NextGEN

FAA Research, Engineering and Development Portfolio Report

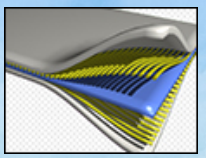
Provided to: House Science Committee staff

FAA

FY 2019 Budget Request

R,E&D BLI Name	FY 2019 Congressional Submission
Fire Research & Safety	$ 4,867,000
Propulsion & Fuel Systems	$ 555,000
Advanced Materials /Structural Safety	$ 2,300,000
Aircraft Icing/Digital System Safety	$ 7,684,000
Continued Air Worthiness	$ 4,969,000
Flightdeck/Maintenance/System Integration Human Factors	$ 5,052,000
Safety System Management	$ 799,000
Air Traffic Control/Technical Operations Human Factors	$ 1,436,000
Aeromedical Research	$ 3,875,000
Weather Research	$ 6,580,000
Unmanned Aircraft Systems Research	$ 3,318,000
Commercial Space	$ 2,500,000
Total Safety	**$ 43,935,000**
NextGen - Wake Turbulence	$ 3,519,000
NextGen - Air Ground Integration	$ 1,336,000
NextGen - Weather Technology in the Cockpit	$ 1,525,000
NextGen - Flight Data Exchange	$ 1,035,000
NextGen - Infrormation Security	$ 1,232,000
Total Economic Competiveness	**$ 8,647,000**
Environment & Energy	$ 11,588,000
NextGen Environmental Research - Aircraft Technologies, Fuels and Metrics	$ 7,578,000
Environmental Sustainability	**$ 19,166,000**
System Planning and Resource Management	$ 1,480,000
WJHTC Lab Facilities	$ 1,178,000
Mission Support	**$ 2,658,000**
Total	**$ 74,406,000**

FAA Research & Development at a Glance



Aircraft Structures

Propulsion and Fuel systems

Digital Systems

Icing

Weather

Air Traffic Management

Commercial Space

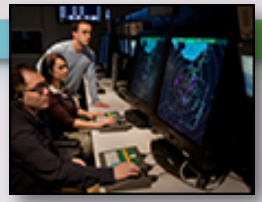
Fire Safety

UAS

Mission Support

Aeromedical & Human Performance

Cyber Security



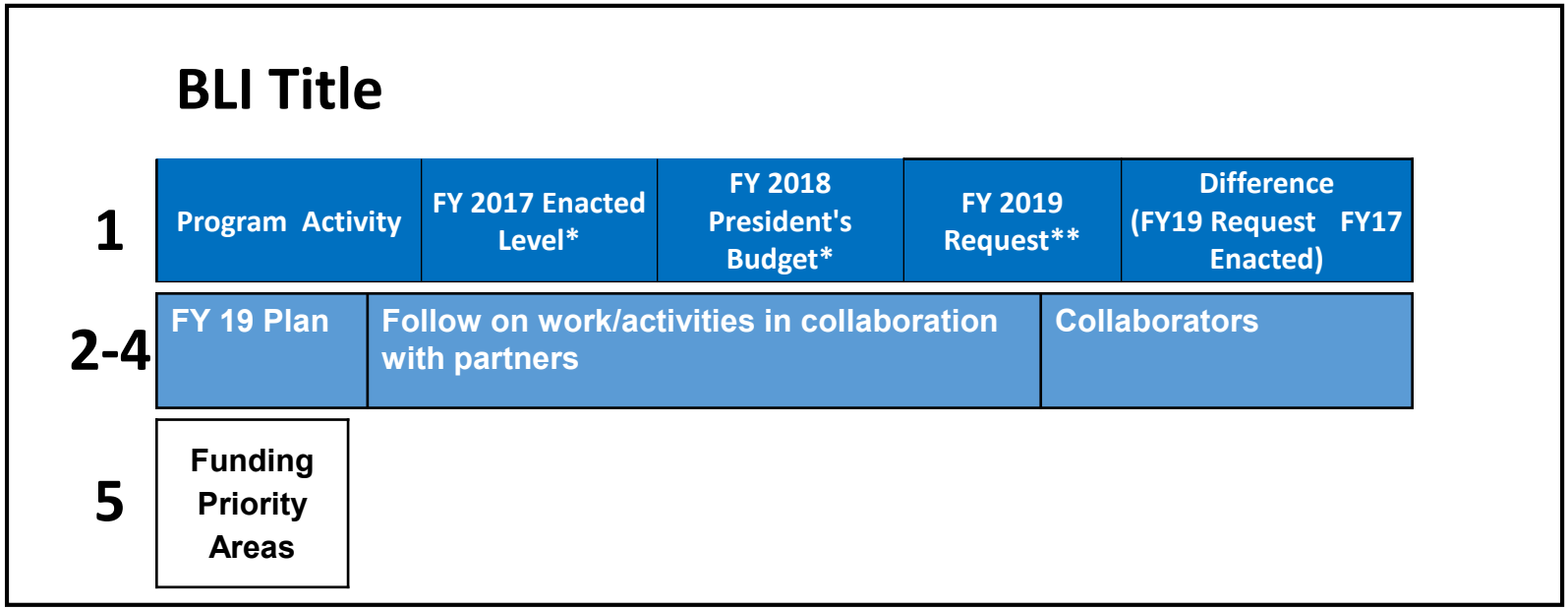
System Safety Management

Environment and Energy/Fuels

FY19 Research and Development Portfolio

Report Format

1. Program Budget Activity/Budget Levels
2. FY 19 Plan
3. Follow on work/activities in collaboration with partners
4. Collaborators
5. Funding Priority Areas:
   - Administration's R&D Priority Areas (Source: OMB M17-30)
   - R&D requirements supporting FAA's regulatory and advisory missions



BLI Title (A11.a): Fire Research and Safety

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$3,930,000	$3,987,580	$3,141,740	-$788,260
Program Costs	$3,495,000	$3,056,420	$1,725,260	-$1,769,740
Total	$7,425,000	$7,044,000	$4,867,000	-$2,558,000
FTEs	25	25	20	-5

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Assess the risks of carrying hazardous goods on aircraft and its impact on fire protection methods and equipment. • Improve understanding of non-traditional structural and cabin materials in accident survivability. • Conduct testing with fire detection, containment, and suppression technologies for fires involving cargo and hazardous materials. • Develop integrated airplane fire protection system criteria.	• Develop enabling technology to prevent accidents caused by in-flight fires in cargo and passenger large transport aircraft. • Improve fire detection, suppression capabilities, and flammability requirements for materials in inaccessible areas and hazardous cargo. • Enable the introduction of new, lightweight/energy efficient, fire-safe materials, and components into commercial transport aircraft. • Support and facilitate the evaluation and replacement of Halon fire extinguishing agents and halogenated cabin material flame-retardants with effective and practical alternatives.	• International Civil Aviation Organization (ICAO) • Boeing Commercial Airplanes

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies ***Research conducted using in-house personnel and contract funding***

BLI Title (A11.c): Advanced Materials & Structural Safety

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$1,006,500	$889,294	$790,805	-$215,695
Program Costs	$5,493,500	$3,448,706	$1,509,195	-$3,984,305
Total	$6,500,000	$4,338,000	$2,300,000	-$4,200,000
FTEs	7	6	5	-2

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Assess the performance, damage tolerance, and characteristics of emerging composite materials and technologies. • Identify fatigue and damage tolerance requirements. • Investigate composite/metal hybrid structural issues and establish related test and analysis protocols.. • Investigate issues surrounding wide area impact and the resulting barely visible impact damage. • Evaluate the onset, growth, and arrestment of delamination for composite rotorcraft dynamic parts. • Investigate high energy impact threats with the greatest potential to damage dynamic rotorcraft components. • Perform preliminary analyses and tests on interlaminar stresses.	• Evaluate damage tolerance and maintenance of composite structures to address accidental damage, environmental, and fabrication defects. • Characterize composite adhesive bonds to ensure aircraft structural integrity. • Address key issues for emerging composite technologies for continued operational safety and certification efficiency.	• National Institute for Aviation Research • NASA

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies ***Research conducted using in-house personnel and some contract funding***

BLI Title (A11.f) Aircraft Catastrophic Failure

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$349,600	$345,728	$ 0	- $349,600
Program Costs	$1,178,400	$1,224,272	$0	-$1,178,400
Total	$1,528,000	$1,570,000	$0	-$1,528,000
FTEs	2	2		-2

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
	• Develop predictive analyses methods for assessing engine fragment impact to determine the containment and shielding capabilities for safety assessments.	

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies.

BLI Title (A11.e): Continued Air Worthiness

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$3,010,000	$3,037,338	$1,575,640	-$1,434,360
Program Costs	$6,259,000	$7,399,662	$3,393,360	-$2,865,640
Total	$9,269,000	$10,437,000	$4,969,000	-$4,300,000
FTEs	16	16	8	-8

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Enhance general aviation safety using new UAS technologies and reduce pilot error with safety interventions with flight path control software. These requirements came out of the General Aviation Joint Steering Committee. • Significantly reduce the risk of rotorcraft wire strike. • Maintain material standards with DoD and industry for new and emerging aerospace metallic materials. • Understand the damage tolerance and durability of new aerospace metallic materials and metal additive manufacturing. • Monitor operational loads for forest fire firefighting aircraft to associated risks in these operational scenarios	• Characterize aircraft tire failures. • Evaluate active flutter suppression safety issues. • Develop nonlinear models to establish safe freeplay for transport category aircraft. • Determine the safety of new electric aircraft systems. • Evaluate new displays and alerts for airplane systems state to enhance general aviation pilot awareness e.g. low energy alternating and awareness • Evaluate advanced wire Strike Avoidance technologies. • Evaluates effect of turbulence on aircraft structural loading. • Develop probabilistic damage approach for general aviation fleet risk management.	• Bombardier, • Arconic (formerly ALCOA) • Constellium and Embraer • National Institute for Aviation Research • DoD • Battelle Memorial Institute

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies ***Research conducted using in-house personnel and some contract funding***

BLI Title (A11.b): Propulsion and Fuel Systems

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	246,000	$1,024,752	$555,000	+$309,000
Program Costs	$1,828,000	$1,244,248	$0	-$1,828,000
Total	$2,074,000	$2,269,000	$555,000	-$1,519,000
FTEs	1	6	3	+2

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Validate LS-DYNA Model for engine blade loss / fragment impact on FAA High Performance Computer • Conduct in-house engine and flight testing	• Reduce the risk of turbine engine failures caused by manufacturing defects such as Lathe Turned Surfaces and Nickel Inherent Anomalies. DARWIN software updates will address features identified by the Aerospace Industries Association Rotor Integrity Steering Committee. • Develop analytical tools to standardize the analysis of engine and aircraft for rotor burst and fan blade out containment enhancements to UEDDAM code to support NTSB's recommendations related to the on O'Hare 767 uncontained engine failure on October 28, 2016. • Develop advanced analysis methods to determine the impact to composite aircraft materials in rotor band blade release.	• Aerospace Industries Association • Department of Defense • National Transportation Safety Board Piston Aviation Fuels Initiative • LS-DYNA Aerospace Users Group

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies ***Research conducted using in-house personnel***

BLI Title (A11.d): Aircraft Icing-Atmospheric Hazards & Digital System Safety & Aircraft Cyber

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$2,480,000	$2,371,000	$2,100,798	-$379,202
Program Costs	$2,622,000	$6,882,000	$5,583,202	+$2,961,202
Total	$5,102,000	$9,253,000	$7,684,000	+$2,582,000
FTEs	15	14	9	-6

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Conduct research on ice crystal icing conditions to support means of compliance. • Ensure safe operations and take-off in aircraft ground icing conditions. • Develop and validate super cooled large (SLD) droplets engineering tools. Aircraft can encounter situations where ice accretion caused by SLD can exceed capability of ice protection system. • Conduct research on assessing and mitigating risks on aircraft flying in the NAS (Aircraft Systems Information Security Protection- ASISP).	• Develop certification assurance techniques for embedded system modules on-board aircraft. • Develop an enhanced safety risk assessment process in collaboration with other organizations.	• NASA (Glenn, AMES, Langley) • National Resource Council of Canada • Aerospace Vehicle Systems Institute (AVSI, a consortium of industry OEMs, other government agencies, and academia) • RTCA, Aerospace Valley • Cyber collaboration includes industry, DHS, DoD and Aviation Cyber Initiative (ACI)

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies ***Research conducted using in-house personnel and contract funding***

BLI Title (A11.k) Weather Program

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$787,000	$792,000	$416,902	-$370,098
Program Costs	$14,689,000	$12,607,000	$6,163,098	-$8,525,902
Total	$15,476,000	$13,399,000	$6,580,000	-$8,896,000
FTEs	4	4	2	-2

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• CONUS & Oceanic Convective Weather (Wx) Probabilistic Forecast Development • Hi-Res Turbulence and Global Forecast Development • CONUS Probabilistic & Alaska Cloud Ceiling and Visibility (C&V) Forecast Grid Development • Develop scientific Meteorology (MET). assessments of convection, turbulence, and C&V • Develop user-based assessment of convective Wx capability • Analyze term. area icing flight test data to quantify new cert requirements • Analysis of airborne Wx radar to detect high ice water conditions	• Inflight Icing CONUS and Alaska capabilities • UAS Wx Forecast Needs development • Forecast uncertainty information development • Radar-based turbulence and infight icing detection capabilities • Weather Prediction Model development • Complete Hi-Res Turbulence Forecast Development • Complete Oceanic Convection capability • Complete CONUS probabilistic C&V forecast grids • Conduct MET. assessment of enhanced forecast capabilities • Complete flight test data analysis for terminal area icing • Complete analysis of high ice water condition radar data • Weather Requirements for Wake Mitigation	• NOAA • NASA, • Australia Bureau of Meteorology (BOM), • Environmental Canada (ECCC) • USAF • Volpe

Funding Priority Areas	**Safety:** improving safety of humans affected by civilian aerospace operations; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; supporting ongoing interagency initiatives and participate in interagency coordination groups; producing useful materials, devices, systems, tools, and technologies ***Research conducted using in-house personnel and contract funding***

BLI Title (A12.c): Weather Technology in the Cockpit

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$934,000	$961,166	$498,000	-$436,000
Program Costs	$3,125,000	$2,682,834	$1,027,000	-$2,098,000
Total	$4,059,000	$3,644,000	$1,525,000	-$2,534,000
FTEs	5	5	2	-3

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Crowd Sourcing Weather Information • Visual Flight Rules Not Recommended (VNR) - Finalize Minimum Weather Service (MinWxSvc) Recommendation • NextGen Operations - User Perspectives on NextGen • Pilot Report (PIREP) Prototype, Evaluation, and Recommendations • Additional Training - Modules and/or Experiential Education	• Resolution of Wind Information shortcomings in NextGen • Multi-Radar Multi-Sensor weather radar system (MRMS) versus NEXRAD for Part 135/91 • Trade Studies to Resolve Helicopter and Special GA Gaps • Climate optimized aircraft trajectories based on advanced MinWxSvc • RTCA • Virtual Graphics for Weather Standards • Service Analyses (ADS-B turbulence PIREPS) • User requirements for En-route hazardous weather information to support strategic reroute requests • GA rendering MinWxSvc recommendations Ver 1 • Weather Information Latency Demonstrator (WILD) MinWxSvc Recommendations • Service Analysis	• Rockwell Collins (CRDA) • FAA Future Flight Services and Flight Services, • AOPA, • NAFI, • FAA Flight Standards • RTCA • FAA GA COE (PEGASAS) grant • PEGASAs and/or ERAU grant

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Safety/Efficiency:** conducting safe and efficient NAS operations; improving safety of humans affected by civilian aerospace operations; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; Support ongoing interagency initiatives and participate in interagency coordination groups; producing useful materials, devices, systems, tools, and technologies ***Research conducted using in-house personnel and contract funding***

BLI Title (A12.a) NextGen Wake Turbulence

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$754,800	$848,028	$438,034	-$316,766
Program Costs	$7,854,200	$5,982,972	$3,080,966	-$4,773,234
Total	$8,609,000	$6,831,000	$3,519,000	-$5,090,000
FTEs	4	4	2	-2

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Wake risk mitigation separation recommendations provided to ATC for new aircraft types beginning operations in the NAS • Evaluate en-route aircraft wake turbulence generation fast-time models and analyze potential ATC wake hazard mitigation procedure changes. • Explore the use of aircraft wake transport and decay real time predictions in determining wake mitigation protection to be used by ATC in future NextGen programs.	• Develop standards for avionics to enable the transmission of near real-time aircraft-based weather observations to enhance dynamic wake separation standards. • Continue large-scale flight data recorder screenings of an aircraft series for potential medium to low-level wake encounter events. • Validate en-route aircraft wake turbulence generation fast-time model and analyze potential ATC wake hazard mitigation procedure changes to determine acceptable levels of en-route wake separations. • Initiate development of feasible concepts including procedures, processes, and applications of NextGen era capabilities, i.e. SASE, that allow the safe relaxation of the ATC wake encounter hazard mitigation constraints on NAS throughput capacity • Update of data collection equipment to include LIDAR maintenance and replacement	• FAA • aircraft manufacturers

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Safety/Efficiency:** conducting safe and efficient NAS operations; improving safety of humans affected by civilian aerospace operations; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; evaluating and/or validating aerospace requirements, procedures, and methods; producing useful materials, devices, systems, tools, and technologies ***Research conducted using in-house personnel and contract funding***

BLI Title (A12.e): NextGen FlightDeck Data Exchange Requirements

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$0	$0	0	0
Program Costs	$0	$0	$1,035,000	+$1,035,000
Total	$0	$0	$1,035,000	+$1,035,000
FTEs	0	0	0	0

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Develop a Flight Deck Data Exchange Requirements research plan • Define a framework to assess technologies and information security for flight deck data exchange requirements, • Initiate stakeholder engagement with key industry representatives and organizations, and • Develop initial concept and operational use cases for flight deck data exchange requirements	• Complete final Flight Deck Data Exchange Requirements research plan • Complete final concept and operational use cases	FAA: AJV-7, AFS-400, AIR–130 Extremal: Ground automation providers, avionics manufacturers, flight operators, aircraft OEMs

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Safety/Efficiency:** conducting safe and efficient NAS operations; improving safety of humans affected by civilian aerospace operations; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; evaluating and/or validating aerospace requirements, procedures, and methods; producing useful materials, devices, systems, tools, and technologies ***Research conducted using contract funding***

BLI Title (A11.n) Commercial Space Transportation

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$0	$0	$0	$0
Program Costs	$2,453,000	$1,796,000	$2,500,000	+$47,000
Total	$2,453,000	$1,796,000	$2,500,000	+$47,000
FTEs	-	-	-	-

FY 19 Requirements	Follow on work/activities in collaboration with partners	Collaborators
• Regulation Streamlining and Innovation: create consolidated, performance-based regulations to ensure public safety, reduce regulatory burdens, and enable rapid industry growth/launch cadence • Deployment of Innovation: research safe integration of CST into the NAS with improved safety analyses and tools (e.g. automation and advanced ADS-B) to: • Safely reduce airspace closed to other stakeholders, develop rapid response capabilities to off-nominal scenarios, quickly release airspace • Spaceport Infrastructure Research: develop methods to assess the effect of spaceports on the public, including airspace/airport operations, safety of population centers, and critical national assets. • Systemic Safety: risk-based approach to human safety (e.g. research practices for crew human factors, develop airspace separation standards)	• Regulation Streamlining II: develop improved safety models to reduce overly-conservative airspace restrictions for commercial activities • Systemic Safety II: develop and demonstrate innovative analysis to automatically declare aircraft hazard areas for launch/re-entry • Deployment of Innovation II: develop methods to share data and software tools that estimate aircraft hazard areas suitable for use in early design and mission planning • Regulatory Streamlining II: develop improved means to mitigate industry insurance needs, including asset & property damage • Develop refined approaches to evaluate failure probabilities for reusable vehicles, including an interactive database on historical experience • Develop web based tools to improve situational awareness between applicant/operator and FAA	• ACTA • Aerospace • CST-COE (Universities) • CSSI • MITRE/CAASD • NASA

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Safety:** improving space safety; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; evaluating and/or validating aerospace requirements, procedures, and methods ***Research conducted using contract funding***

BLI Title (A11.l) Unmanned Aircraft System Research

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$1,600,000	$1,628,009	$797,425	-$802,575
Program Costs	$18,435,000	$5,158,991	$2,520,575	-$15,914,425
Total	$20,035,000	$6,787,000	$3,318,000	-$16,717,000
FTEs	8	8	4	-4

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• High Visual Contrast for UAS • UAS Flight Data Research in supporting of ASIAS (Aviation Safety Information and Analysis Sharing) Program • Air Carrier Operational Considerations for Unmanned Aircraft Systems • Minimum Detect and Avoid (DAA) Display and Flight Path Information • UAS Automation/Autonomy	• UAS Automation and Intelligent Systems • UAS High Performance Command and Control (C2) Link Systems and Networks	• UAS Center Of Excellence • NASA • National Academy of Science

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Safety:** improving safety of humans affected by civilian aerospace operations; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; supporting ongoing interagency initiatives and participate in interagency coordination groups ***Research conducted using in-house personnel and contract funding***

BLI Title (A13.a): Environment and Energy

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$2,425,000	$2,470,210	$1,317,082	-$1,107,918
Program Costs	$13,588,000	$12,026,790	$10,270,918	-$3,317,082
Total	$16,013,000	$14,497,000	$11,588,000	-$4,425,000
FTEs	12	12	7	-5

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Aviation Noise Research • Aviation Emissions Research • Aviation Environmental Tool Suite Development • Aviation Environmental Analyses to support FAA Decision Making	• Noise enhancements for analytical tools to support design of reduced noise operational procedure concepts • Screening tool development to streamline environmental approval process • Environmental analysis to support new entrants (e.g., supersonic aircraft, unmanned aerial systems, and commercial space vehicles) • Quantifying aviation contributions to PM emissions in communities	ASCENT COE, Industry, Communities, Foreign governments, ICAO CAEP, Volpe Center

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Environment/Efficiency:** advancing understanding of aviation noise and emissions at their source, how they propagate and are modified in the atmosphere, and their ultimate health and welfare impacts on the population; developing and carrying out programs to control aircraft noise and other environmental effects of civil aviation; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; evaluating and/or validating aerospace requirements, procedures, and methods; producing useful materials, devices, systems, tools, and technologies ***Research conducted using in-house personnel and contract funding***

BLI Title (A13.b): NextGen – Environmental Research – Aircraft Technologies and Fuels

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$775,000	$733,349	$387,628	-$387,372
Program Costs	$26,399,000	$22,417,651	$7,190,372	-$19,208,628
Total	$27,174,000	$23,151,000	$7,578,000	-$19,596,000
FTEs	4	4	3	-1

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• CLEEN Aircraft Technology Maturation (Funding would complete technology maturation for Phase II of the CLEEN Program.)	• CLEEN Aircraft Technology Maturation (Funding would initiate Phase III of the CLEEN Program with 9 technologies.) • Alternative Jet Fuel Testing (Knowledge about fuel composition and its impact on engine operability will be developed and transitioned to standard setting bodies to support certification/qualification of jet fuels from alternative sources) • Alternative Jet Fuel Analysis (Knowledge will be developed about the entire supply chain to support development of domestic and international standards for jet fuels from alternative sources) • Commercial Aviation Alternative Fuels Initiative (CAAFI) (Knowledge will be shared across the full breadth of jet fuel and aviation stakeholders to support the development of jet fuels from alternative sources)	• Industry (airframe and engine companies, fuel producers, airlines, airports), • ASCENT COE, • DOD, • DOE, • USDA, • EPA, • Volpe Center, • ICAO CAEP, • Foreign governments

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Environment/Efficiency:** advancing understanding of aviation noise and emissions at their source, how they propagate and are modified in the atmosphere, and their ultimate health and welfare impacts on the population; developing and carrying out programs to control aircraft noise and other environmental effects of civil aviation; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; evaluating and/or validating aerospace requirements, procedures, and methods; producing useful materials, devices, systems, tools, and technologies ***Research conducted using in-house personnel and contract funding***

BLI Title (A11.m) NextGen - Alternative Fuels for General Aviation

Research funding planned to end in FY18

Salaries and Expenses				
Program Costs	$6,038,836	$5,539,804	0	-$6,038,836
Total	$7,000,000	$5,924,000	0	-$7,000,000
FTEs	6	2	0	-6

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators

BLI Title (A11.h): System Safety Management/Terminal Area Safety

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$2,316,000	$2,223,036	$799,000	-$1,517,000
Program Costs	$4,184,000	$1,925,964	$0	-$4,184,000
Total	$6,500,000	$4,149,000	$799,000	-$5,701,000
FTEs	13	13	4	-9

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Develop the Safety Oversight Management System (SOMS) analytical prototype for early identification of emerging safety trends in the NAS.. • Develop Integrated Domain Safety Risk Evaluation Tool (ID-SRET) prototype to identify the risk to complex NAS change interactions. • Complete preliminary experimental design of wet runway wheel braking testing	• Complete remaining functions of Safety Oversight Management System (SOMS). • Complete remaining functions of Integrated Domain Safety Risk Evaluation Tool (ID-SRET). • Conduct flight test experiments and complete the wet runway wheel braking testing research. • Evaluate advanced vision systems to achieve greater safety, reliability, and efficiency of helicopter operations in low-visibility conditions (new requirement). • Improve helicopter simulation flight models for outside of envelope flight conditions (new requirement).	• Plan to establish Cooperative Research and Development Agreements (CRDAs) to collaborate with aviation industry.

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies ***FY19 Research to be completed using in-house personnel***

BLI Title (A12.d): NextGen Information Security

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$0	$0	$0	$0
Program Costs	$1,000,000	$1,000,000	$1,232,000	+$232,000
Total	$1,000,000	$1,000,000	$1,232,000	+$232,000
FTEs	0	0	0	0

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Exploratory research on Data Science - Big Data Analytic methodologies addressing cyber security • Conduct Concept Exploration Studies : ➢ Self-adaptive systems & networks ➢ Design assurance methods for mixed trust environments	• Advance the Exploratory Studies to include a demonstration phase for technological maturation.	• Interagency Core Cyber Team (ICCT) • DHS - NPPD • DOD – AFRL • ACI – Aircraft Cyber Initiative

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies ***Research conducted using contract funding***

BLI Title (A11.i) ATC/Tech Ops Human Factors

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$5,266,135	$5,049,500	$1,279,523	-$3,986,612
Program Costs	$898,865	$146,500	$156,477	-$742,388
Total	$6,165,000	$5,196,000	$1,436,000	-$4,729,000
FTEs	36	32	10	-26

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• ATCS Selection, Placement, Training and Performance Evaluation • Runway Safety Analysis and Training Research to Develop Best Practices • ATC and Tech Ops Display Design Standards & Guidance • NAS ATC Capability and Equipment Utilization, HF Issues • Tech Ops Workforce Transition Job Analysis Efforts	• ATCS Selection, Placement, Training and Performance Evaluation • Runway Safety Analysis and Training Research to Develop Best Practices • ATC and Tech Ops Display Design Standards & Guidance • NAS ATC Capability and Equipment Utilization, HF Issues • Tech Ops Workforce Transition Job Analysis Efforts • Assess Controller Fatigue and Recommend Mitigations	• Within FAA: CAMI, WJHTC • MITRE • ATO COE for Human Performance / University of Oklahoma • Wright State University • FAA Air Traffic Organization: Program Management Organization (PMO); Safety and Technical Training (AJI); Management Services (AJG); Technical Operations Services (AJW) • International: EUROCONTROL

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies. ***Research conducted using in-house personnel supported with minimal contract dollars***

BLI Title (A11.g) Flightdeck/Maintenance/System Integration Human Factors

Program Activity	FY 2017 Enacted Level*	FY 2018 President's Budget*	FY 2019 Request**	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$3,754,242	$4,019,588	$2,272,780	-$1,481,462
Program Costs	$3,550,758	$2,805,412	$2,779,220	-$771,538
Total	$7,305,000	$6,825,000	$5,052,000	-$2,253,000
FTEs	26	26	16	-10

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Advanced Vision Systems (EFVS, EVS, SVS, CVS), Head-Up Displays (HUD), and Head Mounted Displays (HMD): Operational Standards & Approval Criteria • Fatigue Mitigation in Flight Operations • Maintenance Human Factors to Support Risk-Based Decision Making (RBDM) and Maintenance Safety Culture	• Pilot Training, Qualification, Procedures and Flight Operations • Avionics & New Technologies - Certification and Operational Approval Criteria • Human Factors Research and Development for Improved Rotorcraft Operational Safety and Reducing Fatal Helicopter Accidents	• Within FAA: CAMI • Industry: Multiple US Operators (FedEx, Delta), aircraft and avionics manufacturers • Labor - TWU, IAM, Teamsters • Academia: Texas A&M University, University of Iowa

Funding Priority Areas	**American Health/Safety:** improving safety of humans affected by civilian aerospace operations; keeping pace with emerging human safety risk issues, reducing aviation's health impacts, researching and developing new health related aviation technologies and improving the quality of American lives; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies ***Research conducted using in-house personnel***

BLI Title (A12.b) NextGen Air Ground Integration Human Factors

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$588,438	$589,842	$308,894	-$279,544
Program Costs	$7,986,562	$6,167,158	$1,027,106	-$6,959,456
Total	$8,575,000	$6,757,000	$1,336,000	-$7,239,000
FTEs	3	3	2	-1

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• ***NextGen Procedures, Tasks, Skills, and Training for NextGen Air Carrier Pilots and Dispatchers***: Research will identify user readiness needs/risks that may be introduced by iTBO and TBO enablers within the context of PBN operations (i.e. 4DT, TBFM enhancements, RTA, GIM-S, path stretch, shared trajectory, etc.). Research will support the implementation of human factors iTBO/TBO mitigations, and the development of evaluation criteria/recommendations to address the impact of flightpath management system changes on manual flightcrew skill proficiency over time. • ***NextGen Flight Deck Systems-Flightcrew Interfaces, Installation, Integration, and Operations:*** Research will evaluate the human-system performance benefits & limitations of emerging flight deck technologies, systems, and controls that may be used in combination with NextGen capabilities to support the iTBO/TBO vision (i.e. Data Comm, ADS-B applications, PBN, etc.). Research will support the implementation of human factors recommendations to close FAA rule/guidance gaps that do not address the proliferation of new aircraft equipment, functions, and procedures that are required to successfully implement NextGen changes.	• ***NextGen Procedures, Tasks, Skills, and Training for NextGen Air Carrier Pilots and Dispatchers:*** Identify and respond to user adaptation/evolution needs (i.e., future knowledge, skills, and abilities) to support the successful development, implementation, and operational use of NextGen technologies/procedures. • ***NextGen Flight Deck Systems-Flightcrew Interfaces, Installation, Integration, and Operations:*** Proactively address human factors installation & integration issues that could arise when combining NextGen aircraft changes with legacy technologies, systems, controls, & their respective mode(s) of operation. • ***NextGen: Human Factors Guidelines for Advanced Instrument Procedure Design and Use:*** Identify & respond to operational integration issues that could arise from the implementation of future NAS procedures & advanced flight deck separation management concepts. • ***NextGen Human Error and Complex Systems:*** Proactively detect & respond to technology shortfalls/gaps that could increase the opportunity for human error in future NAS operations.	• Within FAA: WJHTC, CAMI • Inter-Agency: NASA, DOT Volpe NTSC • Industry: Multiple US Airlines, aircraft and avionics manufacturers (e.g., Honeywell) • Academia

Funding Priority Areas	**American Security:** R&D that can support the safe and secure integration into society of new technologies that have the potential to contribute significantly to American economic and technological leadership. **Safety:** improving safety of humans affected by civilian aerospace operations; ensuring sustained and improved levels of safety in the design, manufacture, maintenance and operation of aviation system components; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies. **Research conducted using in-house personnel and contract funding**

BLI Title (A11.j) Aeromedical Research

Program Activity	FY 2017 Enacted Level*	FY 2018 President's Budget*	FY 2019 Request**	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$5,824,685	$6,532,177	$3,225,622	-$2,599,063
Program Costs	$2,713,315	$3,232,823	$649,378	-$2,063,937
Total	$8,538,000	$9,765,000	$3,875,000	-$4,663,000
FTEs	50	48	24	-26

FY 19 Plan	Follow on work/activities in collaboration with partners	
• Aerospace Medical Systems Analysis • Aerospace Medical Accident Investigation & Prevention • Human Protection & Survival • Occupant Protection for Legacy Rotorcraft • Rotorcraft Injury Mechanism Analysis – Procedure Development and Validation	• *L 114-190. §2307f:* Impact of BASICMED regulation on human safety and *§2307h:* Impact on aviation safety by the introduction of CACI procedures into the medical certification process. • *NTSB A-14-095*: Prevalence of drug use in the pilot population • *NTSB Most Wanted - Fatigue:* Gene expression patterns in response to Modafinil (alertness medication). *Drug Impairment:* transportation accident rates involving operators at various concentrations of marihuana. • *115-296 HR.2997 §407:* Effect of cabin seat pitch and alternative seat configurations on emergency evacuation. • Evaluation of fatal accidents to determine the reporting accuracy of airmen medical certification applications. • Prevalence of designer drugs – synthetic opioids in pilot population. • Aeromedical hazards involved in medical transports by helicopter.	, ,

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances in biometrics and gene editing to promote the nation's economic growth **American Health/Safety:** Give priority to biomedical programs that encourage innovation to prevent, treat, and defeat diseases, including R&D focused on solutions for an aging population, as well as on combating drug addiction and other health crises, alongside foundational biological research and the development of tools and technologies with the potential to open new areas of discovery; improving safety of humans affected by civilian aerospace operations; keeping pace with emerging human safety risk issues, reducing aviation's health impacts, researching and developing new health related aviation technologies and improving the quality of American lives; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; supporting ongoing interagency initiatives and participating in interagency coordination groups ***Research conducted using in-house personnel***

BLI Title (A14.b): William J. Hughes Technical Center Laboratory Facility

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	$2,150,000	$2,128,062	$1,019,103	-$1,130,897
Program Costs	$1,262,000	$1,104,938	$158,897	-$1,103,103
Total	$3,412,000	$3,233,000	$1,178,000	-$2,234,000
FTEs	12	12	7	-5

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
William J. Hughes Technical Center Laboratories and support • Simulation Facilities • Concepts and Systems Integration • Network Infrastructure and Capabilities	William J. Hughes Technical Center Laboratories and support • Simulation Facilities • Concepts and Systems Integration • Network Infrastructure and Capabilities	• **Academia:** Drexel University, George Mason University, Georgia Tech University, MIT Lincoln Labs, Rowan University, University of North Dakota; • **FFRDC:** MITRE • **Government:** DOD Naval Air Station - Patuxent River, DOD Research & Engineering Network, Federal Air Marshals Service, Mike Monroney Aeronautical Center, NASA, National Weather Service, US Army Corp of Engineers, US Navy - Dahlgren, Volpe, Warren Grove Bombing Range; • **Industry**: varied

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Safety/Efficiency:** evaluating and/or validating aerospace requirements, procedures, and methods; providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; producing useful materials, devices, systems, tools, and technologies; supporting ongoing interagency initiatives and participating in interagency coordination groups; justifying and balancing with funding for the operation and maintenance of existing facilities the construction and operation of new facilities; reducing waste by disposing of facilities that are no longer needed ***Using in-house personnel and contract funding***

BLI Title (A14.a): System Planning and Resource Management

Program Activity	FY 2017 Enacted Level	FY 2018 President's Budget	FY 2019 Request	Difference (FY19 Request FY17 Enacted)
Salaries and Expenses	1,570,000	1,853,725	858,043	-$711,957
Program Costs	718,000	$281,275	621,957	-$96,043
Total	2,288,000	2,135,000	1,480,000	-$808,000
FTEs (RED)	8	7	4	-4

FY 19 Plan	Follow on work/activities in collaboration with partners	Collaborators
• Lead the development of the R&D Budget Portfolio. • Coordinate development, review, and presentation of the NARP in accordance with statutory requirement. • Coordinate development, review, and presentation of the R&D Annual Review in accordance with statutory requirement. • Conduct REDAC Portfolio Review in accordance with statutory requirement and FAA Policy Order. • Complete and deliver Annual Federal Advisory Committee Act (FACA) Report as required by GSA Directive. • Complete Annual Modal Research Plan as required by the FAST Act.	• Lead the development of the R&D Budget Portfolio. • Coordinate development, review, and presentation of the NARP in accordance with statutory requirement. • Coordinate development, review, and presentation of the R&D Annual Review in accordance with statutory requirement. • Conduct REDAC Portfolio Review in accordance with statutory requirement and FAA Policy Order. • Complete and deliver Annual Federal Advisory Committee Act (FACA) Report as required by GSA Directive. • Complete Annual Modal Research Plan as required by the FAST Act.	• FAA organizations (AVS, ANG, AIP, AST, APL), • Centers of Excellence

Funding Priority Areas	**American Prosperity:** Providing the fundamental building block of new technology advances to promote the nation's economic growth **Safety/Efficiency:** providing research data and analyses for aerospace policy, regulation, guidance, standards development, and new aviation technologies; producing useful materials, devices, systems, tools, and technologies ***Research management conducted using in-house personnel and contract funding***