management, and safety management tools for rotorcraft operations. (**FY16/FY17**)	5. Complete. Published the research results for public use

System Safety Management – SSM (A11H)

Anticipation of system-wide operational risks, Additional data-driven approaches, Lower accident rate due to loss-of-control, Fewer runway excursions and Improved helicopter safety, Support Risk-Based Decision Making for oversight of the Air Traffic Organization

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
System Safety Management		$2,536		$801		$2,425		$1,197		$1784

People	Facilities	Partnerships	Highlights
• 2.5 GOV FTE; 9.25 CTR FTEs in various technical disciplines including engineering, computer science, statistics, safety and risk management	• Computing and Analytics Shared Services Environment (CASSIE) • FAA Flight Program's helicopter located at WJHTC	• United States Helicopter Safety Team (USHST) • LZ Control • Sikorsky • Airbus • Bell Helicopters • Robinson	• Aligns with the Big Data effort and improved system-wide analysis capabilities. • Completed user interviews to validate the Safety Oversight Management System (SOMS) model and use cases toward development of ConOps. • Provided decision-making support to AOV using the ID-SRET prototype in evaluating NAS changes. • Supported the US Helicopter Safety Team (USHST) by refining the list of parameters, rates, exceedances, events, needed to define mission-specific HFDM safety metrics linked to the rotorcraft fatal accident rate. • Hosted the United States Helicopter Safety Team (USHST) Face-to-Face Summer Annual Meeting at WJHTC Aug. 8-9, 2017 • Continued collecting HFDM data from participating helicopter operators • Challenges- access to flight data could be a challenge due to privacy issues

Terminal Area Safety – TAS (A11H)

Anticipation of system-wide operational risks, Additional data-driven approaches, Lower accident rate due to loss-of-control, Fewer runway excursions and Improved helicopter safety, Support Risk-Based Decision Making for oversight of the Air Traffic Organization

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Reduce "potentially hazardous outcome reports" from go-arounds by a factor of 5 and Reduced runway excursions on wet runway	**Development of Stable Approach Criteria**	1. Technical report "Recommended Go-Around Criteria Based on Approach and Landing Safety Risk". (**FY15**) 2. Experimental plan for conducting a human-in-the-loop simulator experiment to develop simplified stabilized approach criteria. (**FY17**)	1. This report is not prepared for public dissemination due to the data privacy agreements. Research team used the findings in the report to develop the experimental plan. The original completion date was September 2017. However, the revised anticipated completion date is September 2018 due to prolonged procurement process. Furthermore, recent research findings revealed that additional experiments are necessary. 2. The experimental plan will be used to conduct the human-in-the-loop experiment at NASA Ames and Mike Maroney Aeronautical Center (MMAC) Level D simulators in the Fall of 2017. The original completion date was September 2017. However, the revised anticipated completion date is September 2018 due to prolonged procurement process. Furthermore, recent research findings revealed that additional experiments are necessary.
	Helicopter Operational Safety Improvements using Advanced Vision Systems	1. Cooperative Research and Development Agreements (CRDA) with aviation industry for rotorcraft advanced vision systems research 2. Experimental plan for conducting flight test **(FY16/FY17)**	1. CRDA's made it possible to acquire advanced vision systems and install them on the FAA's helicopter for research and testing purpose

		3. Procurement, installation and configuration of advanced vision systems on FAA's helicopter (**FY16/FY17**). 4. Test procedures (**FY16/FY17**).	2. The experimental plan will be used to conduct the flight tests in order to collect data towards developing recommendations for operational use of advanced vision systems. 3. The test helicopter will be used to conduct the experiment in Fall of 2017. 4. The test procedures will be used to conduct the experiment in Fall of 2017 5. For Items 1-4, The original completion dates for this research requirement was September 2017. However, the revised anticipated date is September 2018 due to unforeseen WJHTC's helicopter maintenance issues. In addition, procurement process for parts, sensors, and displays took far longer than planned.
	Angle-of-attack Displays for Upset Recovery and Air Data Systems Failure Designs	1. Literature review documenting AOA indicator effectiveness and the types of indicators available for display of AOA (**FY17**) 2. Experimental plan for conducting a human-in-the-loop simulator experiment to determine the effectiveness of AOA displays for upset recovery and air data system failure designs (**FY17**)	1. Complete. Literature review will be available for public. It was used in the development of the experimental plan. 2. Complete. The experimental plan will be used to conduct the human-in-the-loop experiment at Mike Maroney Aeronautical Center (MMAC) Level D simulators in the Fall of 2017

Terminal Area Safety- TAS (A11H)- *Continued*

Anticipation of system-wide operational risks, Additional data-driven approaches, Lower accident rate due to loss-of-control, Fewer runway excursions and Improved helicopter safety, Support Risk-Based Decision Making for oversight of the Air Traffic Organization

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Terminal Area Safety		$2,534		$2,256		$1648		$450		$500

People	Facilities	Partnerships	Highlights
• 2.25 Gov FTEs and 3 CTR FTE in various technical disciplines including engineering, computer science, statistics, safety and risk management, etc.	• WJHTC Labs (i.e., NextGen Integration and Evaluation Capability) • Mike Monroney Aeronautical Center (MMAC) Flight Operations Simulation Lab • NASA Ames Boeing 747 Level D simulator	• NASA • United States Helicopter Safety Team (USHST) • HAI • Sikorsky • Leonardo • Airbus Helicopters • HeliExperts • U.S. Coast Guard • NJ State Police • FAA Flight Program • MaxVis • Thales • Elbit Systems • Rockwell Collins • Honeywell	• Conducted a Stable Approach Criteria workshop with representative from aviation industry and Flight Safety Foundation. Reviewed the FAA's plan for the human-in-the-loop flight simulation experiment and obtained participants feedback on the plans. (June 2017) • Integrated Advanced Vision Systems Devices onto FAA Helicopter (N38) for Thales TopMax Head-Worn Display (HWD), and MaxVis Enhanced Vision System (EVS). • Conducted initial test with FAA S76 Helicopter, NJ State Police, and U.S. Coast Guard. • Provided several presentations at the 2017 HAI Heli-Expo held in Dallas, TX on March 6-9, 2017. Heli-Expo is the premier annual gathering of helicopter industry, manufacturers, government officials, and associated vendors. Presentations included the proposed concept of operations, a summary of current progress to date, and future plans for ongoing rotorcraft research. • Completed a market survey to gather information on available Angle of Attack indicators. • Identified AOA display types to include in the human-in-the-loop simulator experiment.

Aeromedical Research (A11J)

Provide up-to-date guidance and standards to enhance human safety, security, and survivability in civilian aerospace operations.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Maximize the strengths of the human link in the NAS and minimize inherent human weaknesses to prevent accidents and improve safety through evidence-based medicine; Harmonize aeromedical standards across Civil Aviation Authorities; Manage risk by identifying hazards and strengthening aeromedical safety management systems; Enhance aeromedical education programs.	**Human Protection & Survival**	1. Technical Report detailing the evaluation of the effectiveness of photo luminescent signs and markers in providing visual guidance to human observers during aircraft emergency evacuation. (**FY17**) 2. Technical Report determining how to safely accommodate a range of aircraft occupant sizes. (**FY17**) 3. Technical Report detailing the evaluation of worst-case scenarios using low flow passenger oxygen systems covered under pending deviation requests. (**FY17**)	1. AM-3 TCRG – Project #10069 is on track. Retirement of the PI (C. Corbett) and hiring freeze necessitated a reduction in scope and PI reassignment; the test facility was changed to be the CAB Laboratory only. Technical report is expected to be on time (4Q18 K. Larcher). 2. AM-3 TCRG – Project #10084 is on track – no issues; technical report expected to be on time (4Q19 A. Taylor). 3. AM-3 TCRG – Project #10049 has been delayed due to the lack of a PI to perform the study. Hiring freeze and nature of the position has impeded progress. Updated IRB protocol is expected within the year of hire
	Aeromedical Accident Prevention & Investigation	1. Forensic toxicology laboratory methodology to perform analysis of benzodiazepines in postmortem fluids and tissues using ultra performance liquid chromatography/mass spectrometry. (**FY17**) 2. Comparative evaluation of forensic toxicology findings of the CAMI laboratory with those reported by Medical Examiner and Coroner laboratories carrying out preliminary toxicological analysis of samples subsequently received by CAMI. (**FY17**) 3. Assessment of the clinical effects (gene expression changes) of cabin altitude during air travel on patients with pulmonary disease (**FY17**)	1. AM-2 TCRG – Project #10004 is on track – no issues; laboratory methodology and technical report expected to be on time (9/30/2017, M. Angier). 2. AM-2 TCRG – Project #10013 is on track – no issues; technical report expected a year ahead of time (4Q18, Dr. Soper). 3. AM-2 TCRG – Project #10019 was delayed to 4Q18 so that two other projects were completed by the PI before his retirement (in 9/30/2017, Dr. Burian):

			a. #10097 - Burian D, et al. Postmortem Samples from Aviation Accident Victims Maintain Tissue Specific mRNA Expression Profiles. Report undergoing FAA clearance review. b. #10098 - Burian D, et al. Genomic Responses of Individuals Exposed to Aviation-Relevant Hypoxia. First draft completed, undergoing co-author review

Aeromedical Research (A11J)

Provide up-to-date guidance and standards to enhance human safety, security, and survivability in civilian aerospace operations.

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Maximize the strengths of the human link in the NAS and minimize inherent human weaknesses to prevent accidents and improve safety through evidence-based medicine; Harmonize aeromedical standards across Civil Aviation Authorities; Manage risk by identifying hazards and strengthening aeromedical safety management systems; Enhance aeromedical education programs.	**Aerospace Medical Systems Analysis**	1. An evaluation of over-the-counter antihistamines use by general aviation pilots involved in fatal aircraft accidents and the implications to aviation safety. (**FY17**) 2. Technical Report determining the health effects of ionizing radiation. (**FY17**)	1. AM-1 TCRG – PI for this study (Dr. Webster) left the FAA. It was supplanted by project #10137 on the same topic, but focused on vision issues and led by AAM-500. Gildea KM, Hileman CR, Rogers P, Salazar GJ, Paskoff LN. Antihistamines and Fatal Aircraft Accidents in Instrument Meteorological Conditions. J. Aerosp. Med. Human Perf. (in press). 2. AM-1 TCRG – Project #10055 was delayed due to lack of PI and difficulties presented by the hiring freeze. Technical report is expected in 2Q18 (Drs. Copeland & Greenhaw)
	System Level Crashworthiness - Injury Criteria and Certification Methodology	1. Technical Report determining the likely impact scenarios, occupant loading and resulting injury risks for occupants of all types of aircraft and seating configurations and identifying a methodology to evaluate the risk and relevant existing injury criteria that permits safe egress after a survivable crash. (**FY17**)	1. FCS TCRG – Project #10085 FY18 budget request was not granted and FY19 allocated budget was cut by OMB. As a result, the task to evaluate injury risks of current seat technology using identified crash scenarios and injury criteria, was canceled. Technical reports are expected on 2Q18 and 3Q19 (D. Moorcroft).
	Evacuation Equipment Aids	1. B-747 AERF: Evaluation of physical way-finding technology proposed for use on aircraft such as audible signals, tactile aids, enhanced escape path lighting, and other emerging way finding technologies. (**FY17**) 2. CAB Lab: Evaluation of Serious Games for Passenger Education (**FY17**)	1. FCS TCRG – Project #10089. FY12 funding was cut in half and FY13-FY16 was zero. In consultation with the sponsor, the effort was revised on 4/2017 to address two tasks only. Deliverables for the B-747 study are: IRB Approved Protocol (4Q19) and Draft Report (4Q20) – D. Weed

			2. Deliverables for the CAB Lab study are: IRB Approved Protocol (4Q18) and Draft Report (4Q19) – D. Weed
	Emergency Exit Operation and Location	1. Technical Report assessing the impact of the emergency exit means of disposal and location, as well as experimental protocols and the tests conducted. (**FY17**)	1. FCS TCRG – Project# 10064 was delayed from 4Q18 to 2Q19 due to the retirement of the PI (Dr. McLean). In FY18, it did not rank high enough and therefore funding was not granted. The project will be completed with AM TCRG carry-over funds. IRB protocol is expected 9-30-2017 (D. Weed).

Aeromedical Research (A11J) - *Continued*

Provide up-to-date guidance and standards to enhance human safety, security, and survivability in civilian aerospace operations.

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Aeromedical Research	$8,300	$2,942	$8,467	$2,902	$8,538	$2,641	$9,765	$2,857	$10,753	$4,032

People	Facilities	Partnerships	Highlights
• 56 In-House at the Civil Aerospace Medical Institute (CAMI): 48 GOV FTE; 8 CTR FTE • Physicians, Scientists, and Engineers: Associate (19%); Baccalaureate (71%), Master (49%), and Doctorate (27%). • Disciplines: Medicine, Human Factors, Cabin Safety, Genomics, Bioinformatics, Biodynamics, Radiobiology, Physiology, Physics, Chemistry, Toxicology, Mathematics, Computer Science, and Knowledge Management.	• > 20 at CAMI	• 40 National: OK Medical Research Foundation, Naval Medical Research Unit-D, USAFSAM, Wichita State U., Walter Reed Army Inst. of Research, SW Research Institute, Medical College of Wisconsin, U. Michigan Transp. Research Institute, Cleveland Clinic Foundation • 40 International: Airbus; Bahamas CAA; European Aviation Safety Agency; German Aerosp. Center; Intl. Cabin Safety Res. Tech. Gp.; ICAO; Natl. U. of Colombia; Republic of Korea Radio Research Agency; Royal Canadian AF; SAE International; Czech Technical U.; Università degli Studi di Udine, Italy.	• FY19 increased funding for Sleep Deprivation (AM-2 Task 4) • AM tasks approved by AM TCRG and Federal Air Surgeon • FCS and RS tasks sponsored by AIR • All CAMI laboratory facilities and technical expertise are part of the total BLI budget request

Unmanned Aircraft Systems Research (A11L)

Develop certification standards, policy, and guidance needed to safely integrate UAS into the NAS

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Support the safe, efficient, and timely integration of UAS into the NAS by reducing incident and accident rates due to mid-air collisions between UAS and other aircraft and collisions with people on the ground while supporting risk mitigation.	**SAA Multi Sensor Surveillance Data Fusion Strategies**	1. RTCA Phase One MOPS Sample Tracker in support of Sensor Fusion Trade-Off Study (**FY17**)	1. Phase One MOPS Sample Tracker complete
	Small UAS Detect and Avoid Requirements Necessary for Beyond Visual Line of Sight Operations	1. Technical report detailing sUAS DAA MOPS (**FY17**)	1. Final DAA for BVLOS report delivered in May 2017, FAA stakeholders completed review in August
	Collect and Analyze UAS Safety Data from the Congressionally Mandated Test Sites	1. Technical report documenting UAS Safety Data from the Congressionally mandated Test Sites (**FY17**)	1. On schedule. Test Sites data is continuously collected. A final report of FY17 data collected will be delivered to the Sponsor
	UAS System Safety Criteria	1. Ground Collision Severity Evaluation (**FY17**) 2. Airborne Collision Severity Evaluation (**FY17**)	1. Phase 1 of the project is complete. Final Reports have been received and peer review has been conducted. Phase 2 began 1 August 2017 – planning and coordination efforts are currently underway. 2. Phase 1 of the project is complete. Final Reports have been received and peer review has been conducted. Edited versions of the final reports are being delivered after incorporating the outcomes of the peer review.

	Research of UAS Detection at Airports	1. Technical report documenting evaluation of UAS detection system (**FY17**)	1. UAS Center of Excellence (COE) Data gathering campaign completed, Apr 2017. Data analysis by COE research performers is taking longer than anticipated, and will push into new FY.
	Assessing the Risk of UAS Integration	1. Technical Report documenting the study to evaluate the potential of probabilistic assessments of risks and other risk assessment methodologies for streamlining the process of integrating unmanned aircraft systems into the NAS and supporting R&D (**FY17**)	1. On- Schedule. The National Academies of Sciences, Engineering, and Medicine (NAS) will evaluate probabilistic assessments of risks and other risk assessment methods for streamlining the process of UAS integration. The committee nominations package has been submitted to the National Academies Executive Office for approval. First meeting is planned for end of Sept
	UAS Command and Control (C2) Link Compatibility Testing	1. Phase 1 Report detailing L-Band CNPC and TACAN Compatibility Validation.	1. The Phase 1 report was delivered in Feb 2017. The start of Phase 2 is being delayed by contracting issues.
	UAS Ground to Ground Architecture Assessment	1. Final Report describing Ground-to-Ground Architecture Options.	1. The final report will be delivered September 2017.
	Secure Command and Control (C2) Link with Interference Mitigation	1. Bi-Annual Technical Report describing research progress	1. The Bi-Annual Technical Report was delivered June 2017.

Unmanned Aircraft Systems Research (A11L)

Develop certification standards, policy, and guidance needed to safely integrate UAS into the NAS

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Support the safe, efficient, and timely integration of UAS into the NAS by reducing incident and accident rates due to mid-air collisions between UAS and other aircraft and collisions with people on the ground while supporting risk mitigation.	**Fuel Cell Energy Supply Systems for UAV Systems and Aerospace Applications**	1. Issued BAAs to solicit industry input and down-select to focus in an area directly applicable to UAV systems for a representative fuel cell suitable for widespread use in UAS. (**FY17**) 2. Physical Testing Progress Report (**FY17**)	1. Completed. Contract has been awarded for this effort. 2. Continued effort dedicated to fulfilling fuel cell stack design. a. Completed power demand analysis per plan b. Completed energy storage analysis per plan c. Progress on air/oxygen analysis d. Progress on fuel cell design to meet requirements e. Progress on system requirements and specifications
	Lithium Batteries and Battery Systems for UAV systems and Aerospace Applications	1. Project Plan (**FY17**) 2. Initiate Testing (**FY17**)	1. Completed. Project Plan is completed. Contract has been awarded for this effort. 2. The project team has continued to work to establish the design philosophy and design goals for the battery module and has compiled information from Boeing, Pyrophobic, Nexceris and General Atomics to gain insight and information. In addition, the team has begun reaching out to battery cell manufacturers to procure appropriate cells for testing.
	ASSURE Center of Excellence (COE) Management Budget	1. Oversees the activities of the UAS COE (**FY17**)	1. The UAS COE brings together 23 of the Nation's leading UAS and aviation universities committed to UAS research.

		2. Plan organize and host required semi-annual meetings (**FY17**)	The lead university is responsible for the overall operation and management of the COE. The COE has performed 6 research projects in FY17 2. This activity is completed. ASSURE hosted Program Reviews in March 2017 and August 2017.
	Minority Outreach- UAS as a STEM Minority Outreach Learning Platform for K-12 Students (Part 2)	1. UAS Roadshows (**FY17**) 2. Provide Roadshow materials to the FAA (**FY17**) 3. UAS Summer Camps (**FY17**) 4. UAS Minority Outreach Final Report (**FY17**)	1. This activity is completed. The COE exceeded the original requirement that each of the two universities hold two roadshows and completed three roadshows each. 2. This activity is completed. The roadshow materials have been provided to the FAA and are available for use by others interested in conducting these types of activities 3. This activity is completed. The COE completed three one-week summer camps, which hosted an estimated 80 students. 4. The final report is due September 30, 2017

Unmanned Aircraft Systems Research (A11L) – *Continued*

Develop certification standards, policy, and guidance needed to safely integrate UAS into the NAS

Resources

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Unmanned Aircraft Systems Research	$14,974	$12,204	$17,635	$14865	$20035	$17946	$6,787	$4824	$4,130	$2,454

People	Facilities	Partnerships	Highlights
• FAA Center of Excellence (COE) for UAS • FAA Aviation Safety including: UAS Integration Office (AUS), Aviation Safety (AVS), Aircraft Certification (AIR), Small Airplane Directorate (ACE) • 8 Federal FTEs as Subject matter experts in UAS detect and avoid capability, air carrier operations, human factors, and safety data collection	• FAA Technical Center • FAA Civil Aerospace Medical Institute (CAMI) • FAA UAS Test Sites: North Dakota DOC, State of Nevada, New Mexico State University, University of Alaska Fairbanks, Texas A&M University Corpus Christi, Virginia Polytechnic Institute & State University, Griffiss International Airport (NY)	• UAS Center of Excellence • Alliance for System Safety of UAS through Research Excellence (ASSURE): 23 leading research institutions and a hundred leading industry, academic, and government partners.	• The FAA and the UAS community face unique operational challenges to safe integration into the NAS that are quite different from those associated with manned aviation. • Keeping research in pace with the rapidly evolving UAS trends is challenging • New levels of autonomy and new automation applications require research to determine the potential impact of the automation and potential ways to design the user interface for the pilot • Substantial and recent public interest in UAS have translated into congressional acts, and legislation is likely to drive research focus and requirements

Alternative Fuels for General Aviation (ALLM)

Alternative and renewable fuels for use by the GA community to lessen aviation environmental impacts (air and water quality)

Outcome	Task Area	Research Outputs Delivered in FY17	Status
Safe introduction of an unleaded aviation gasoline to replace 100LL for a majority of the existing fleet through a fleet-wide authorization by the FAA	**Aviation Engine Test**	1. Test Reports for performance and detonation testing on key engine platforms utilizing both PAFI candidate fuels. (**FY17**) 2. Test Reports for performance and durability testing on key engine platforms utilizing both PAFI candidate fuels. (**FY17**) 3. Test Reports for performance and operability testing on key engine platforms utilizing both PAFI candidate fuels. (**FY17**)	1. On Target. a. Performance and Detonation testing has been completed on the O-470-U, and the report has been generated. The TIO-540-J2BD report will be delivered by 9/30/2017. b. Support equipment failures have hindered the project, and the time delay in having fixes implemented is a program risk. c. A delay in the TIO-540-J2BD report could result in a delay of the fleet-wide authorization. d. ANG-E283 has performed a significant redesign of critical support equipment and have implemented these changes to ensure satisfactory performance throughout the remaining program tests. 2. On Target. a. Performance and durability testing has been completed on the TSIO-550-K on Fuel B, and the report is in process. The O-360-A1A on Fuel A testing started in July and will rollover to FY18. b. Risks are fuel formulation changes during durability testing. Fuel A has identified possible fuel additives to mitigate issues while testing. The impact of the formulation changes on engine performance is currently unknown.

			c. A delay in the O-360-A1A report could delay the fleet assessment for the segment of the fleet represented by this engine platform. d. ANG-E283 is conducting tests utilizing the existing Fuel A formulation until directed otherwise. 3. On Target. a. Performance and operability testing has been completed on several engines by the OEMs, and the reports have been generated. The only outstanding operability test to complete is on the W670N radial engine. This testing has been contracted to Radial Engines Ltd. and is projected to begin testing in Q1 FY18. b. Risk is that the contractor does not fulfill contractor commitments. c. A delay in the W670N report could result in a delay of the fleet-wide authorization. d. ANG-E283 has scheduled a kickoff meeting for November 1, 2017 to review the testing setup. At this time, all segments of the test will undergo a conformity check against the PAFI test plans.

Alternative Fuels for General Aviation (A11M) – *Continued*

Alternative and renewable fuels for use by the GA community to lessen aviation environmental impacts (air and water quality)

Program Area	FY15 Total Actuals	FY15 Contract Actuals	FY16 Total Actuals	FY16 Contract Actuals	FY17 Policy Request	FY17 Contract Request	FY18 Policy	FY18 Contract Target	FY19 Policy	FY19 Contract Target
Alternative Fuels for General Aviation	$6,000	$5,534	$7,000	$6,183	$7000	$5879	$5,924	$5539	TBD	TBD

Resources

People	Facilities	Partnerships	Highlights
• 6 FTEs in various technical disciplines including engineering.	• FAA Propulsion & airpOWer Engineering Research (POWER Lab • FAA Aviation Fuels Research Lab • FAA Flight Test Aircraft	• Cooperative Research and Development Agreements with Shell Global and Swift Fuels • NTextron, CMI, Lycoming, Cirrus, Robinson, Rotax, Cape Air, National Resources Canada • Partnership to Enhance General Aviation Safety, Accessibility and Sustainability (PEGASAS) Center of Excellence	• Plan to address out of scope aircraft and engines is unknown at this time • Working within the agency to scope and secure funding for the next phase of research