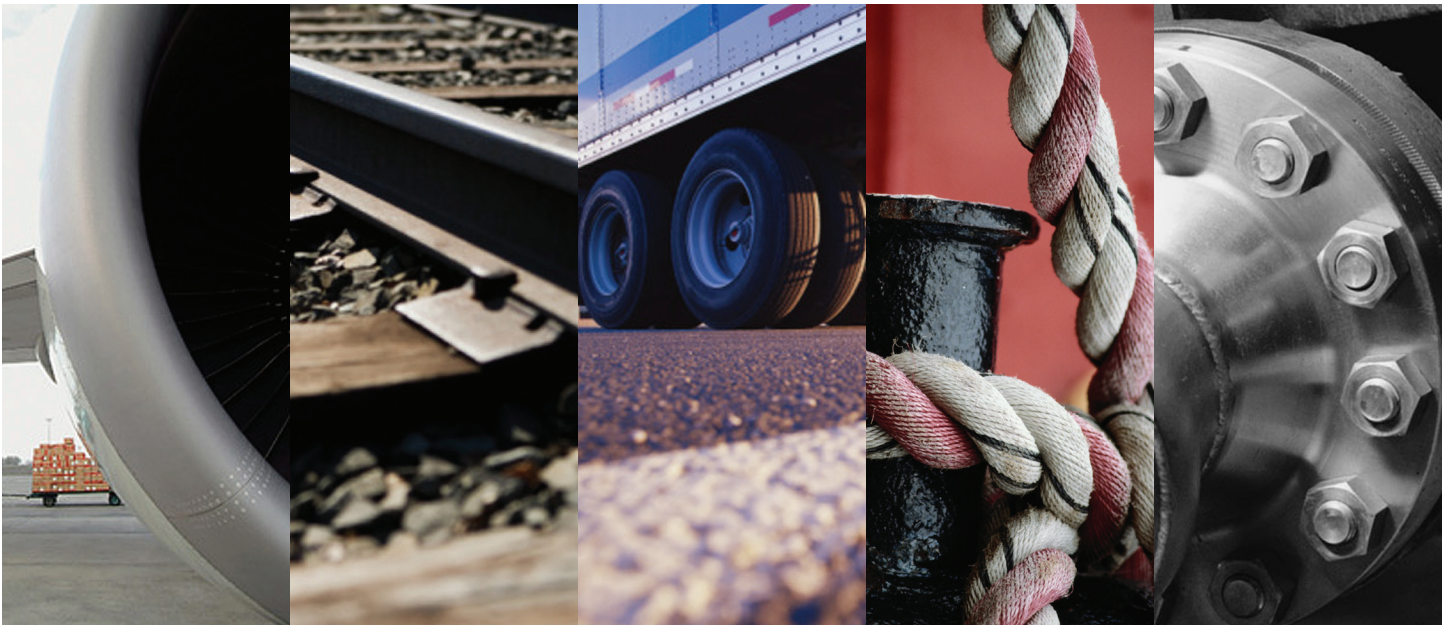


NATIONAL TRANSPORTATION SAFETY BOARD

FISCAL YEAR 2019
BUDGET REQUEST





National Transportation Safety Board

Washington, DC 20594 | www.NTSB.gov

OFFICE OF THE CHAIRMAN

February 12, 2018

The Honorable Michael R. Pence
President
United States Senate
Washington, DC 20510

The Honorable Paul D. Ryan
Speaker
United States House of Representatives
Washington, DC 20515

Dear Mr. President and Mr. Speaker:

The National Transportation Safety Board (NTSB) is an independent federal agency responsible for investigating and determining the probable cause of every civil aviation accident and significant accidents in other modes of transportation—railroad, highway, marine and pipeline—as well as accidents related to the transportation of hazardous materials. We develop and advocate recommendations to prevent future accidents or reduce their effects, and coordinate assistance to victims and their family members impacted by major transportation disasters. The NTSB also conducts safety studies and prepares safety reports based on analyses of transportation accident and incident data to identify safety improvements.

The enclosed budget submission reflects the President's request of \$108.0 million for fiscal year (FY) 2019. This is an increase of \$2.7 million from the FY 2018 discretionary amount of \$105.3 million. The FY 2019 President's request funds 418 full-time equivalent (FTE) positions, an increase of 5 FTEs from the 413 FTEs supported by the FY 2018 discretionary funding level.

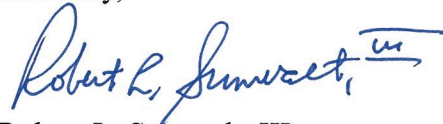
The NTSB is a small agency and succeeds because of the technical expertise, experience, and dedication of our employees. Although modest, a \$2.7 million increase helps stabilize our workforce. It also allows us to invest in two important initiatives. The first is working to ensure our capabilities are aligned with emerging developments in the transportation industry such as commercial space travel, unmanned aircraft systems, high-speed rail, state-of-the-art railroad technology, and autonomous vehicles. The second is moving toward a more robust use of data and evidence in the investigation process. These two initiatives, described in full in this request, are ongoing, and increased funding enables incremental gains on both fronts.

The NTSB's accomplishments are many, as we have documented in the enclosed budget submission. These include issuance of Board-approved reports and briefs arising from our investigations of major accidents in all modes, as well as a variety of other products developed and

communicated to our stakeholders and the public to improve transportation safety. The submission details safety recommendations we have issued and the related Most Wanted List, which identifies the top safety improvements that can be made to prevent accidents in the future. It also notes our advocacy efforts in support of these recommendations.

In addition to these safety-related accomplishments, we are proud of our sound financial management and the resulting 15th consecutive unmodified (clean) audit opinion for the FY 2017 consolidated financial statements. Although our budget is small, adequate funding is essential to fulfill our mission now and to build the expertise and tools that will ensure NTSB's continued position as a global leader in promoting transportation safety.

Sincerely,



Robert L. Sumwalt, III
Chairman

Enclosure

cc: The Honorable Mario Diaz-Balart,
Chairman
Subcommittee on Transportation, HUD,
and Related Agencies
Committee on Appropriations
US House of Representatives

The Honorable David Price
Ranking Member
Subcommittee on Transportation, HUD,
and Related Agencies
Committee on Appropriations
US House of Representatives

The Honorable Susan Collins, Chairman
Subcommittee on Transportation, HUD,
and Related Agencies
Committee on Appropriations
US Senate

The Honorable Jack Reed
Ranking Member
Subcommittee on Transportation, HUD,
and Related Agencies
Committee on Appropriations
US Senate

National Transportation Safety Board

Fiscal Year 2019 Budget Request



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ACRONYMS AND ABBREVIATIONS

ADAS	advanced driver assistance system
ADMS	Accident Data Management System
ADS-B	automatic dependent surveillance–broadcast
AS	NTSB Office of Aviation Safety
AKR	Akron Fulton International Airport (Ohio)
APV	amphibious passenger vehicle
ASI	aviation safety investigator
ATB	articulated tug barge
ATC	air traffic control
BNSF	formerly the Burlington Northern Santa Fe Railway
CFO	NTSB Office of the Chief Financial Officer
<i>CFR</i>	<i>Code of Federal Regulations</i>
CFV	commercial fishing vessel
CGC	Coast Guard cutter
CISO	Chief Information Security Officer
CO	carbon monoxide
CSD	Computer Services Division
CVR	cockpit voice recorder
DOT	US Department of Transportation
DUCK	amphibious modification of a former military vehicle
EAD	Enterprise Architect Division
EASA	European Aviation Safety Agency
EEODI	NTSB Office of Equal Employment Opportunity, Diversity, and Inclusion

EMAS	engineered materials arresting system
FAA	Federal Aviation Administration
FDR	flight data recorder
FEVS	Federal Employee Viewpoint Survey
FISMA	Federal Information Security Management Act
FOD	foreign object debris
FOIA	Freedom of Information Act
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FTE	full-time equivalent
FY	fiscal year
GA	general aviation
GPS	global positioning system
GSA	General Services Administration
HR	Human Resources
HS	NTSB Office of Highway Safety
HSC	Harbor Safety Committees
HSPD	Homeland Security Presidential Directive
ICAO	International Civil Aviation Organization
ICS	intercommunication system
IFR	instrument flight rules
IIC	investigator-in-charge
IMO	International Maritime Organization
IT	information technology
LC	local controller

LIRR	Long Island Rail Road
LOC	loss of control
LTE	loss of tail rotor effectiveness
M-ADMS	multi-modal Accident Data Management System
MV	motor vessel
MS	NTSB Office of Marine Safety
MWL	Most Wanted List
NASA	National Aeronautics and Space Administration
NASBLA	National Association of State Boating Law Administrators
NHTSA	National Highway
nm	nautical mile
NTSB	National Transportation Safety Board
NWSC	National Water Safety Congress
OCIO	NTSB Office of the Chief Information Officer
OMB	Office of Management and Budget
OPM	Office of Personnel Management
OSHA	Occupational Safety and Health Administration
OSHP	Occupational Safety and Health Program
PACS	physical access control system
PIV	personal identity verification
PIREP	pilot weather report
PTC	positive train control
PV	passenger vessel
RB-S	Response Boat – Search and Rescue
RE	NTSB Office of Research and Engineering

RMD	Records Management Division
RPH	NTSB Office of Railroad, Pipeline and Hazardous Materials
SDM	Brown Field Municipal Airport (California)
SEPTA	Southeastern Pennsylvania Transportation Authority
SES	Senior Executive Service
SIS	substantially interested state
SMS	safety management system
SPV	small passenger vessel
SRC	NTSB Office of Safety Recommendations and Communications
SSA	Safe Skies for Africa
SSD	NTSB Systems Support Division
sUAS	small unmanned aircraft system
SUV	sport utility vehicle
SV	sailing vessel
TDA	NTSB Transportation Disaster Assistance Division
TV	towing vessel
UAS	unmanned aircraft system
UP	Union Pacific Railroad
<i>U.S.C.</i>	<i>United States Code</i>
UTV	uninspected towing vessel
VFR	visual flight rules
VMC	visual meteorological conditions
WMATA	Washington Metropolitan Area Transit Authority

EXECUTIVE SUMMARY

The National Transportation Safety Board (NTSB) is an independent federal agency responsible for investigating and determining the probable cause of every civil aviation accident and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We develop and advocate recommendations to prevent future accidents or reduce their effects, and coordinate assistance to victims and their family members impacted by major transportation disasters. The NTSB also conducts safety studies and prepares safety reports based on analyses of transportation accident and incident data to identify safety improvements.

The NTSB budget submission reflects the President’s request of \$108.0 million for fiscal year (FY) 2019. This is an increase of \$2.7 million from the FY 2018 discretionary amount of \$105.3 million. The FY 2019 President’s request funds 418 full-time equivalents (FTEs), an increase of 5 FTEs from the 413 FTEs supported by the FY 2018 discretionary funding level.

The NTSB is a small agency and succeeds because of the technical expertise, experience, and dedication of its employees. Although modest, a \$2.7 million increase helps stabilize our workforce. It allows us to take steps to ensure our capabilities are aligned with emerging developments in the transportation industry, and enables us to move toward a more robust use of data and evidence in the investigation process. These two initiatives, described in full in this request, are ongoing, and increased funding enables incremental gains on both fronts.

This submission details our response in the current year to advances in transportation technologies that are rapidly and significantly impacting the transportation sector. These emergent technologies include commercial space travel, unmanned aircraft systems, high-speed rail, state-of-the-art railroad technology, and autonomous vehicles. With increased funding, we will accelerate our investment of labor hours and resources to increase our technical knowledge, expertise, and exposure in these areas.

Also included in this submission are details of planning efforts to expand our data analysis programs, including the expansion of the tool used to record data from aviation investigations to capture similar data from all NTSB investigations, and enhance analyses of safety issues within and across modes of transportation. Complementary to this effort, we are piloting expanded data analytics capabilities to improve the efficiency of investigations and the efficacy of safety improvement activities. Results of our pilot projects are encouraging, and additional funding will allow us to move to implementation.

Highlights of FY 2017 accomplishments and workload are contained in this submission. Seventy Board-adopted products, including Accident Investigation Reports and Briefs, Safety Recommendation Letters, Safety Alerts, Safety Studies, and Special Investigation Reports, were issued. Over 1,200 additional Briefs were completed and adopted by Office Directors under delegated authority. There were 185 new safety recommendations issued, and 118 safety recommendations were closed acceptably. Employees processed over 300 requests for data analysis and statistical information, and the read-out of over 500 recording devices. These and many other actions contributed to increased transportation safety across the world, and continued to distinguish the NTSB as a global leader in promoting transportation safety.

EMERGING TRANSPORTATION TECHNOLOGIES

Total Requirements: \$3.6 million

Overview of the Request

Technological advances are transforming transportation products and services at an astonishing rate. These advances are a harbinger of dramatic improvements in transportation safety, but they pose new challenges for manufacturers and operators of transportation conveyances and the traveling public. In particular, the ability of transportation operators to use new technologies safely and effectively has only recently become a subject of serious attention. Despite these concerns about the impact of new technologies on transportation safety, it is clear they can also offer dramatically improved tools for investigating the causes of transportation accidents.

Transportation technologies continue to advance, and it is critical that the NTSB remain aligned with changing trends. Recent innovation in the transportation industry, such as autonomous vehicles, commercial space transportation, hyper-speed rail, solar-powered planes, and new recording technologies make it increasingly important to remain up-to-date on emerging developments and techniques in mitigating, preventing, and investigating transportation accidents.

The NTSB strives to use the most advanced tools in analyzing transportation accidents and, over many years, has made a significant number of recommendations to regulators, manufacturers, and operators to develop and deploy new technologies to enhance safety and prevent future accidents. Yet, the pace, complexity, and sophistication of technological change present new challenges to NTSB investigators and analysts. In recent years, for example, we have investigated—and continue to investigate—accidents involving commercial space launches, unmanned aircraft systems (UAS), semi-autonomous vehicles, and lithium ion battery fires aboard aircraft and various commercial vehicles. We also anticipate our future involvement in investigating high-speed rail accidents and accidents on systems subject to positive train control (PTC).

We recognize that our ability to continue to provide outstanding investigative services and analyses requires the availability of funds to acquire additional staff, develop staff expertise, and employ appropriate equipment and analytical tools to investigate those transportation accidents in which the latest technologies may have contributed to accident causation.

Aviation Safety

Commercial Space Transportation

The Office of Aviation Safety's (AS) Commercial Space Transportation Program supports the agency's broader mission of improving transportation safety through accident and

serious incident investigations, conducting collaborative outreach and education on commercial space vehicles, developing safety investigation techniques in commercial space, and having those techniques with the international community. The purpose of this funding is to—

- Develop the necessary investigative expertise in an emerging segment of transportation.
- Improve transportation safety through comprehensive and technically proficient commercial space accident and incident investigation.
- Develop and apply innovative and efficient investigative tools to be used during commercial space investigations to increase the timeliness of the investigations (less than 1 year) while maintaining their high quality.

Examples of activities include these:

Training for NTSB staff. Specific activities will focus on two areas: (1) support of investigator proficiency through a broad portfolio of technical training and policy outreach activities and (2) NTSB participation as observers in commercial space mishap investigations led by an operator. These activities will enable staff to better understand key commercial space organizations, to become familiar with how different organizations create and develop their system safety analyses and hazard analyses, to determine risk factors and reliability, and to better understand rocket motors and associated systems.

Outreach with Commercial Space Stakeholders. AS staff has established relations with numerous commercial space stakeholders including manufacturers and other groups (such as Orbital ATK, SpaceX, Scaled Composites, Virgin Galactic, United Launch Alliance, and Aerojet Rocketdyne). These key stakeholders need to become familiar with our agency and our investigative methodology. AS also needs to maintain close contact with the key government stakeholders in commercial space flight—the Federal Aviation Administration (FAA) Office of Commercial Space Transportation, the National Aeronautics and Space Administration (NASA) Office of Safety and Mission Assurance, and the US Air Force Safety Center Space Safety Division. AS staff needs to participate in quarterly quad chair meetings (FAA, NASA, NTSB, and Air Force) and attend semi-annual Space Safety Council meetings at the Air Force Safety Center. AS staff also needs to provide update briefings at Commercial Spaceflight Federation Board meetings. The requested funding will enable AS staff to maintain these crucial relationships in the emerging industry. In addition, staff from the NTSB’s Office of Research and Engineering (RE) will need to develop expertise in analyzing vehicle performance and the data collection systems used by commercial space operators.

Cost Estimate. For commercial space transportation, \$0.6 million, consisting of \$0.2 million for training and travel expenses and \$0.4 million for two FTEs.

Unmanned Aircraft Systems

The purpose of this funding is to support AS’s mission through investigating UAS accidents and serious incidents and maintaining investigator education and technical proficiency with an emerging segment of aviation. In addition, this funding will support effective and efficient investigations throughout the various transportation modes by developing staff capabilities to use the latest technology associated with UAS.

The high-level objectives for the AS’s UAS Safety Program are to—

- Improve aviation safety through comprehensive and technically proficient UAS accident and incident investigation.
- Develop and apply innovative and efficient investigative tools using UAS and associated technologies to maintain the quality and timeliness of NTSB investigations.

As the number and complexity of UAS operations continues to grow, it is inevitable that the number of our UAS investigations will also increase. AS must plan for increased demand on mission resources to cover this emerging segment of the industry. Currently, a cross-office informal collection of staff is available for various specialist-type issues regarding UAS, but specific mission resources will be required to maintain our high-quality investigative standards. The plan for FY 2018 proposes formalizing “Team UAS” to support building the knowledge base and conducting expert investigations.

Examples of activities include these:

Training. The agency will develop a comprehensive and organized plan for technical and procedural training for staff members who will participate in various facets of UAS investigations. NTSB specialists must be available to support all aspects of UAS accident and incident investigation in a manner similar to that used in other major NTSB investigations. Training will focus on specific technical areas including, but not limited to, air traffic procedures and technologies, vehicle performance, recorded data logging, battery technology, operational training, and maintenance.

Outreach with Other Investigative Agencies and Industry Stakeholders. As noted above, the personnel in various NTSB offices have initiated contacts and networked with other agencies and entities with experience or roles in accident and incident investigation. We need to maintain and broaden our contacts with FAA, military, and international investigators, as well as with experienced industry representatives, to ensure that the NTSB is aware of best practices and techniques and lessons learned from other investigations. The International Civil Aviation Organization (ICAO) has established a Remotely Piloted Airplane Safety Working Group, and the plan for FY 2018 supports this effort. NTSB outreach in numerous conferences and with other government agencies will enable us to explain and clarify the NTSB’s role and safety initiatives and provide stakeholder go-team training.

Development of UAS as an Accident Investigation Tool. The second pillar of the NTSB involvement in UAS is in harnessing the capabilities of UAS and associated technologies to support the agency’s mission. NTSB investigative staff in all modes are motivated professionals always seeking the best, most efficient, and thorough methods to pursue the mission of conducting world-class accident investigations, keeping their fingers on the pulse of the latest investigative techniques and technologies. UAS aerial imagery and other associated capabilities fall directly into this category. Funding for these activities will enhance the agency’s organic investigative capabilities and facilitate the coordination of airspace issues with the FAA. In addition, beyond the versatility and cost-effective access that an unmanned vehicle itself offers, the accelerating development of payloads and processing for UAS imagery introduces virtually limitless possibilities for innovation of investigative techniques. In accordance with 31 U.S.C. 1343(d), the agency is also seeking authority to purchase unmanned aircraft in the appropriation language.

Cost Estimate. For UAS, \$0.3 million, consisting of \$0.2 million for one FTE and \$0.1 million for travel, training, and procuring the necessary equipment. Responsibilities of the FTE would include leading and coordinating the development of projects; working with other agencies to implement and monitor projects; coordinating cross-agency learning; problem-solving with state and local officials on ways to promote data-driven, innovative service delivery with existing resources; and guiding the incorporation of project learning into programs and policy.

Rail Safety

High-Speed Rail

The Office of Railroad, Pipeline and Hazardous Materials Investigations (RPH) is responsible for investigating railroad accidents involving passenger and freight railroads and commuter rail transit systems. These accidents typically involve collisions or derailments. In addition, staff provide expertise in signal and train control systems, mechanical equipment, track infrastructure, and operations. To ensure effective high-speed rail accident investigations, staff must develop expertise in emerging high-speed rail technologies. The purpose of this funding is to—

- Train/hire subject matter experts in high-speed rail transportation.
- Build expertise to support thorough high-speed rail accident/incident investigations.
- Expand outreach with manufacturers and state and federal government counterparts on international high-speed railroads and high-speed railroad equipment.

Examples of activities include these:

Training. High-speed rail is a mature technology that has operated across Europe and Asia for decades. US railroads have begun the investment into high-speed corridors that will provide efficient high-speed passenger transportation. Technical training and the hiring of

experts with high-speed rail experience will be necessary to support accident investigations on high-speed corridors involving emerging technology in signal systems, equipment, and infrastructure. Participation of NTSB railroad investigators in foreign high-speed railroad investigations as observers, and the interaction of these investigators with their foreign counterparts, will enable the NTSB to begin developing investigative staff to identify the safety issues related to high-speed rail transportation, to build expertise in extracting and analyzing recorded data and vehicle performance, and to develop safety recommendations that will help to ensure passenger safety. Such foreign-investigation participation will also provide opportunities for investigative staff to learn how other countries regulate and conduct safety oversight of their complex high-speed railroad environments.

Outreach. Investigative staff often develop professional relationships domestically with railroad/transit officials, rail equipment manufacturers, and government officials to expand lessons learned from rail accident investigations to prevent similar accidents from occurring. Similarly, it is vital that investigative staff develop contacts internationally with high-speed rail industry representatives. Attendance and participation in high-speed rail conferences, seminars, and trade shows will allow NTSB investigators to seek out high-speed industry experts to support high-speed railroad accident investigations in the United States. Subject-matter experts in new high-speed rolling stock, tilt technology, crash energy management, alternative fuels, and new and innovative construction materials will be integral to NTSB accident investigations. Additionally, subject-matter experts with knowledge of computer automation and modeling, new communication systems, and advanced signal and train control systems will be required. The infrastructure to operate high-speed trains will also involve tighter tolerances and maintenance requirements; therefore, staff must become familiar with the maintenance practices of high-speed systems.

Cost Estimate. For high-speed rail, \$0.5 million for training, travel expenses, and two FTEs.

State-of-the-Art Railroad Technology

Funding for this area will ensure that rail investigators build expertise and maintain technical proficiency that will potentially expedite phases of an investigation when investigators are confronted with new technology. Technical proficiency on emerging technology implemented throughout the railroad industry is vital to enable railroad investigators to conduct thorough rail investigations involving PTC systems, tilt train technologies, alternative fuel motive power, computer automation, and advanced communication systems. Research and knowledge of new investigative approaches will ensure investigators' quick identification of safety issues, will provide them analytical skills, and will lead to the best ideas for safety recommendations to mitigate or prevent future accidents. Through observation and training, the agency can assess whether procuring and maintaining a locomotive simulator and track signal simulator or workstation would allow rail investigators to expedite testing and analysis necessary during an investigation without having to rely on or burden a railroad for the use of its facilities.

(This potential capability would have the added advantage of enhancing our ability to maintain our independence during an investigation.) The purpose of this funding is to—

- Research the efficacy for the NTSB to obtain both a locomotive and track signal simulator or advanced work station(s) and evaluate the potential of this equipment to support the mission of rail accident/incident investigations involving advanced train control systems, advanced signal control technology, and other emerging railroad technology through the analysis of accident data from such technologies when determining probable cause and potential safety recommendations.
- Research the types of data that will be available once these emerging technologies are fully deployed in the United States.
- Develop the potential to expedite all phases of a rail investigation by affording rail investigators access to a locomotive simulator and a track signal and switch simulator.

Advanced Train Control Systems. US railroads have been mandated to implement PTC systems on certain rail corridors across the country. The system will comprise back-office technology, wayside technology, and locomotive technology. All three systems, coupled with advanced communications, contain advanced hardware and software. Technical training for railroad investigators to enable investigation of these advanced train control systems, train equipment, and computer automation systems is necessary to support future accident investigations. Further participation and interaction between NTSB railroad investigators with railroad equipment manufacturers and railroad technical training divisions will provide the agency with the information necessary to determine the efficacy of owning and maintaining in-house simulators. Investigative staff will research the functionality of these emerging rail systems, the interoperability designs required by current regulations, maintenance practices that railroads employ to maintain these complex systems, and, most importantly, the data repositories available to investigators during investigations. With this information, NTSB staff will be adept at applying the methodologies necessary to examine accident details in greater depth, and identifying preventable measures to mitigate future occurrences. The cost estimates below include the education and research elements of this proposed effort.

Cost Estimate. For research of advanced train control systems, \$0.2 million in support of acquiring a locomotive and track signal simulator or advanced work station(s).

Highway Safety

Autonomous Vehicles

Driverless cars are coming, and their potential for improving highway safety is promising: these vehicles are projected to substantially affect the 40,000 lives that are currently lost every year on our streets and highways. Driverless cars could also increase the amount of traffic that our roads can safely carry, because the precision of vehicle separation can be reduced, thus improving infrastructure capacity. Most crashes on our roads are due to driver

error. The theory of driverless cars is that without a driver, there can be no driver error. Decades of experience in a variety of contexts has demonstrated that automation can improve safety, reliability, productivity, and efficiency. However, that experience has also demonstrated that there can be a downside to automation.

To reach the goal of a driverless car, many automotive manufacturers are introducing various levels of automated driving systems including systems that can control the car's longitudinal and lateral position within a lane. These early systems require that the driver remain fully engaged in the driving task to correct for deficiencies in the automated system and to take over instantaneously when the automated system is unable to proceed. These systems also depend on the driver to limit their activation and use to appropriate situations.

Challenges arise with these automated systems. What if the automation fails? Will it fail in a way that is safe? If it cannot be guaranteed to fail safely, will the operator be aware of the failure in a timely manner and be able to take over to avoid a crash? Further, humans are involved in designing, manufacturing, and maintaining the vehicles, as well as the streets and highways that the vehicles traverse. Each of these points of human engagement presents opportunities for human error. Moreover, human error in these steps and elements is likely to be difficult to identify and correct, especially with systems that learn through artificial intelligence. Further, these automated vehicles will operate alongside traditional vehicles for many years, and the mixed use may prove challenging.

The purpose of this funding is to improve transportation safety through comprehensive and technically proficient automated vehicle crash and/or incident investigation. Cars today contain a host of vehicle electronics, many of which are relevant to crash investigations. The future of vehicle crash investigations will entail even more electronic systems that will use a variety of technologies: a differential global positioning system (GPS), Lidar, radar, machine learning of camera imaging, and fleet learning. We must fully understand these components in vehicle control systems to investigate automated vehicle crashes successfully. Crash reconstruction techniques are also evolving based on data available to document the movement and control of vehicles (for example, three-dimensional GPS layers of position data).

Examples of activities include these:

Develop staff and staffing for the complexity of automated vehicles. Both the Office of Highway Safety (HS) and RE need a recorder specialist and systems engineer with the expertise to work with automated vehicle command and control systems. The ability to handle large data sets and an understanding of forensic data techniques, for example, and the ability to crosscheck the event timing of data among different vehicle network systems will be required. Based on sensor type and processing algorithms, a wide range of data formats will need to be understood to accurately analyze command and control of the vehicle.

Develop technical capabilities to analyze systems data collected from automated vehicles. Current automotive engineering is a very competitive environment, and we anticipate experiencing a range of car manufacturers' responsiveness to engage as party

members in NTSB investigations. No safety standards exist that dictate a common set of systems functionality, and each vehicle type involved in an investigation will have its own unique systems. Our standard methods for downloading event data recorders may not be applicable to automated vehicle crashes. To the extent that we can reverse-engineer an understanding of the data as we encounter more cases, we need to develop an independent capability to simulate the automated systems' role in the crash sequence.

Cost Estimate. For autonomous vehicles, \$0.6 million, which includes \$0.2 million for training and travel expenses and \$0.4 million for two FTEs. The real need in future budget terms is human capital with the right expertise. To the extent possible, we will develop that expertise in existing staff through training and industry experience.

Multi-modal

Intern Program

Our future ability to keep pace with rapidly advancing technology lies in maintaining the expertise we are developing. The NTSB is finding it increasingly difficult to find the talent needed to fill critical positions. Many applicants simply lack the experience, technical skills, academic background or formal qualifications necessary to successfully perform the duties of the various positions. In addition, like most federal agencies, the NTSB is facing the challenge of an aging workforce that is retirement eligible. Currently, close to 40 percent of agency employees are eligible to retire within the next 5 years. This leaves the agency vulnerable to losing staff with the valuable and specialized knowledge and skills needed to develop new employees.

The purpose of this funding is to implement an intern program to assist the NTSB in recruiting and attracting exceptional recent college graduates in a cost-effective manner. This program will allow those retirement-eligible employees the opportunity to mentor and train the interns in their specialized fields, including the emergent technology areas noted, while encouraging the interns to retain employment with the agency by offering challenging assignments and room for career growth.

Cost Estimate. For an intern program, \$1.4 million for 12 FTEs.

EVIDENCE AND EVALUATION CAPABILITY

Total Requirements: \$2.2 million

Overview of the Request

The NTSB strives to use the most advanced tools in analyzing transportation accidents, and throughout our history, we have maintained an aviation database we have used in our investigations and safety analysis functions. Opportunities exist to add to this database by expanding it to include all modes. Opportunities also exist to use advanced data analytics tools to utilize data more fully, as well as to tap into additional data available from other sources.

Multi-Modal Accident Database Management System

The purpose of this funding is to support NTSB investigative offices' ability to maintain a historical record of the accidents that they investigate. The NTSB maintains an aviation Accident Data Management System (ADMS) for the storage, retrieval, and management of information associated with its aviation accident/incident investigations. AS investigators use the ADMS to start a new case record for each investigation and subsequently to manage that case through various report development milestones to the release of a final report. Staff relies on data from the aviation ADMS to monitor workflow, conduct safety research, support accident investigations, produce annual statistical reviews, and respond to congressional requests. These data are also used to fulfill the United States' reporting requirements to ICAO, to other government agencies, and to industry organizations; individuals also regularly use the data when conducting safety research.

The NTSB has identified a need (based, in part, on the demonstrated value of the aviation ADMS) to develop multiple ADMS variants for the other transportation modes. The requirement will involve, through evaluation of modal office needs, development of ADMS variants suitable for each modal office and the subsequent ongoing maintenance of those systems. To limit development and maintenance costs and to maximize the availability of shared data across modes, the newly developed ADMS variants will use the existing aviation ADMS framework.

The high-level objectives for the Multi-Modal Program ADMS (M-ADMS) are to—

- Improve the quality of accident data available to the public.
- Develop state-of-the-art transportation accident databases for each of the three other modal investigative offices to improve accident selection and allocation of limited resources.
- Improve the user interface of the current ADMS, which will reduce the time needed for staff to enter data and will improve accuracy, thereby improving the effectiveness of safety efforts based upon the data.

Task Areas:

The NTSB has been using the aviation ADMS since 2008. Through daily use of the system, in addition to completion of a product requirements document, NTSB staff has identified several new system features and enhancements aimed at improving the efficiency and quality of data entry, analysis, and presentation. These are the types of tasks we want to address:

- Evaluation of modal office data collection and reporting requirements.
- Development of new modal ADMS variants based on the needs established in the data collection and reporting requirements task and the existing ADMS framework.
- Ongoing maintenance of the existing aviation ADMS, as well as the newly developed ADMS in other modes.
- Enhancements to both the existing and newly developed ADMS software for all modes, as identified.

Cost Estimate. For the M-ADMS development, \$1.2 million, which includes \$0.2 million for one FTE. Responsibilities of the FTE would include leading and coordinating the development of the project, working with modal offices to improve the product and ensure that the product meets the modal offices' needs, and coordinating modal office staff learning of the program.

Data Analytics

The NTSB's ADMS is an electronic database containing the factual and analytical details of all aviation accidents and incidents investigated by the agency. NTSB investigators and analysts use this database, along with external information sources, in support of aviation investigations, safety recommendations, outreach, and to fulfill the NTSB's responsibility to "conduct special studies on matters pertaining to safety in transportation and the prevention of accidents." The purpose of this funding is to expand the NTSB's capabilities for analyzing safety data beyond that of individual investigations and to use data analytics to improve the efficiency of investigations and efficacy of safety improvement activities.

FAA aviation safety oversight has been evolving over several years away from strict regulatory enforcement to support voluntary compliance policy and full-scale implementation of safety management systems (SMS) in air carrier, airport, and manufacturing operations. Expanded data analytics capabilities will allow the NTSB to make better use of SMS and operational data for investigations and studies and to strategically align NTSB safety efforts with those of the industry and the FAA, where appropriate.

Task Areas:

Staff from AS, RE, and the Office of the Chief Information Officer (OCIO) are working together using data analytics to identify the following needed improvements in the NTSB strategic use of safety data sources and visualization techniques:

- Investigation and remediation of the highest consequence safety issues contributing to accidents that are most relevant for the aviation industry.
- Proactive identification of trends and emerging aviation safety risks in both airline and general aviation (GA) operations.

Staff will analyze aviation safety-related data from both internal and external sources to identify emerging areas of transportation safety risk and to strategically examine (1) issue areas for enhanced evidence documentation, (2) the realistic scoping of safety recommendations and safety alerts, and (3) the effectiveness of our products and outreach and advocacy initiatives. Improved data analytics will drive decision-making for investigation launch criteria, training priorities for staff, and outreach efforts, and will provide data to support inquiries and safety initiatives from the transportation industry, Congress, and the public.

This effort complements the NTSB M-ADMS development, and, once established by AS, the data analytics effort could expand to include the other NTSB modal offices.

Cost Estimate. For the advancement of data analysis capabilities, \$1.0 million, which includes software, configuration, training, and \$0.6 million for three FTEs. Responsibilities of the FTEs would include leading and coordinating the development of the project and working with industry and government sources to analyze and share safety data.

MISSION AND ORGANIZATION OVERVIEW

Since its creation in 1967 as an accident investigation agency within the newly created US Department of Transportation (DOT), the NTSB's mission has been to determine the probable cause of transportation accidents and incidents and to formulate safety recommendations to improve transportation safety. Our authority currently extends to the following types of accidents:

- All US civil aviation accidents and certain public aircraft accidents.
- Select highway accidents.
- Railroad accidents involving passenger trains or select freight train accidents that result in fatalities or significant property damage.
- Major marine accidents and any marine accident involving both a public and a nonpublic vessel.
- Pipeline accidents involving fatalities, substantial property damage, or significant environmental damage.
- Select accidents resulting in the release of hazardous materials in any mode of transportation.
- Select transportation accidents that involve problems of a recurring nature or that are catastrophic.

In 1974, Congress passed the Independent Safety Board Act, which severed the NTSB's ties to the DOT and authorized the agency to take the following additional actions:

- Evaluate the effectiveness of government agencies involved in transportation safety.
- Evaluate the safeguards used in the transportation of hazardous materials.
- Evaluate the effectiveness of emergency responses to hazardous material accidents.
- Conduct special studies on safety problems.
- Maintain an official US census of aviation accidents and incidents.
- Review appeals from individuals and entities who have been assessed civil penalties by the FAA.
- Review appeals from airmen and merchant seamen whose certificates have been revoked or suspended by the FAA and the US Coast Guard, respectively.

The NTSB also leads US teams assisting in foreign airline accident investigations conducted by foreign authorities under the provisions of ICAO agreements. In 1996, the Aviation Disaster Family Assistance Act further assigned us the responsibility of coordinating federal government resources and other organizations to support local, state,

and airline efforts to assist aviation disaster victims and their families after accidents in which there is a major loss of life. A subsequent presidential memorandum directed other federal agencies to support our agency when we assume the same responsibilities for major surface transportation accidents. The rail passenger disaster family assistance provisions of the Rail Safety Improvement Act of 2008 assigned us similar responsibilities for rail passenger disasters resulting in a major loss of life, regardless of the cause or suspected cause.

To date, the NTSB has investigated more than 144,000 aviation accidents and thousands of surface transportation accidents. On call 24 hours a day, 365 days a year, our investigators have traveled throughout the United States and to every corner of the world to perform investigations. Because of this dedication, we are recognized as the world's leading accident investigation agency.

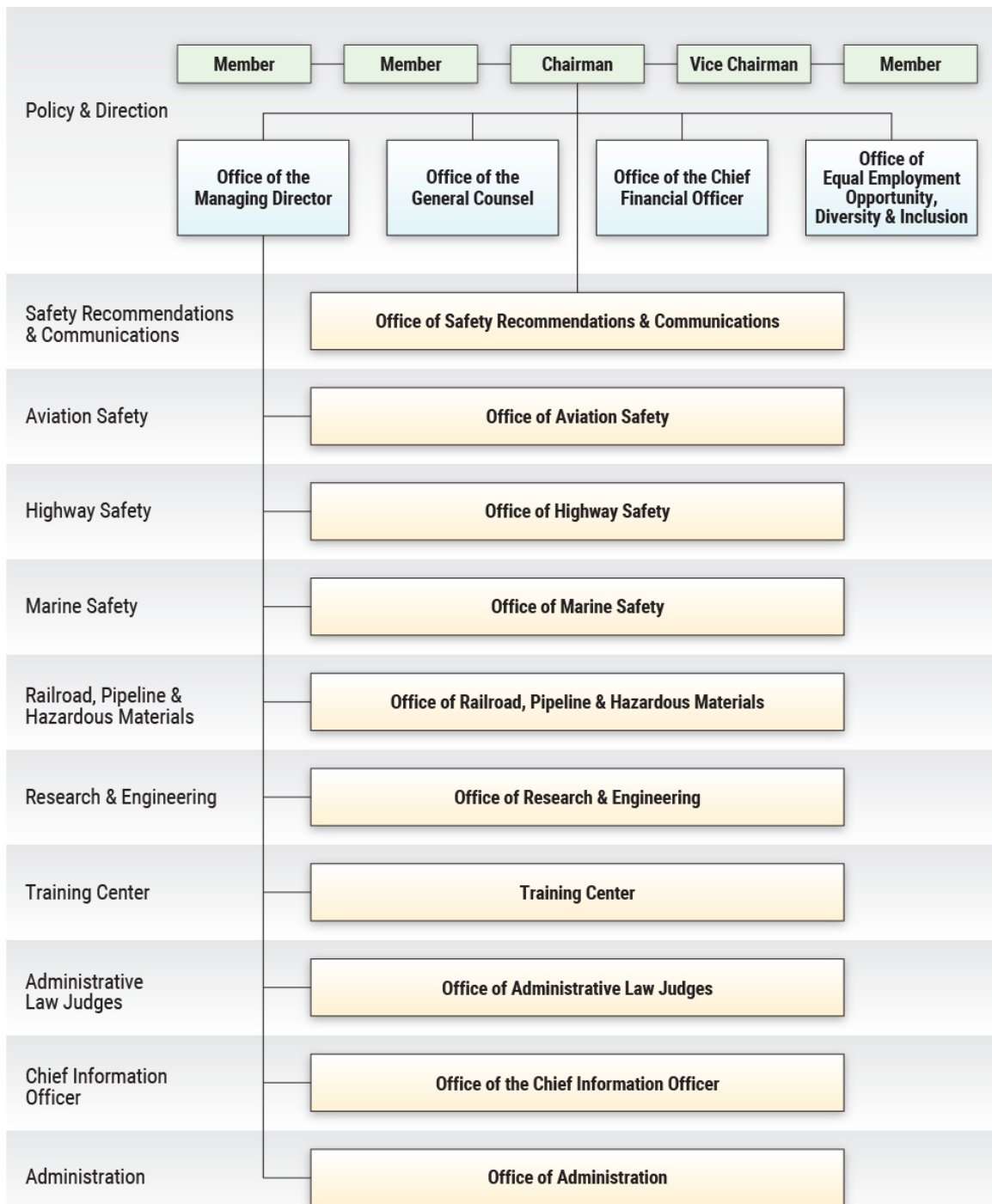
We have issued more than 14,600 safety recommendations to more than 2,300 recipients in all transportation modes as a result of NTSB investigations. Since 1990, we have published the Most Wanted List (MWL) of Transportation Safety Improvements, which highlights safety-critical actions that the DOT modal administrations, the Coast Guard, the states, and other entities should take to help prevent accidents and save lives. Further information concerning the MWL appears in Appendix A.

We are not authorized to regulate transportation equipment, personnel, or operations or to initiate enforcement action. However, because of our reputation for objectivity and thoroughness, we have achieved such success in shaping transportation safety improvements that those authorized to effect these changes have implemented more than 82 percent of the agency's recommendations. Many safety features currently incorporated into airplanes, helicopters, automobiles, commercial motor vehicles, trains, pipelines, and marine vessels had their genesis in NTSB safety recommendations. Further information concerning the status of our safety recommendations appears in Appendix B.

The five-member Board is composed of appointees nominated by the President and confirmed by the Senate. A Chairman (who is nominated by the President and subject to Senate confirmation) serves as the chief executive officer of the NTSB. The President also designates one of the Members as Vice Chairman.

The NTSB is headquartered in Washington, DC. We also have investigators located in offices in Ashburn, Virginia; Denver, Colorado; Anchorage, Alaska; and Federal Way, Washington; as well investigators throughout the country who telework. The NTSB's training center is located in Ashburn, Virginia.

Organization and Program Structure



RESOURCE REQUIREMENTS

Appropriations Language

Salaries and Expenses - 950310

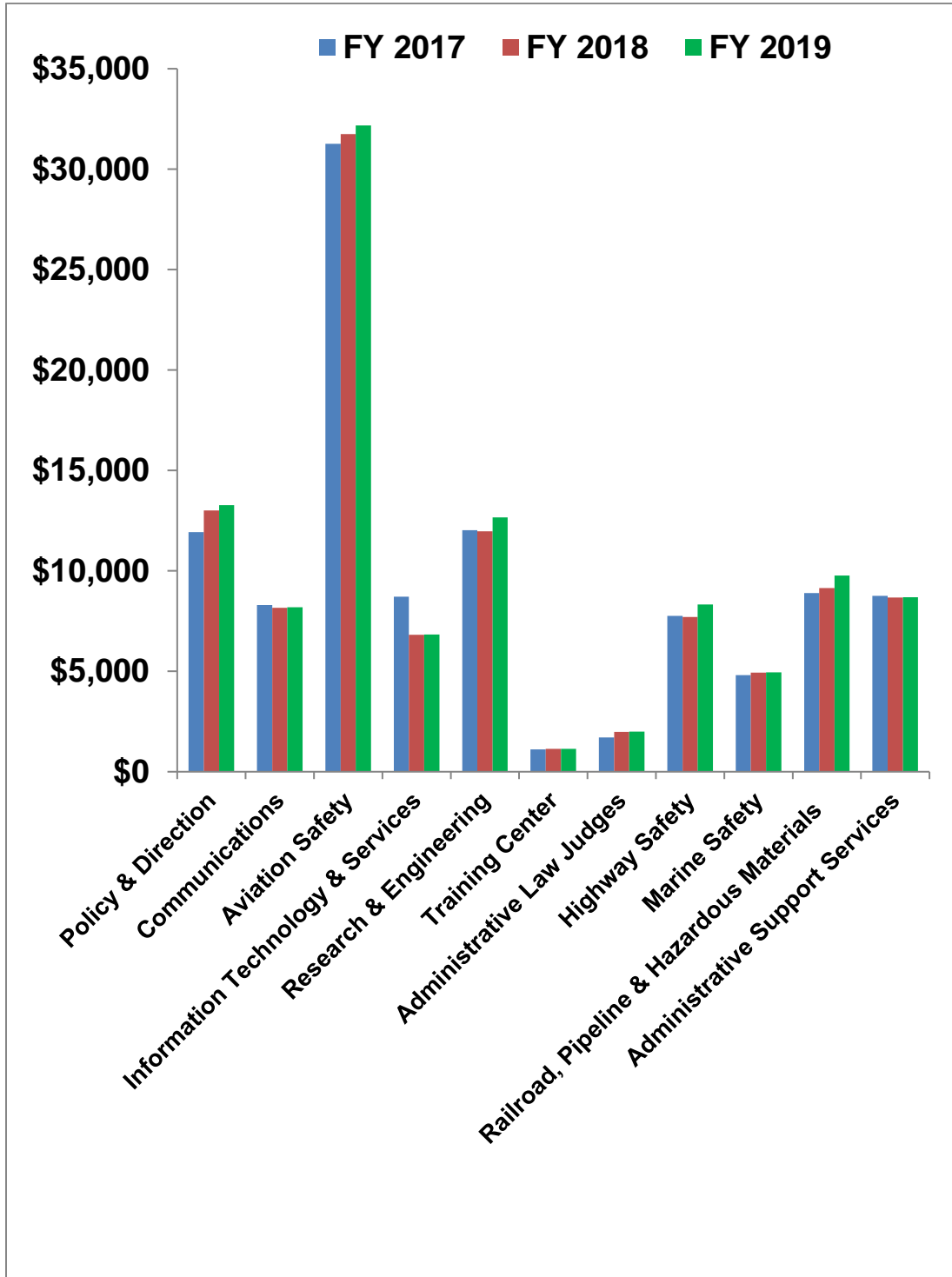
“For necessary expenses of the National Transportation Safety Board, including hire of passenger motor vehicles and aircraft; *purchase, operation, and maintenance of unmanned aircraft systems*; services as authorized by 5 U.S.C. 3109, but at rates for individuals not to exceed the per diem rate equivalent to the rate for a GS-15; uniforms or allowances therefor, as authorized by law (5 U.S.C. 5901-5902), *\$108,000,000* of which not to exceed \$2,000 may be used for official reception and representation expenses. The amounts made available to the National Transportation Safety Board in this Act include amounts necessary to make lease payments on an obligation incurred in FY 2001 for a capital lease.”

Emergency Fund - 950311

The Administration is not requesting new funding for the Emergency Fund for FY 2019.

NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Obligations by Program Activity (\$000s)



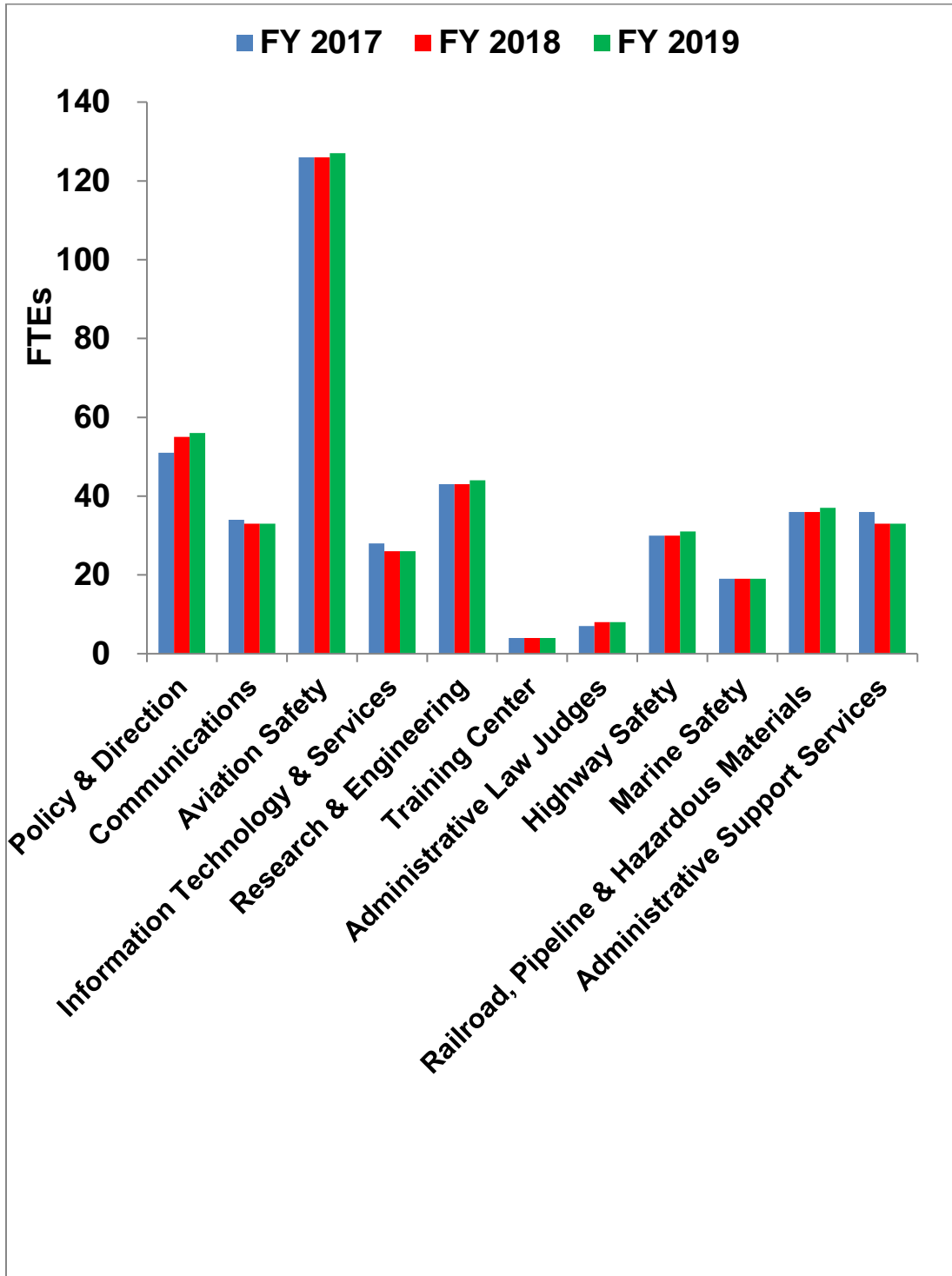
NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Obligations by Program Activity (\$000s)

Identification Code: 95-0310-0-1-407	FY 2017	FY 2018	FY 2019
Policy and Direction	11,928	13,012	13,271
Communications	8,301	8,165	8,186
Aviation Safety	31,257	31,748	32,179
Information Technology and Services	8,721	6,815	6,832
Research and Engineering	12,030	11,964	12,667
Training Center	1,111	1,139	1,146
Administrative Law Judges	1,714	1,988	1,994
Highway Safety	7,764	7,706	8,326
Marine Safety	4,805	4,930	4,942
Railroad, Pipeline and Hazardous Materials Investigations	8,900	9,146	9,769
Administrative Support Services	8,752	8,667	8,688
Total	105,283	105,280	108,000

NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Staffing by Program Activity



NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

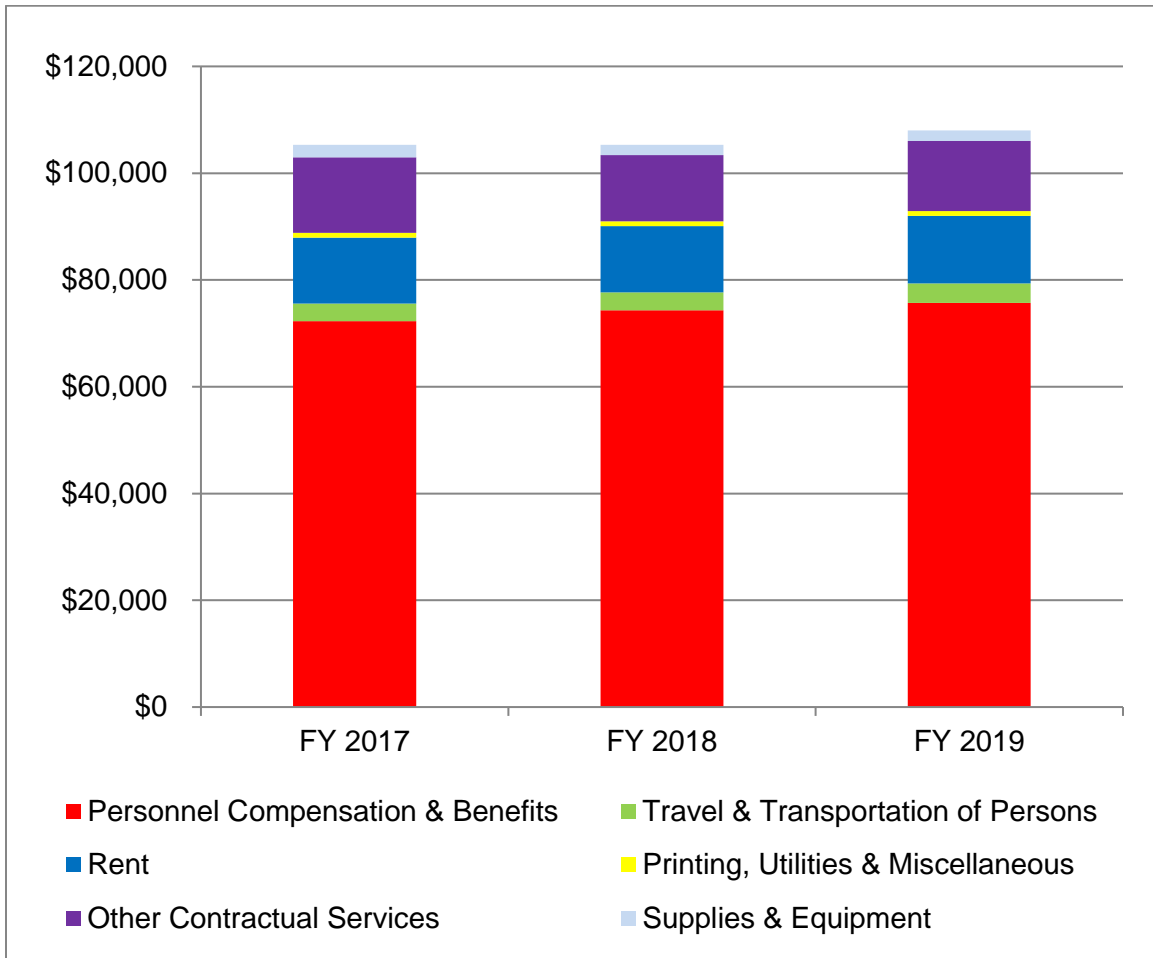
Staffing by Program Activity

Identification Code: 95-0310-0-1-407	FY 2017	FY 2018	FY 2019
Policy and Direction	<u>51</u>	<u>55</u>	<u>56</u>
Chairman, Vice Chairman, Board Members*	12	14	15
Office of the Managing Director	14	15	15
Office of the General Counsel	9	9	9
Office of the Chief Financial Officer	13	14	14
EEO, Diversity & Inclusion Office	3	3	3
Communications	34	33	33
Aviation Safety	126	126	127
Information Technology and Services	28	26	26
Research and Engineering	43	43	44
Training Center	4	4	4
Administrative Law Judges	7	8	8
Highway Safety	30	30	31
Marine Safety	19	19	19
Railroad, Pipeline and Hazardous Materials	36	36	37
Administrative Support Services	36	33	33
Total	414	413	418

* FY 2018 and FY 2019 increases represent anticipated filling of current Board vacancies.

NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Obligations by Object Classification (\$000s)



NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Obligations by Object Classification (\$000s)

Identification Code:	95-0310-0-1-407	FY 2017	FY 2018	FY 2019
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Personnel Compensation and Benefits:

11.1	Permanent Positions	50,283	51,123	52,129
11.3	Positions Other Than Permanent	2,443	2,761	2,779
11.5	Other Personnel Compensation	2,166	2,568	2,603
	Total Personnel Compensation	54,892	56,452	57,511
12.1	Personnel Benefits	17,399	17,872	18,172
	Subtotal, Personnel Compensation and Benefits	72,291	74,324	75,683

Other Than Personnel Compensation and Benefits:

21.0	Travel and Transportation of Persons	3,254	3,266	3,622
22.0	Transportation of Things	59	59	61
23.1	Rental Payments to GSA	9,541	9,629	9,732
23.2	Rental Payments to Others	2,767	2,821	2,878
23.3	Communications, Utilities, and Miscellaneous Charges	785	799	825
24.0	Printing and Reproduction	109	111	115
25.0	Other Contractual Services	14,175	12,373	13,130
26.0	Supplies and Materials	534	543	561
31.0	Equipment	1,768	1,355	1,393
99.9	Total Obligations	105,283	105,280	108,000

Personnel Summary:

	Full Time Equivalent Employment (FTE)	414	413	418
	- Permanent	408	407	412
	- Other Than Permanent	6	6	6

NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Analysis of Changes - FY 2018 to FY 2019

\$ 1,122 Staff Increase/Decrease

The requested funding level provides for a FTE level of 418, an increase of 5 FTEs from FY2018.

\$ 461 Pay Raises

Funding required to cover the last quarter of the President's 1.9 percent provisional pay raise effective January 2018.

\$ 371 Non-Pay Inflation

Inflation of 2.0 percent is used for non-pay based on economic assumptions for discretionary programs.

\$ 766 Other

The requested funding level provides for advancing NTS initiatives involving Emerging Transportation Technologies and Data Analytics.

\$ 2,720 Total

Summary of Changes

\$ 105,280 FY 2018 level (413 FTEs)

\$ 2,720 Total Increase

\$ 108,000 FY 2019 Discretionary Level (407 FTEs)

POLICY AND DIRECTION

	(\$000s)	FTEs
FY 2018 Estimate	\$13,012	55
FY 2019 Request	\$13,271	56
Increase/Decrease	\$259	1

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. An increase in staffing of 1 FTE reflects full Board staffing. No other program changes are planned.

Program Description

Policy and Direction program resources fund the offices of the Chairman, Vice Chairman, and Members of the Board, as well as the offices of the Managing Director; General Counsel; Chief Financial Officer; and Equal Employment Opportunity, Diversity, and Inclusion. Collectively, these offices provide overall leadership, management, and direction for the NTSB.

Chairman, Vice Chairman, and Board Members

The Chairman serves as the chief executive officer for the agency. The Chairman, Vice Chairman, and Board Members preside at NTSB Board meetings; review and approve NTSB reports, safety studies, and safety recommendations; provide appellate review of FAA certificate and certain civil penalty actions, as well as Coast Guard license actions; and act as spokespersons at accident scenes. They also advocate safety recommendations with the transportation community, other federal agencies, state and local governments, and the public.

Office of the Managing Director

The Office of the Managing Director assists the Chairman in the discharge of executive and administrative functions. The office coordinates activities of the entire staff, manages the day-to-day operation of the agency, and develops and recommends plans to achieve program objectives. The Managing Director is responsible for the overall leadership, direction, and performance of the agency, as well as its communications and organizational efficiency, including oversight of the NTSB Response Operations Center. The center provides support 24 hours a day, 365 days a year, for agency-wide operational requirements, including accident launches and the collection and dissemination of information related to transportation accidents and incidents.

Additionally, two organizational units reside within the Office of the Managing Director. The Training Center manages workforce development and external training functions. The Executive Secretariat is responsible for managing the voting process for Board Members and for the processing and archiving of external correspondence.

Office of the General Counsel

The Office of the General Counsel provides advice and assistance on legal aspects of policy matters, legislation, testimony, NTSB rules, and ethics. The office also provides timely and objective review of airman appeals of certificate actions and certain civil penalties and seaman license actions, acting on behalf of the NTSB on particular procedural aspects of enforcement cases; makes decisions as to the release of official information pursuant to the requests or demands of private litigants, courts, or other authorities for use in litigation not involving the United States; ensures compliance with statutes concerning public access to information through publication of NTSB decisions and releases under the Freedom of Information Act (FOIA); provides counsel and staff assistance to the US Department of Justice when the NTSB is a party to judicial proceedings; and provides internal legal assistance and guidance regarding accident and incident investigations, hearings, appearances as witnesses, acquiring evidence by subpoena and other means, and the taking of depositions.

Office of the Chief Financial Officer

The Office of the Chief Financial Officer (CFO) manages NTSB financial resources, develops the agency's budget requests for submission to the Office of Management and Budget (OMB) and Congress, and executes the budget for resources appropriated to the NTSB by Congress. The CFO also prepares the agency's financial statements, as required by the Accountability of Tax Dollars Act; oversees property and inventory control programs; and analyzes the fee structure for services that the agency provides on a reimbursable basis. Additionally, the CFO is responsible for ensuring compliance with the Federal Managers' Financial Integrity Act.

Office of Equal Employment Opportunity, Diversity, and Inclusion

The Office of Equal Employment Opportunity, Diversity, and Inclusion (EEODI) advises and assists the Chairman and NTSB office directors in carrying out their responsibilities relative to Title VII of the Civil Rights Act of 1964, as amended, and other laws, executive orders, and regulatory guidelines affecting diversity development and the processing of EEO complaints. These services are provided to managers, employees, and job applicants by the director and two full-time staff, three collateral-duty employees (one Hispanic employment program manager, one federal women's program manager, and one disability program manager), and volunteer special emphasis program managers. To maintain the integrity and impartiality of the agency's EEO complaints resolution program, external EEO counselors and investigators are contracted to help employees and job applicants who file formal or informal complaints of alleged discrimination. In addition, the office manages an alternative dispute resolution program. EEODI services also include providing

required educational training to NTSB staff, raising diversity awareness at the agency, engaging in targeted outreach, helping with internal recruitment initiatives, and providing career enhancement advisory services.

SAFETY RECOMMENDATIONS AND COMMUNICATIONS

	(\$000s)	FTEs
FY 2018 Estimate	\$8,165	33
FY 2019 Request	\$8,186	33
Increase/Decrease	\$21	0

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

The Office of Safety Recommendations and Communications (SRC) comprises six divisions: Safety Advocacy, Safety Recommendations, Media Relations, Government and Industry Affairs, Transportation Disaster Assistance (TDA), and Digital Services. SRC ensures that information regarding NTSB investigations, activities, advocacy, and safety recommendations is accurately and effectively communicated to a range of stakeholders, including elected officials and their staffs at the federal, state, and local levels; industry representatives; media; victims of transportation accidents and their families; and the public. SRC's mission begins at the scene of an accident, continues through NTSB safety investigations and recommendation issuance, and is maintained through advocacy efforts to secure favorable action on safety recommendations that are not yet implemented. In addition to traditional communication methods, the office uses digital and social media to facilitate robust public and stakeholder engagement.

Safety Advocacy Division

The Safety Advocacy Division is responsible for the following:

- Developing and administering the NTSB's MWL based, in part, on open safety recommendations. The MWL is the agency's preeminent advocacy tool and highlights issues whose resolution would significantly impact transportation safety at the national and state levels. A new list is announced biennially at a press conference. Although the NTSB actively advocates for the acceptance of all its safety recommendations, follow-up efforts are generally more aggressive for the recommendations supporting MWL issues.
- Developing the MWL advocacy strategy and working with Board Members and NTSB staff to promote MWL issues.
- Developing and implementing the agency's advocacy program to highlight state-related safety recommendations.

- Collaborating with the Government and Industry Affairs Division to obtain support for programs and legislation at state and local levels consistent with agency recommendations.
- Disseminating safety information and increasing public awareness of NTSB activities in transportation safety through the “Safety Compass” blog, other social media venues, and conference presentations.
- Developing and maintaining contact with safety advocacy organizations and providing information on NTSB activities and safety recommendations.

Safety Recommendations Division

The Safety Recommendations Division is responsible for the following:

- Working with modal offices to develop draft safety recommendations that are actionable, effective, and measurable.
- Supporting and tracking the implementation of issued safety recommendations.
- Reviewing responses from safety recommendation recipients and drafting classification response letters for Board Member review and approval.
- Maintaining the safety recommendation database, which includes information on recommendation recipients, status, adoption, and implementation.
- Analyzing safety recommendation status and implementation and generating summary reports.

Media Relations Division

The Media Relations Division is responsible for the following:

- Serving as national spokespersons for the NTSB.
- Serving as the primary point of contact for all media activity and disseminating information about NTSB activities to the public. This includes collaborating with other SRC divisions to ensure the integrated, coordinated, and synchronized release of information including imagery, such media relations products as news releases and feature releases, and social media content to build public support of the NTSB’s mission, initiatives, and campaigns.
- Providing media relations support for Board Members and investigators, including developing key messages, supporting talking points, facilitating interviews, and conducting media training. Identifying opportunities to engage the media to communicate key messages to identified audiences.
- Providing input to senior leadership regarding public and media perceptions of NTSB actions and policies and creating and maintaining a library of public affairs guidance for issues of media interest to align messaging and promote unity of effort within the agency.

- Providing strategic and tactical media-relations support for forums, meetings, roundtables, and other special investigative events.

Government and Industry Affairs Division

The Government and Industry Affairs Division serves as the principal point of contact for government entities regarding the NTSB mission and supports outreach to industry stakeholders. The division is responsible for the following:

- Informing Congress, other federal agencies, and state and local governments regarding NTSB activities and advising the Chairman, Vice Chairman, Board Members and staff on congressional and legislative matters.
- Coordinating responses to requests for information and assistance from Congress, the White House, the Government Accountability Office, other federal agencies, and state and local governments through correspondence and briefings.
- Helping the Chairman, Vice Chairman, Board Members, and staff with legislative testimony.
- Providing launch support to the Chairman, Vice Chairman, Board Members, and accident investigators.
- Monitoring federal and state legislative activity relevant to NTSB safety recommendations.
- Coordinating the development of NTSB legislative proposals and providing technical assistance to Congress and states in drafting legislation.
- Supporting modal offices in planning and executing forums and roundtables.
- Helping staff identify appropriate resources in state and local government to support investigations and other projects.
- Collaborating with the Safety Advocacy Division in support of its advocacy programs.

Transportation Disaster Assistance Division

TDA is responsible for the following:

- Carrying out NTSB statutory duty under the Aviation Disaster Family Assistance Act (49 U.S.C. section 1136) and the rail passenger disaster family assistance provisions of the Rail Safety Improvement Act of 2008 (49 U.S.C. section 1139). This involves responding to all major aviation accidents and rail accidents, as required by law.
- Supporting accident investigations in other modes of transportation, including regional aviation.

- Coordinating the federal services provided to accident survivors and victims' families, including crisis counseling, victim recovery and identification, and communication with foreign governments.
- Briefing families during the on-scene phase of an investigation and as needed throughout the investigation to provide updates and address family member concerns.
- Notifying victims and their family members regarding all NTSB proceedings and investigative products.
- Providing training and educational outreach regarding family assistance operations to other government agencies, organizations potentially affected by or involved in NTSB accident investigations, airline and airport personnel, transportation operators in other modes, and state and local governments to help ensure their preparedness for a major transportation disaster.

Digital Services Division

The Digital Services Division is responsible for the following:

- Public and stakeholder engagement via digital media.
- Implementing digital strategies to highlight NTSB's investigative and safety advocacy messages.
- Managing digital communications programs and platforms (website, social media, and visual media) to ensure consistent messaging across various digital channels and agency compliance with digital government policies and orders.
- Providing leadership and guidance regarding digital technology adoption for agency communications programs.
- Producing videos and animations, providing photography support, producing original graphics, and editing images in support of agency activities such as accident launches, development of investigative products, advocacy, and other NTSB activities.

Accomplishments and Workload

Safety Advocacy Division

The Safety Advocacy Division oversees the agency's advocacy efforts on the MWL and non-MWL issues, including related recommendations. In FY 2017, division staff conducted, supported, and organized 143 advocacy activities covering both MWL and non-MWL issues and other advocacy/outreach efforts. In November 2016, division staff led the effort announcing the 2017-18 MWL to the media, stakeholders, and the public. The division coordinated several events and activities related to the MWL that raised awareness about the agency's 10 priority safety issues and related safety recommendations.

Staff significantly expanded the agency’s use of social media platforms to share safety messages. Division staff wrote and released hundreds of social media postings via the NTSB “Safety Compass” blog, Twitter, Facebook, LinkedIn, Instagram, YouTube, and Flickr. The division also improved the agency’s corporate LinkedIn page to include safety messaging information/products. Additionally, the Safety Advocacy Division launched its first webinar and introduced its new Behind the Scene podcast series. With division staff support, Board Members, safety advocates, and investigators delivered 66 presentations related to the MWL and our safety recommendations.

The division coordinated several other advocacy and outreach activities and events to help deliver the agency’s key safety messages and further brand the organization as a leader in safety advocacy. Staff presented and exhibited at several key conferences, including the Lifesavers Conference (highway), the Fatigue Management Conference, and the National Black Caucus of State Legislators’ 40th Annual Legislative Conference. Staff also collaborated with the National Safety Council, DriveSmartVA, and distraction.org, among others, to plan, facilitate, and execute two safety roundtables—one on distracted driving and one on collision avoidance technologies—and several activities to raise awareness regarding the issue of teen driver safety. The division worked with the Office of Aviation Safety to conduct the first-ever Alaska and Long Island, NY, outreach events promoting loss-of-control general aviation safety. Staff also produced two new unique products for targeted stakeholder groups—a school bus safety video and a truck safety tip card, highlighting lessons learned from accident investigations that we have conducted.

Staff also continued to build its product/report dissemination and event notification platform. Work included building contact lists and product e-mail release templates. For example, the team produced and distributed two editions of the *Advocacy Spotlight* newsletter, which communicates the latest advocacy happenings to stakeholders and advocacy partners within and outside the NTSB.

Safety Recommendations Division

In FY 2017, the Safety Recommendations Division staff reviewed and analyzed 189 responses from recommendation recipients and developed corresponding draft recommendation classification responses for Board review and approval. Additionally, the staff assisted the modal offices in developing and issuing 185 new safety recommendations.

Safety Recommendations Division staff developed 258 summary statistical reports or data summaries on specific recommendation topics to support NTSB Board Members, NTSB staff, and the public. Topics addressed in these reports included a summary of recommendation issues related to human fatigue, runway incursions, sleep apnea, rail crossing accidents, and the NTSB’s Most Wanted List. Division staff also helped develop new recommendations during the report-planning phase of nine accident investigations conducted by the modal offices.

Outreach activities by Safety Recommendations staff included four presentations describing the safety recommendation process. These included a presentation for aviation managers attending a training session at the NTSB Training Center, a presentation for

accident investigation students at an NTSB-conducted training course, a presentation for senior staff members at the Canadian Transportation Safety Board, and a presentation for senior air medical transportation managers. Division staff also participated in 27 meetings to discuss and support the acceptance of previously issued recommendations with government and industry organizations, including the Federal Highway Administration, the FAA, the National Highway Traffic Safety Administration (NHTSA), the Federal Railroad Administration (FRA), the Federal Transit Administration (FTA), the Coast Guard, the American Trucking Associations, and the Association of Air Medical Services.

Media Relations Division

The division continues to provide media relations support to all levels of the agency including support for such special events as the MWL kickoff event; an Aviation Safety Investigative Hearing in Anchorage, Alaska; the Long Island NTSB Loss of Control Lessons Learned Safety Seminar; release of the El Faro VDR transcript; and all the agency's major launches, roundtables, forums, and panel discussions. In FY 2017, the division's media relations efforts generated more than 302,000 print, online, and broadcast news mentions of the NTSB.

News Releases and Media Advisories issued during FY 2017 earned an average 28.82 percent open rate (seven points above the industry standard) and an average 16.76 percent click-to-open rate (about 2 percent less than the industry standard). The media relations staff used more than 467 unique, shortened URLs to drive traffic to the NTSB's online content, generating more than 120,580 clicks.

The division has focused on increasing the amount of its content that features compelling imagery to capitalize on trends in digital communication. More than 57 percent of NTSB News Releases and 13 percent of NTSB_Newsroom tweets issued in FY 2017 contained imagery.

The Media Relations Division also developed and delivered a 1-hour media relations refresher training, which will be offered as a webinar to all NTSB employees in FY 2018. During FY 2017, 852 industry and NTSB personnel received media relations training from division staff, significantly enhancing staff relationships with industry spokespersons as well as the NTSB's ability to communicate during investigations.

Government and Industry Affairs Division

The Government and Industry Affairs Division initiated outreach to congressional, federal, state and local officials who have expressed an interest in improving transportation safety, arranging numerous briefings and responding to requests for information regarding NTSB investigations and safety issue areas. Staff coordinated the review of and provided technical and draft assistance on legislation addressing vessel traffic safety and airman certificate appeals.

Staff prepared NTSB Board Members to testify at three congressional hearings to provide information regarding Washington Metropolitan Area Transit Authority (WMATA) safety

oversight, commercial trucking safety, and highway safety. The division also supported Board Member and senior official testimonies and legislative advocacy efforts before state legislatures regarding alcohol impairment in Utah, distracted driving in Texas, and motorcycle safety in Delaware. Staff was also involved in preparations for the presidential transition, and provided support for Board Member confirmation.

In FY 2017, the division supported 11 accident launches on scene, as well as additional major launches and some GA regional investigations from headquarters. As each of these investigations continues, this division is the main point of contact for additional outreach to, and inquiries from, Congress and state and local officials.

Transportation Disaster Assistance Division

In FY 2017, TDA staff launched two aviation accidents, one of which met the requirements of the Aviation Disaster Family Assistance Act of 1996 (49 U.S.C. sections 1136 and 41113), four highway accidents, and a pipeline accident investigation. Staff provided non-launch support for an additional 284 domestic aviation accidents, nine international aviation accidents, 17 rail accidents, 14 highway accidents, five marine accidents, and four pipeline accidents. Staff managed an average of 32 cases per week.

TDA also assisted family members of transportation accident victims and served as a technical resource for the Chairman and Board Members regarding family member attendance at two investigative hearings and seven Board meetings.

During this reporting period, TDA participated in 46 outreach training events, resulting in direct contact with approximately 3,228 participants. Staff also organized seven web conferences, reaching approximately 426 participants. TDA responded to inquiries for information from 11 international agencies and organizations, 33 other US federal agencies and departments within agencies, 38 state and local agencies, 99 transportation industry organizations, and 7 professional organizations, educational institutions, and other aid organizations. TDA engaged in an average of 16 outreach activities per week requiring either travel or remote interaction with the family assistance response community.

In collaboration with the NTSB Training Center, TDA organized TDA 301: Family Assistance, a 2.5-day course that provided an overview of family assistance operations associated with transportation disasters. The first offering of the course, in April 2017, served 41 representatives of industry; local, state, and federal agencies; and other entities interested in family assistance operations. TDA participated in five additional training courses hosted by the NTSB Training Center, resulting in direct contact with 224 course participants.

During this reporting period, staff collaborated with the DOT, the FRA, Amtrak, and the American Red Cross to complete a post-accident assessment of the May 12, 2015, crash of Amtrak Northeast Regional Train #188, as required by Public Law 114-95 (the FAST Act), Section 11410. The NTSB's contributions to the post-accident assessment focused primarily on the family assistance operation and the challenges faced during the response to this accident.

Digital Services Division

In FY 2017, Digital Services completed more than 800 requests for information via the web, social media, or visual media (graphics, publications, video). Staff supported 10 major accident investigation launches, 24 Board Meetings, and various public forums, symposia, and other events. Staff also managed outgoing agency communications on the public website and the agency's five social media platforms, increasing engagement with the public and other stakeholders. Visual Information staff created over 350 graphic and video products for use in agency products and for the communication of key safety messages.

AVIATION SAFETY

	(\$000s)	FTEs
FY 2018 Estimate	\$31,748	126
FY 2019 Request	\$32,179	127
Increase/Decrease	\$431	1

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. An increase of 1 FTE is supported by this funding level. No other program changes are planned.

Program Description

The mission of the Office of Aviation Safety (AS) is to—

- Investigate all air carrier, commuter, and air taxi accidents and certain serious incidents; in-flight collisions; fatal and nonfatal GA accidents and serious incidents; UAS and public aircraft accidents and serious incidents; and commercial space launch/reentry accidents.
- Participate in the investigation of major airline crashes in foreign countries that involve US carriers, US-manufactured or -designed equipment, or US-registered aircraft to fulfill US obligations under ICAO agreements.
- Investigate safety issues that extend beyond a single accident to examine specific aviation safety problems from a broader perspective.

AS conducts investigative activities through five specialty divisions based in Washington, DC, and a regional investigation management structure consisting of four regions. Investigators are located throughout the country. International aviation activities are coordinated from the Washington, DC, office.

Major Investigations Division

The Major Investigations Division of AS performs these functions:

- Provides an investigator-in-charge (IIC) for air carrier domestic aircraft accident and incident investigations, certain public aircraft accidents and incidents, commercial space launch/reentry accidents, and UAS accident and incident investigations.
- Coordinates the preparation of comprehensive aviation accident and incident reports and manages aviation investigative hearings, forums, and conferences.

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- Coordinates and supervises the efforts of NTSB group chairmen and external investigation participants provided by industry, other government agencies, and foreign authorities (for US investigations involving foreign-operated, -registered, -manufactured, or -designed aircraft).
 - Provides accredited representatives to assist in the investigation of civil aviation accidents that occur in other countries. (The accredited representative informs domestic aviation interests of the progress of an investigation, while providing needed technical expertise, as requested, to foreign accident investigation counterparts, and informs FAA and US industry representatives of issues that may affect US aviation safety or the safety of aircraft or aircraft components manufactured in the United States.)
 - Develops NTSB investigative capabilities and agency strategy in new and innovative transportation industries to improve safety. Current areas of development include increasing NTSB comprehensive and technical proficiency in UAS accident and incident investigation as well as use for accident scene documentation and commercial space launch/reentry accident investigation.

As applicable for domestic accident and incident investigations, a specialist in operational factors, aviation engineering, human performance, survival factors, or other NTSB organizational elements may act as a group chairman on a major investigation to examine issues in his or her specialty area. Group chairmen lead their respective groups in the technical investigation of an accident under the direction of the IIC and produce a factual report that is placed in the NTSB public docket. They also produce analytical reports that are used in developing the draft accident report and proposed safety recommendations. NTSB technical specialists may also provide specialized assistance through the US-accredited representative in foreign accident and incident investigations.

Operational Factors Division

The Operational Factors Division examines issues related to air traffic control (ATC), flight operations, and meteorology, such as—

- ATC facilities, procedures, and flight handling, including developing flight histories and animations from air route traffic control centers and terminal facility radar records.
- Operations of the air carrier and airport; training, experience, and operational performance of flight crews; and FAA surveillance of flight operations.
- Meteorological/environmental conditions that may have caused or contributed to an accident, and pertinent meteorological products, procedures, and services provided by government and industry.
- Commercial space crewmember training, experience, and operational performance.

Aviation Engineering Division

The Aviation Engineering Division examines all issues related to powerplants, structures, systems, system safety, and maintenance, such as—

- Powerplant components, including the airworthiness of aircraft engines and propellers.
- Integrity of aircraft structures and flight controls, including the adequacy of design and certification.
- Airworthiness of aircraft flight controls and electrical, pneumatic, hydraulic, and avionics systems.
- Hazards and associated safety risks introduced by aircraft systems and equipment failures, including the adequacy of design and certification.
- Service history and maintenance of aircraft systems, structures, and powerplants.
- Airworthiness of helicopters, including powerplants, structures, and control systems.
- Commercial spacecraft engines, structure, and systems.

Human Performance/Survival Factors Division

AS human performance specialists assess the knowledge, experience, training, and physical abilities of those whose actions may have caused or contributed to an accident or incident. They review the adequacy of established procedures, examine work habit patterns and interrelationships among crewmembers and managers to assess organizational factors and safety culture, and investigate the ergonomics of equipment design and the potential effects of that design on operator performance. A human performance investigation may also include an assessment of sleep and rest cycles and drug or alcohol use.

Survival factors specialists examine factors that affect the survival of those involved in accidents, including the causes of injuries sustained by occupants of the aircraft or by others. They also examine safety procedures, search and rescue operations, crashworthiness, equipment design, emergency response and escape, crewmember emergency procedures training, and airport certification.

Writing and Editing Division

The Writing and Editing Division manages the development of and writes major aviation reports, as well as writes, analyzes, and edits accident briefs, safety recommendation reports, special investigation reports, safety alerts, responses to notices of proposed rulemaking, and general correspondence. The division also manages the NTSB's aviation accident database.

Regional Offices

Although many regional accident/incident investigations may be much smaller in scope than those led by IICs at the Washington, DC, headquarters, they are conducted in a similar manner. Often, a single aviation safety investigator (ASI) conducts the investigation, gathering detailed information and working with party representatives. During each investigation, ASIs consider ways to prevent similar accidents from occurring through a more immediate and informal solution (known as a safety accomplishment) or through the formal safety recommendation process. In addition, ASIs often provide support to major accident investigations and may identify accidents that have broader safety issues to be addressed in a forum, at a Board meeting, or through a special investigation report. In these cases, additional staff from headquarters are often assigned to assist ASIs in gathering the facts, developing the analysis, and drafting the final report.

See Appendix C for AS regional office coverage.

General Aviation Accident Investigations Division

The General Aviation Accident Investigations Division staff comprises recent college graduates selected from the Federal Pathways Program. They are responsible for investigating and documenting minor accidents (data collection investigations), conducting some nonfatal limited investigations and engine teardowns, and assisting with foreign accident notifications and investigations. This division has reduced the workload of more senior journeyman and senior accident investigators so that they can better focus on investigating more complex accidents, developing safety recommendations, conducting external industry safety outreach, and advocating safety initiatives.

Accomplishments and Workload

This office's accomplishments include the issuance of several products related to aviation safety arising from completed and ongoing investigations. Products completed October 1, 2016, through September 30, 2017, are highlighted below, together with information on other efforts and focus areas important to both the current and future mission of the agency.

Accident Reports

Accident reports, adopted by the Board, are issued for major accidents.

Collision With Terrain Promech Air Inc., de Havilland DHC-3 Ketchikan, Alaska June 25, 2015

On June 25, 2015, about 1215 Alaska daylight time, a single-engine, turbine-powered, float-equipped de Havilland DHC-3 (Otter) airplane, N270PA, collided with mountainous, tree-covered terrain about 24 miles east-northeast of Ketchikan, Alaska. The commercial

pilot and eight passengers sustained fatal injuries, and the airplane was destroyed. The airplane was owned by Pantechnicon Aviation, of Minden, Nevada, and operated by Promech Air Inc. of Ketchikan. The flight was conducted under the provisions of 14 *Code of Federal Regulations (CFR)* Part 135 as an on-demand sightseeing flight; a company visual flight rules (VFR) flight plan (by which the company performed its own flight-following) was in effect. Marginal VFR conditions were reported in the area at the time of the accident. The flight had departed about 1207 from Rudyerd Bay about 44 miles east-northeast of Ketchikan and was en route to the operator's base at the Ketchikan Harbor Seaplane Base, Ketchikan.

The NTSB determined that the probable cause of this accident was (1) the pilot's decision to continue visual flight into an area of instrument meteorological conditions, which resulted in his geographic disorientation and controlled flight into terrain, and (2) Promech's company culture, which tacitly endorsed flying in hazardous weather and failed to manage the risks associated with the competitive pressures affecting Ketchikan-area air tour operators, the company's lack of a formal safety program, and its inadequate operational control of flight releases.

Safety issues discussed in this report relate to the need for training program improvements for Ketchikan air tour operators that address pilot human factors issues, such as assessment of safe weather conditions, recognition of potentially hazardous local weather patterns, and operational influences on decision-making; the need for collaboration among Ketchikan air tour operators to identify and mitigate operational hazards through analysis of automatic dependent surveillance-broadcast data; the lack of conservative weather minimums for Ketchikan air tour operators; the lack of defined curriculum segments for controlled flight into terrain-avoidance training for all 14 *CFR* Part 135 operators; nuisance alerts from the Class B terrain awareness and warning system during tour operations; the limitations of older software and terrain database versions for the legacy Chelton Flight Systems FlightLogic electronic flight instrument system; the lack of minimum training requirements for operational control personnel and the lack of guidance for FAA inspectors for performing oversight of operational control training programs; the need for cruise industry awareness of schedule pressures associated with air tours sold as shore excursions; the lack of a requirement for an SMS for Part 135 operators; and the lack of a crash-resistant flight recorder system.

As a result of this investigation, the NTSB made recommendations to the FAA and the Cruise Lines International Association. The NTSB also reiterated three previously issued recommendations to the FAA.

Recommendations: 10 new, 3 reiterated
Report Adopted: April 25, 2017

**Loss of Control at Takeoff, Air Methods Corporation, Airbus Helicopters
AS350 B3e
Frisco, Colorado
July 3, 2015**

On July 3, 2015, about 1339 mountain daylight time, an Airbus Helicopters AS350 B3e helicopter, N390LG, registered to and operated by Air Methods Corporation, lifted off from the Summit Medical Center Heliport, Frisco, Colorado, and then crashed into a parking lot; the impact point was located 360 feet southwest of the ground-based helipad. The pilot was fatally injured, and the two flight nurses were seriously injured. The helicopter was destroyed by impact forces and a postcrash fire. The flight was conducted under the provisions of 14 *CFR* Part 135 on a company flight plan. Visual meteorological conditions (VMC) prevailed at the time of the accident.

The NTSB determined that the probable cause of this accident was Airbus Helicopters' dual-hydraulic AS350 B3e helicopter's (1) preflight hydraulic check, which depleted hydraulic pressure in the tail rotor hydraulic circuit, and (2) lack of salient alerting to the pilot that hydraulic pressure was not restored before takeoff. Such alerting might have cued the pilot to his failure to reset the yaw servo hydraulic switch to its correct position during the preflight hydraulic check, which resulted in a lack of hydraulic boost to the pedal controls, high pedal forces, and a subsequent loss of control (LOC) after takeoff. Contributing to the accident was the pilot's failure to perform a hover check after liftoff, which would have alerted him to the pedal control anomaly at an altitude that could have allowed him to safely land the helicopter. Contributing to the severity of the injuries was the helicopter's fuel system, which was not crash resistant and facilitated a fuel-fed postcrash fire.

Safety issues discussed in this report relate to the lack of a cockpit alert to pilots to indicate the loss of hydraulic boost to the pedal controls for AS350-series helicopters with a dual hydraulic system, the need for changes to the tail rotor flight controls of AS350-series helicopters with a dual hydraulic system to ensure pedal control hydraulic assistance and mitigate the possibility of pilot error during hydraulic system checks, the lack of readily available information for helicopter operators and customers regarding safety equipment and systems that would enhance a helicopter's crashworthiness, the need for crash-resistant fuel systems for helicopters not covered by the November 1994 fuel system crashworthiness requirements, and the lack of requirements to install, on smaller aircraft, flight recorder systems that protect recorded data from crash impact damage and postcrash fire damage.

As a result of this investigation, the NTSB made safety recommendations to the FAA, Airbus Helicopters, the European Aviation Safety Agency (EASA), the Association of Critical Care Transport, the Association of Air Medical Services, and the Air Medical Operators Association. The NTSB also reiterated two safety recommendations to the FAA.

Recommendations: 6 new, 2 reiterated
Report Adopted: March 28, 2017

The NTSB previously issued recommendations based on this accident that address the need for owners and operators of existing AS350 B3e helicopters and similarly designed variants to incorporate a crash-resistant fuel system into their rotorcraft. The impact forces were survivable for occupants, but fatal and serious injuries occurred from postcrash fires caused by an impact-related breach of the fuel tanks. As a result of these investigations, the NTSB issued safety recommendations to the FAA and EASA.

Stand-Alone Recommendations: 4 new
Stand-Alone Recommendations Adopted: March 23, 2016

**Crash During Nonprecision Instrument Approach to Landing, Execuflight
Flight 1526 British Aerospace HS 125-700A
Akron, Ohio
November 10, 2015**

On November 10, 2015, about 1453 eastern standard time, Execuflight flight 1526, a British Aerospace HS 125-700A, N237WR, departed controlled flight while on a nonprecision localizer approach to runway 25 at Akron Fulton International Airport (AKR) and impacted a four-unit apartment building in Akron, Ohio. The captain, first officer, and seven passengers died; no one on the ground was injured. The airplane was destroyed by impact forces and postcrash fire. The airplane was registered to Rais Group International NC LLC and operated by Execuflight under the provisions of 14 *CFR* Part 135 as an on-demand charter flight. Instrument meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan was filed. The flight had departed from Dayton-Wright Brothers Airport, Dayton, Ohio, about 1413 and was destined for AKR.

The NTSB determined that the probable cause of this accident was the flight crew's mismanagement of the approach and multiple deviations from company standard operating procedures, which placed the airplane in an unsafe situation and led to an unstabilized approach, a descent below minimum descent altitude without visual contact with the runway environment, and an aerodynamic stall. Contributing to the accident were Execuflight's casual attitude toward compliance with standards; its inadequate hiring, training, and operational oversight of the flight crew; the company's lack of a formal safety program; and the FAA's insufficient oversight of the company's training program and flight operations.

Safety issues discussed in this report relate to a lack of a requirement for flight data monitoring programs for 14 *CFR* Part 135 operators, a lack of a requirement for SMS programs for 14 *CFR* Part 135 operators, a lack of a nonprecision approach procedure for Hawker 700- and 800-series airplanes that meets stabilized approach criteria and defines "landing assured," a lack of a requirement for flight crew training on the continuous descent final approach technique, inaccuracy of data entered into weight-and-balance software, inadequate FAA surveillance of Part 135 operators, and inadequate cockpit voice recorder

(CVR) maintenance procedures. Safety recommendations were addressed to the FAA, Textron Aviation, and Hawker 700- and 800-series training centers.

Recommendations: 13 new
Report Adopted: October 18, 2016

Accident Briefs

Investigations resulting in accident briefs are more limited in scope than those leading to major accident reports, and have the primary purpose of determining probable cause. These briefs may be adopted by the Office Director under delegated authority or may be adopted by the Board. Not all completed briefs are included here. AS completed 1,196 briefs in FY 2017. The briefs below are examples of the accident briefs that were developed by our regional investigators and adopted by the Board.

Runway Overrun, Eastern Airlines flight 3452 Queens, New York October 27, 2016

On October 27, 2016, about 1942 eastern daylight time, Eastern Air Lines flight 3452, a Boeing 737-700, N923CL, overran runway 22 during the landing roll at LaGuardia Airport, Flushing, Queens, New York. The airplane traveled through the right forward corner of the engineered materials arresting system (EMAS) at the departure end of the runway and came to rest off the right side of the EMAS. The 2 certificated airline transport pilots, 7 cabin crewmembers, and 39 passengers were not injured and evacuated the airplane via airstairs. The airplane sustained minor damage. The charter flight was operating under the provisions of 14 *CFR* Part 121. Night instrument flight rules conditions prevailed at the airport at the time of the incident, and an instrument flight rules flight plan was filed for the flight, which had originated at Fort Dodge Regional Airport, Fort Dodge, Iowa, about 1623 central daylight time.

The NTSB determined that the probable cause of this accident was the first officer's failure to attain the proper touchdown point and the flight crew's failure to call for a go-around, which resulted in the airplane landing more than halfway down the runway. Contributing to the incident were the first officer's initiation of the landing flare at a relatively high altitude and his delay in reducing the throttles to idle, the captain's delay in manually deploying the speed brakes after touchdown, the captain's lack of command authority, and a lack of robust training provided by the operator to support the flight crew's decision-making concerning when to call for a go-around.

Recommendations: None
Brief adopted: September 18, 2017

**Midair Collision Between a Cessna 150M and a Lockheed Martin F-16CM
Moncks Corner, South Carolina
July 7, 2015**

On July 7, 2015, about 1101 eastern daylight time, a Cessna 150M, N3601V, and a Lockheed Martin F-16CM operated by the US Air Force collided in midair near Moncks Corner, South Carolina. The private pilot and passenger aboard the Cessna died, and the Cessna was destroyed in the collision. The damaged F-16 continued to fly for about 2 1/2 minutes, during which the pilot activated the airplane's ejection system. The F-16 pilot landed safely using a parachute and incurred minor injuries, and the F-16 was destroyed by its subsequent collision with terrain and postimpact fire. VMC prevailed at the time of the accident. No flight plan was filed for the Cessna, which had departed from Berkeley County Airport, Moncks Corner, South Carolina, about 1057, destined for Grand Strand Airport, North Myrtle Beach, South Carolina. The personal flight was conducted under the provisions of 14 *CFR* Part 91. The F-16 was operating on an IFR flight plan and had departed from Shaw Air Force Base, Sumter, South Carolina, about 1020.

The NTSB determined that the probable cause of this accident was the approach controller's failure to provide an appropriate resolution to the conflict between the F-16 and the Cessna. Contributing to the accident were the inherent limitations of the see-and-avoid concept, resulting in both pilots' inability to take evasive action in time to avert the collision.

The safety issue addressed in the associated safety recommendation report addressed educating controllers on the circumstances of the accident and the judgment errors made in this accident and in the midair collision in San Diego, California (described below).

Recommendations: 2 new
Brief Adopted: November 14, 2016

**Midair Collision Between a Cessna 172M and a North American Rockwell
NA265-60SC Sabreliner
San Diego, California
August 16, 2015**

On August 16, 2015, about 1103 Pacific daylight time, a Cessna 172M, N1285U, and an experimental North American Rockwell NA265-60SC Sabreliner, N442RM (call sign Eagle1), collided in midair about 1 mile northeast of Brown Field Municipal Airport (SDM), San Diego, California. The pilot (sole occupant) of N1285U and the two pilots and two mission specialists aboard Eagle1 died; both airplanes were destroyed. N1285U was registered to a private individual and operated by Plus One Flyers under the provisions of 14 *CFR* Part 91 as a personal flight. Eagle1 was registered to and operated by BAE Systems Technology Solutions & Services Inc., for the US Department of Defense as a public aircraft in support of the US Navy. No flight plan had been filed for N1285U, which had originated from Montgomery-Gibbs Executive Airport, San Diego, California. A mission flight plan had been filed for Eagle1, which had originated from SDM about 0830 and was returning to SDM. VMC prevailed at the time of the accident.

The NTSB determined that the probable cause of this accident was the local controller’s (LC) failure to properly identify the aircraft in the pattern and to ensure control instructions provided to the intended Cessna on downwind were being performed before turning Eagle1 into its path for landing. Contributing to the LC’s actions was his incomplete situational awareness when he took over communications from the LC trainee because of the high workload at the time of the accident. Contributing to the accident were the inherent limitations of the see-and-avoid concept, resulting in the inability of the pilots involved to take evasive action in time to avert the collision.

The safety issue addressed in the associated safety recommendation report addressed educating controllers on the circumstances of the accident and the judgment errors made in this accident and in the midair collision in Moncks Corner, South Carolina (described above).

Recommendations: 2 new
 Brief Adopted: November 14, 2016

Domestic Investigative Workload Summarized by State

The following table summarizes statistical information on domestic accident/incident investigations initiated from October 1, 2016, through September 30, 2017, by state. Investigation types are defined after the table.

State	Major Investigation	Field Investigation	Limited Investigation	Data Collection Investigation	Incident Investigation	Total
ALABAMA	0	2	9	7	0	18
ALASKA	1	12	25	49	0	87
ARIZONA	0	5	20	17	2	44
ARKANSAS	0	3	6	8	0	17
CALIFORNIA	0	29	55	67	7	158
COLORADO	0	2	20	11	1	34
CONNECTICUT	0	6	5	5	0	16
DELAWARE	0	1	2	1	0	4
DISTRICT OF COLUMBIA	0	0	0	0	1	1
FLORIDA	1	14	43	42	0	100
GEORGIA	0	10	17	14	0	41
HAWAII	0	2	2	5	0	9
IDAHO	0	1	11	20	0	32
ILLINOIS	0	3	6	12	2	23
INDIANA	0	4	12	7	0	23
IOWA	0	2	2	7	0	11
KANSAS	0	2	3	16	0	21
KENTUCKY	0	1	3	6	0	10

State	Major Investigation	Field Investigation	Limited Investigation	Data Collection Investigation	Incident Investigation	Total
LOUISIANA	0	4	11	2	1	18
MAINE	0	0	3	5	0	8
MARYLAND	0	1	3	6	1	11
MASSACHUSETTS	0	1	1	6	1	9
MICHIGAN	0	2	9	8	0	19
MINNESOTA	0	2	14	5	0	21
MISSISSIPPI	0	3	3	3	1	10
MISSOURI	0	4	15	11	0	30
MONTANA	0	0	8	4	1	13
NEBRASKA	0	1	3	5	0	9
NEVADA	0	1	9	20	1	31
NEW HAMPSHIRE	0	1	1	6	0	8
NEW JERSEY	1	3	10	10	0	24
NEW MEXICO	0	3	5	13	0	21
NEW YORK	0	3	12	11	3	29
NORTH CAROLINA	1	2	11	13	0	27
NORTH DAKOTA	0	1	3	1	0	5
OHIO	0	5	11	12	1	29
OKLAHOMA	0	3	10	7	0	20
OREGON	0	3	4	15	0	22
PENNSYLVANIA	0	5	12	18	0	35
RHODE ISLAND	0	0	2	0	0	2
SOUTH CAROLINA	0	1	9	3	0	13
SOUTH DAKOTA	0	1	1	3	1	6
TENNESSEE	0	3	6	12	1	22
TEXAS	0	17	52	40	1	110
UTAH	0	4	5	18	0	27
VERMONT	0	1	1	2	0	4
VIRGINIA	0	1	6	20	0	27
WASHINGTON	0	4	13	15	1	33
WEST VIRGINIA	0	2	2	2	0	6
WISCONSIN	0	6	10	11	0	27
WYOMING	0	2	4	8	0	14
Total	4	189	510	609	27	1339

Major Investigation: A major investigation is a significant event, involving the launch of a team consisting of an IIC and one or more NTSB investigators or the use of significant NTSB investigative resources. These accidents typically involve loss of life, multiple injuries, considerable property damage, a new aircraft design, or significant public interest.

Field Investigation: A field investigation requires at least one NTSB investigator to travel to the accident site and conduct a follow-up investigation. Field accidents typically involve at least one fatality in an airplane that is FAA certified in the “normal” category. This category also encompasses field investigations involving an aircraft that is operated by a federal, state, or local government.

Limited Investigation: This category represents NTSB investigations in which investigators do not travel to the scene. An FAA inspector documents the accident site, and an NTSB investigator conducts the remainder of the investigation from the office or during a follow-up examination. These accidents typically do not involve fatalities. This category also encompasses investigations involving an aircraft that is operated by a federal, state, or local government.

Data Collection Investigation: This category of investigation does not involve investigator travel and does not require significant investigative efforts. A brief report is completed for these investigations. These accidents must meet the following criteria:

- No fatalities or “critical” serious injuries.
- Statement from the pilot documenting that no mechanical malfunctions or safety issues were known.
- Lack of any obvious safety issues.
- Minimal public or industry visibility.

Incident Investigation: This category defines occurrences involving one or more aircraft in which there is a hazard or potential hazard to safety, but the event is not classified as an accident because of the degree of injury or the extent of damage, or because the circumstances of the injury or damage fall outside the definition of *aircraft accident* contained in 49 *CFR* 830.2. Incident investigations cover a broad range of events and may include the following:

- Damage to an aircraft that does not occur while passengers are on board.
- Runway incursion.
- Pilot deviation.
- Near midair collision.
- Aircraft malfunction.

When the NTSB conducts a full investigation of an incident, similar to an accident investigation, we determine probable cause. The NTSB focuses on those incidents that

involve safety issues of high potential consequence and/or are of a systemic, recurring nature. An incident investigation may involve investigator travel.

International Investigations

The United States is a signatory to the Chicago Convention on International Civil Aviation, which is administered by ICAO. The NTSB is charged with fulfilling the US obligation for accident and incident investigations in accordance with Annex 13 of this agreement in full coordination with the US Department of State.

The international investigative process is critical to maintaining aviation safety in the United States and throughout the world. When an aircraft operated by—or designed, manufactured, or registered to—a US company has been involved in an accident in a foreign state, NTSB participation in that investigation enables the United States to ensure the airworthiness and operation of its aircraft operated here in the United States and overseas. ICAO Annex 13 protocols also define the NTSB’s engagement with international authorities whose products or operations are involved in accidents within the United States. This international process of collaboration plays an important role in enabling the NTSB to identify safety concerns and issue appropriate recommendations. The NTSB has issued numerous safety recommendations that have resulted in safety improvements worldwide directly due to our participation in these foreign investigations.

Between October 1, 2016, and September 30, 2017, AS was notified of and assisted on 259 international investigations. Of these, investigators launched or traveled in support of 7 investigations. Several accidents, including these, required significant US involvement:

- On September 30, 2017, Air France flight AF66, an Airbus A380 flying from Paris, France, to Los Angeles, California, had the No. 4 engine’s inlet and fan rotor separate from the remainder of the engine. The airplane diverted to Goose Bay, Canada, for landing. The accident is being investigated by the French Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture of the engines.
- On September 5, 2017, Japan Airline flight JL6, a Boeing 777-300 flying from Tokyo, Japan, to New York, New York, experienced an engine failure after takeoff. The accident is being investigated by the Japan Transportation Safety Board. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture of the engines.
- On March 28, 2017, Peruvian Airlines flight 112 departed the right side of the runway at the Jauja, Peru Airport after landing and impacted the perimeter fence. The airplane was destroyed by postimpact fire, and the 141 passengers and 9 crewmembers were not injured. The accident is being investigated by the Peru Comisión de Investigación de Accidentes de Aviación. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture and design of the airplane.

- On March 14, 2017, a Sikorsky S-92 helicopter, Irish registration EI-ICR, crashed offshore near Blackrock Island, west of Blacksod Bay, Ireland. The four occupants were fatally injured, and the helicopter was destroyed. The helicopter, operated by the Irish Coast Guard, was repositioning for a search-and-rescue mission at the time of the accident. The Ireland Air Accident Investigation Unit is investigating the accident. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture and design of the helicopter and engines.
- On February 20, 2017, a Raytheon model B200 (King Air) airplane, Australian registration VH-ZCR, impacted a building and roadway shortly after takeoff from Essendon Airport, Victoria, Australia. A postimpact fire ensued. The pilot and four passengers were fatally injured, and the airplane was destroyed. The Australian Transport Safety Bureau is investigating the accident. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture and design of the airplane.
- On January 16, 2017, Turkish Airlines cargo flight TK6491 impacted terrain about 900 meters from the runway at Manas International Airport, Bishkek, Kyrgyz Republic after initiating a go-around. The airplane was destroyed, and the four crewmembers were fatally injured. The accident is being investigated by the Russian Interstate Aviation Committee. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture and design of the airplane.
- On November 28, 2016, LaMia flight LMI2933 impacted terrain about 15 nautical miles (nm) from the runway while on approach to Medellin, Colombia. The airplane was destroyed, and 71 of the 78 passengers and crewmembers onboard were fatally injured. The accident is being investigated by the Colombia Grupo Investigación de Accidentes. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture and design of the engines.

US Comments/Foreign Accident Reports

The NTSB completed comments on behalf of the United States on several international investigations in which the United States had significant involvement under Annex 13, including these:

Crash During Flight Test, Agusta Westland Tilt Rotor AW609 Tronzano Vercellese, Italy October 30, 2015

On October 30, 2015, an Agusta Westland tilt rotor AW609, crashed during a manufacturer's development flight test near Tronzano Vercellese, Italy. The two crewmembers onboard received fatal injuries. The Italian Agenzia Nazionale per la

Sicurezza del Volo investigated the accident. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture and design of the aircraft. The United States provided comments on the draft report in November 2016. The report was published May 10, 2017.

**Damage During Pushback, Boeing 737-800
Changi, Singapore
December 6, 2015**

On December 6, 2015, a Boeing 737-800, operated by SilkAir, was damaged during pushback at Changi Airport, Singapore. There were no injuries to any of the passengers or crewmembers onboard. The Singapore Transport Safety Investigation Bureau investigated the accident. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture and design of the airplane. The United States provided comments on the draft report in November 2016. The report was published on April 27, 2017.

**Engine Failure During Climb, Boeing 777-300
Changi, Singapore
June 27, 2016**

On June 27, 2016, a Boeing 777-300, operated by Singapore Airlines, experienced an engine failure during climb and subsequent fire after landing at Changi Airport, Singapore. The airplane was substantially damaged because of a fuel-fed fire. There were no injuries to the passengers or crewmembers. The Singapore Transport Safety Investigation Bureau is investigating the accident. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is the state of manufacture and design of the airplane. The United States provided comments on the draft report in December 2016. The report was published on February 27, 2017.

Investigative Hearings

Investigative Hearings are public hearings related to investigations in which the agency is authorized to obtain testimony under oath.

**Crash of Ravn Connect Flight 3153, Togiak, Alaska
Investigative Hearing
August 17, 2017**

The NTSB convened a 1-day hearing to discuss the ongoing investigation and to gather additional facts about the Togiak, Alaska, 14 *CFR* Part 135 commuter flight accident that occurred on October 2, 2016; the flight was operated by Hageland Aviation. Among the safety issues discussed at the investigative hearing were: operational control at Hageland Aviation, including its FAA oversight, organizational structure, policies and procedures, and training and guidance for operational control agents; pilot training and guidance related to deteriorating weather conditions to mitigate controlled flight into terrain risk, including

the incorporation of lessons learned from previous controlled flight into terrain accidents; and safety management, training, and oversight resources available to the Alaskan aviation community.

**Lockhart, Texas, Balloon Accident
Investigative Hearing
December 9, 2016**

The NTSB convened a 1-day hearing to discuss the ongoing investigation into the Lockhart, Texas, balloon accident and to gather additional facts. The hearing focused on operations of large, passenger-carrying balloons, balloon pilot training and decision-making, relevant weather factors, FAA regulation and oversight of commercial balloon operations, tour operator best practices, and relevant medical factors and certification requirements.

Safety Recommendation Reports

AS investigators often identify safety issues during field, limited, or incident investigations that warrant further scrutiny. Safety recommendation reports are used to make recommendations on issues identified during such investigations in which a major report is not warranted. Safety recommendation reports may be issued at any time during an accident investigation. If the Board determines that a recommended course of action requires immediate attention to avoid imminent loss of life due to a similar accident, we designate the safety recommendation “Urgent.” In FY 2017, AS developed safety recommendation reports for issuance by the Board on these topics:

Spool Bearing Failures in Rolls-Royce 250-series Engines

This recommendation is intended to prevent failures of spool bearings installed in the power turbine governors of certain Rolls-Royce (formerly Allison) 250-series engines. It is derived from the NTSB’s investigation of a fatal accident in which an MD Helicopters 369E helicopter, N629JK, impacted trees and terrain following a loss of engine power near Reedsville, Wisconsin.

Recommendation: 1 new
Report Adopted: June 5, 2017

Preventing Catastrophic Failure of Pratt & Whitney Canada JT15D-5 Engines Following Birdstrike or Foreign Object Ingestion

This recommendation addresses catastrophic failures of Pratt & Whitney Canada JT15D-5 engines installed on Beechcraft Beechjet 400A airplanes following a birdstrike or foreign object ingestion. It is derived from three NTSB investigations of incidents in which liberated fan blades breached engine cases and cowlings after bird species well below the weight required for certification testing were ingested. Subsequent testing and analysis

identified a failure mode in the event of a birdstrike or foreign object ingestion at a certain engine speed.

Recommendation: 1 new
Report Adopted: February 28, 2017

Uncommanded Nosewheel Steering Anomalies During Landing in Embraer EMB-145 Regional Jets

These recommendations are derived from our investigations, as well as our participation in foreign-led investigations, of several runway excursion events involving uncommanded nosewheel steering anomalies during landing in Embraer EMB-145 regional jets. The investigations found that manufacturers' acceptance tests may not be effective at detecting foreign object debris that may cause uncommanded nosewheel steering anomalies; the manufacturing process may not be robust enough to identify quality control problems; a binder mounted on an unapproved bracket may interfere with steering; and a lack of simulator training exists for nosewheel steering anomalies.

Recommendations: 5 new
Report Adopted: February 1, 2017

Unsafe Wiring Conditions in Piper Model PA-31T-Series Airplane Floor-Mounted Circuit Breaker Panels

This recommendation is intended to detect and correct unsafe wiring conditions that could lead to chafing, thermal stress, or arcing in the area directly below the floor-mounted circuit breaker panel in Piper Aircraft Inc. model PA-31T-series airplanes. It is derived from an ongoing investigation of an accident in which a Piper PA-31T broke up in flight and crashed shortly after the pilot reported smoke in the cockpit.

Recommendation: 1 new (Urgent)
Report Adopted: January 5, 2017

Preventing Incorrect Installation of the Beta Arm in Pratt & Whitney Canada PT6A Engines

These recommendations are intended to prevent the incorrect installation of the reversing lever (beta arm) and related components in PT6A engines, which can cause the propeller to transition uncommanded to feather in flight. They are derived from investigations in which the beta arm or related components were found incorrectly positioned. The recommendations address short-term inspections and long-term redesign of the guide pin assembly.

Recommendations: 2 new
Report Adopted: December 5, 2016

Weather Information Dissemination

These recommendations address weather information dissemination and are derived from recent accident investigations that revealed that some critical weather information is not being made available to air traffic controllers and, ultimately, to airborne pilots in need of timely, accurate weather information. Further, when weather information is not readily available to air traffic controllers, many air traffic controllers and their supervisors are unfamiliar with how to solicit alternate sources of weather information.

Recommendations: 4 new
Report Adopted: October 27, 2016

Special Investigations

Special investigations usually involve analysis of data from multiple accidents related to a common safety issue.

Improving Pilot Weather Report Submission and Dissemination to Benefit Safety in the National Airspace System

The NTSB investigated several recent incidents and accidents and engaged in discussions with members of various pilot weather report (PIREP) user groups that revealed deficiencies in the handling of PIREP information that had resulted in delays, errors, and data losses. These types of issues can play a role in the complex interaction of events and conditions that lead to aircraft accidents. Specifically, between March 2012 and December 2015, the NTSB investigated 16 accidents and incidents that exposed PIREP-related areas of concern. This special investigation report describes the two broad categories of issues that reduce the effectiveness of PIREPs: submission issues and dissemination issues.

The NTSB made safety recommendations to the FAA, the National Weather Service, the National Air Traffic Controllers Association, the Aircraft Owners and Pilots Association Air Safety Institute, the Aviation Accreditation Board International, the National Association of Flight Instructors, the Society of Aviation and Flight Educators, and the Cargo Airline Association.

Recommendations: 19 new
Report Adopted: March 29, 2017

Safety Alerts

Safety alerts are brief information sheets that pinpoint a particular safety issue. They are primarily used to alert the GA community, which may not otherwise be reached through safety recommendations, of safety issues identified during multiple investigations. Safety alerts provide information on the problem, examples of accidents, what pilots can do to avoid making the same mistakes, and references for pilots to find additional information. These alerts are posted on the NTSB website, and brochures are distributed at outreach

events that staff attends throughout the year. In FY 2017, AS developed the following safety alerts for issuance by the Board:

- **Do Your Takeoff Homework; Runway Length Matters: Understanding the potential hazards of intersection takeoffs.** Typically used to save time, intersection takeoffs are a common practice in aviation, especially in general aviation operations. However, pilots may not fully understand the potential risks associated with conducting intersection takeoffs. If an aircraft experiences a problem while conducting an intersection takeoff, the available runway remaining to abort the takeoff or perform an emergency landing is reduced or eliminated, resulting in greater risk of injury or aircraft damage. This safety alert encourages pilots to eliminate time pressures, know their aircraft's performance, communicate, and use the full runway length if able. (Adopted: September 12, 2017)
- **Mechanics: Prevent Carbon Monoxide Poisoning and Pilots: Prevent Carbon Monoxide Poisoning: The risk of carbon monoxide poisoning is overlooked and underestimated!** Carbon monoxide (CO) is a colorless, odorless, tasteless gas by-product of internal combustion engines found in exhaust gases. Sufficiently high levels of CO in the bloodstream will lead to oxygen starvation and the onset of symptoms (such as headaches, drowsiness, nausea, or shortness of breath). Many internal combustion engine airplanes are heated by air that has been warmed by circulating air around the exhaust system using a heater shroud. A defect or leak in the exhaust pipes or muffler can introduce CO into the cockpit. Cracks in exhaust/heater mufflers and tubes and unplugged holes in the firewall can go unnoticed during inspections and lead to CO entering an airplane's cabin during flight. Degraded door and window seals or leaks in the air ducting can also allow CO into the cabin. These two safety alerts seek to encourage mechanics and pilot to inspect exhaust systems regularly, install CO alerting systems in the cabin, and, for pilots, to land immediately if there is concern about exposure. (Adopted: September 11, 2017)
- **Flight Helmet Cords Can Impede Egress: Understand the hazard of direct-to-airframe cord connections.** In the event of an accident or emergency in which an aircraft occupant wearing a flight helmet needs to egress quickly (such as a ditching, water impact, or fire), fast and unimpeded egress from the aircraft is essential for survival. Direct-to-airframe intercommunication system (ICS) cord connections between the flight helmet and the airframe can impede egress during an accident or emergency. The cord connecting the flight helmet to the aircraft's ICS might not release readily from the airframe ICS port if the direction of egress is contrary to the direction needed to easily release the cord. This safety alert encourages pilots to ensure proficiency in egress procedures and to install an intermediate cord for quick release. (Adopted: September 5, 2017)
- **Flying on Empty: Prevent the preventable with careful fuel management.** Within fuel-related accidents, fuel exhaustion and fuel starvation continue to be leading causes. From 2011 to 2015, an average of more than 50 accidents per year

- occurred because of fuel management issues. Fuel exhaustion accounted for 56 percent of fuel-related accidents, and fuel starvation was responsible for 35 percent. More than 66 percent of fuel management accidents occurred on flights for which the intended destination airport was different from the departure airport. About 80 percent of all fuel management accidents occurred during the day in visual meteorological conditions; only 15 percent occurred at night. Almost half of pilots involved in fuel management accidents hold either a commercial or air transport pilot certificate (48 percent); pilots holding private or sport pilot certificates make up 50 percent. Only 2 percent of accidents involved student pilots. Pilot complacency and overestimation of flying ability can play a role in fuel management accidents. This safety alert reminds pilots of the need to always be aware of the airplane's fuel level, know their airplane's fuel gauges and its fuel burn rate, and stop and refuel. (Adopted: August 17, 2017)
- **Pilot Weather Reports (PIREPs): Pay It Forward: More and better PIREPs enhance safety for all.** Sparse reporting and inaccurate or incomplete information adversely affect the usefulness of PIREPs (brief reports from pilots describing observed in-flight weather conditions) for improving weather forecasts and advisories and helping pilots avoid weather hazards. Pilots submit relatively few PIREPs compared to overall traffic volume. In addition, PIREPs often contain inaccurate or incomplete information. This safety alert encourages pilots to submit precise pilot reports when workload permits and directs pilots to reference information to help them use standard terminology and submit them in a method that is most appropriate for the situation. (Adopted: June 26, 2017)
 - **Loss of Tail Rotor Effectiveness in Helicopters: Be alert for uncommanded yaw so you don't get caught off guard!** In helicopters, loss of tail rotor effectiveness (LTE), or unanticipated yaw, is an uncommanded rapid yaw that does not subside of its own accord. LTE can occur in all single-engine, tail rotor-equipped helicopters at airspeeds lower than 30 knots and, if uncorrected, can cause the pilot to lose helicopter control, potentially resulting in serious injury or death. Various factors can contribute to LTE, including varying airflow from the main rotor blades (particularly at high power settings) or from the environment, which can affect the airflow entering the tail rotor; operating at airspeeds below translational lift; operating at high altitudes and high gross weights; operating near large buildings or ridgelines, which can cause turbulence; and the relative wind direction. This safety alert provides information to pilots to help them avoid LTE. (Adopted: February 28, 2017)
 - **Stay Centered: Preventing loss of control during landing.** Loss of control (LOC) during landing is one of the leading causes of GA accidents and is often attributed to operational issues. Although most LOC during landing accidents do not result in serious injuries, they typically require extensive airplane repairs and may involve potential damage to nearby objects, such as fences, signs, or lighting. Wind often plays a role in these accidents. Landing in a crosswind presents challenges for pilots of all experience levels. Other wind conditions, such as gusting wind, tailwind,

variable wind, or wind shifts, can also interfere with a pilot's ability to land the airplane and maintain directional control. The safety alert reminds pilots to always be aware of the weather and to maintain positive control of the airplane when landing. (Adopted: January 17, 2017)

- **Prevent Midair Collisions: Don't depend on vision alone.** The see-and-avoid concept has long been the foundation of midair collision prevention. However, the inherent limitations of this concept, including human limitations, environmental conditions, aircraft blind spots, and operational distractions, leave even the most diligent pilot vulnerable to the threat of a midair collision with an unseen aircraft. Technologies in the cockpit that display or alert of traffic conflicts, such as traffic advisory systems and automatic dependent surveillance–broadcast (ADS-B), can help pilots become aware of and maintain separation from nearby aircraft. Such systems can augment reality and help compensate for the limitations of visually searching for traffic. This safety alert promotes the use of technologies to aid in collision avoidance. (Adopted: November 14, 2016)
- **Helicopter Landing Sites: Free from debris.** Unsecured or improperly secured foreign object debris (FOD)—such as towels, ropes, equipment covers, or hats—at helicopter landing sites can be blown about during main rotor system downwash and upwash and can interfere with the main or tail rotor systems, which can lead to a loss of helicopter control. This safety alert is intended to remind pilots of the importance of identifying FOD before landing and selecting an appropriate landing site. (Adopted: October 27, 2016)
- **Take Time to Torque: Apply proper torque to prevent accidents.** From 2009 to 2015, over 45 accidents and incidents occurred from maintenance personnel applying improper torque to engine fasteners during engine maintenance activities, leading to internal engine damage and subsequent engine failures and accidents or incidents. Applying too little or too much torque can cause a bolt to fail and/or the nut and bolt threads to become stripped, which allows the fastening hardware to loosen. This safety alert is intended to reinforce to mechanics the need to properly torque fasteners and eliminate those with excessive wear. (Adopted: October 20, 2016)

Public Forums

Public Forums are public proceedings generally organized in a question-and-answer format with various invited participants who may make presentations and may be questioned individually or in a panel by the Board or designated NTSB staff.

Runway Incursion Safety Issues, Prevention, and Mitigation Public Forum September 19-20, 2017

The NTSB convened a 2-day public forum to focus attention on and raise awareness of runway incursion safety issues, to promote and facilitate dialogue among government and industry officials to better define the issues, and to determine how to effectively address these issues to improve safety.

Experts from other federal agencies, airlines, and industry associations made presentations on runway incursion statistics and trends, air traffic control, operations, and airports. A roundtable was held at the end of the presentations to facilitate discussion among all the participants.

Other Efforts and Focus Areas

Preventing Loss of Control in General Aviation: Lessons Learned from NTSB Accident Investigations Safety Seminar Ronkonkoma, New York September 9, 2017

Nearly half of fatal GA accidents in the New York/tri-state region since 2012 were caused by LOC. LOC involves an aircraft's unintended departure from controlled flight due to a variety of reasons, such as pilot distraction or loss of situational awareness, or even weather. The circumstances for these accidents are often repeated over time, and too many preventable crashes are occurring. This seminar discussed LOC, its causes, and how to avoid LOC in flight. NTSB investigators presented local accident case studies occurring in New York and the surrounding areas, and experts from the FAA and the Aircraft Owners and Pilots Association offered their perspectives on this critical safety issue.

Loss of Control Lessons Learned Safety Seminar Anchorage, Alaska November 5, 2016

LOC is a leading cause of GA accidents, and preventing LOC in flight within the GA community is on the NTSB's Most Wanted List of Transportation Safety Improvements. Due to terrain and weather issues, pilots in Alaska face more flying challenges, increasing the risk of LOC accidents. From 2011 through September 2016, the NTSB investigated 76 GA accidents in Alaska involving LOC in flight that resulted in 31 fatalities and 38 injuries.

The NTSB partnered with the Alaskan Aviation Safety Foundation to put on a seminar for pilots in Alaska that highlighted the problem, identified its causes, and used case studies to identify strategies and solutions to preventing it, including technology and improved pilot skills for handling various stall scenarios.

**Pilot Impairment
Safety Seminar
NTSB Training Center
October 15, 2016**

The NTSB presented to pilots the risks of impairment to them by over-the-counter and prescription medications. Attendees heard presentations from the FAA and the NTSB staff regarding drug use trends revealed by accident investigations, as well as resources available to pilots to assist in their decision-making and training.

**NTSB ADMS
Software Upgrades and Improvements and Expansion to M-ADMS**

The NTSB maintains the aviation ADMS for the storage, retrieval, and management of information associated with our aviation accident/incident investigations. NTSB ASIs use the aviation ADMS interface to initialize a new case record for each investigation, and subsequently manage that case through various report development milestones until the release of a final report with findings of probable cause. NTSB staff relies on data from the aviation ADMS to monitor workflow, conduct safety research, support accident investigations, produce annual statistical reviews, respond to congressional requests, and provide Board Member support. These data are also used to fulfill the United States' reporting requirements to ICAO. Other government agencies, industry organizations, and individuals regularly use the data for safety research. ADMS is also a key data source used in AS's data analytics program initiative described below. During this fiscal year, AS will continue enhancements to improve the efficiency of associated processes and the accuracy of its data. Such work includes the following:

- Improving data reporting capabilities to help ensure effective oversight and use of limited investigative resources.
- Expanding system search capabilities to allow investigative staff to more easily find relevant cases and safety issue areas.
- Developing automatic system notifications to meet the United States' reporting requirements to ICAO, helping to minimize the administrative burden on investigative staff.
- Beginning work to enable mobile access to the office's ADMS.

The NTSB has begun some exploratory work evaluating and documenting requirements that would allow for the development of an expanded M-ADMS as funding becomes available. An M-ADMS is an enterprise line-of-business application that would encompass

the workflow and case management of an NTSB investigation for all modal offices, resulting in consolidation and standardization of processes and accident and incident data. Further information on the costs of the M-ADMS and the benefits it will provide can be found in the “Evidence and Evaluation Capability” section.

Data Analytics

Program Development

AS has embarked on a proof-of-concept initiative to explore ways to address emerging safety risks and opportunities by using advanced data analytics capabilities in conducting our safety business. To date, this proof-of-concept initiative has conducted market surveys on required tools and is developing two examples to demonstrate the use of dashboards to evaluate accident trends and monitor NTSB performance outcomes associated with: (1) fuel management related accidents; and (2) accidents involving operations conducted under 14 *CFR* Part 135. As part of this initiative, the NTSB is also pursuing partnerships with other government agencies and private industry to gain broader access to safety-related aviation databases and leverage cost and knowledge-sharing strategies for needed tools analysis methods. Further information on the costs and benefits of the data analytics program can be found in the “Evidence and Evaluation” section of this report.

Commercial Space Transportation

Program Development

The NTSB has been involved in commercial space investigations for over 30 years. In 2015, the agency completed the investigation of the first fatal commercial space launch accident, SpaceShip2, and completed the investigation into a Pegasus launch anomaly in 1993. In addition, since the mid-1980s, the NTSB has assisted in multiple other space investigations, including the Challenger Space Shuttle accident in 1986, the Titan II launch anomaly in 1988, the Columbia Space Shuttle accident in 2003, and the Genesis spacecraft mishap in 2004.

However, the growth of non-federal, commercial space transportation operations has continued to accelerate under the oversight of the FAA’s Office of Commercial Space Transportation. Since 1989, there have been approximately 264 FAA-licensed launches, and according to the FAA’s *Commercial Space Transportation Forecasts* report, projections show that the growth of new commercial launch service providers for both cargo and human spaceflight transportation will continue to increase through the year 2021.

To prepare for this increasing number of commercial space launches and reentries, the NTSB has been developing specific and comprehensive policies and procedures to ensure that the agency is positioned to effectively investigate accidents in this burgeoning industry. The Major Investigations Division is working to establish strong relationships with numerous commercial space stakeholders, and the agency has invested a significant amount of time and funding to train our cross-division group of commercial space investigators. The pace of these activities is limited by available resources; the costs and

benefits of increased investment in this program are detailed in the “Emerging Transportation Technologies” section of this report.

UAS Program Development

The use of civil UAS, particularly small UAS (sUAS), is growing rapidly, along with many recent regulatory changes concerning their operation. In particular, the FAA and the DOT’s Office of the Secretary issued a final rule that adds the new Part 107 to 14 *CFR* regarding the operation of sUAS. The FAA also recently issued a new “blanket Certificate of Waiver or Authorization” for commercial Section 333 and public aircraft operators. Although the NTSB has already investigated a number of UAS accidents and incidents since 2006, we expect that these new FAA regulations and authorizations will result in a significant increase in the number of UAS operations in the National Airspace System and, therefore, an increased risk of accident and incident occurrences involving unmanned aircraft in the future. The NTSB requires operators of any civil UAS, other than those operated for hobby or recreational purposes, to report all accidents and certain incidents based on requirements contained in 49 *CFR* Part 830. Because the NTSB is charged with investigating UAS accidents and serious incidents, we must maintain investigator education and technical proficiency with this emerging segment of aviation.

The agency is also exploring the innovative use of UAS technologies to facilitate on-scene investigation work. sUAS-mounted remote sensors and video could offer substantial benefits in finding and documenting wreckage and impact scars, particularly for aviation, rail, highway, and marine accidents that occur in hazardous or remote locations. We believe such technology could improve the efficiency of on-scene work as well as offer enhancements to the quality of investigative data. To evaluate these potential benefits, AS is currently leading a proof-of-concept project to demonstrate the use of UAS for on-scene documentation in all modes of transportation that the NTSB investigates; we expect this proof-of-concept project to continue into FY 2018 as standard operating procedures and image documentation and analysis methods are developed and refined. In FY 2019 and beyond, the NTSB expects to fully deploy UAS technology for accident investigation use, and we will need to acquire assets, analysis tools, and training to fully implement the technology in all our modal investigations.

A UAS program plan has been created to layout the overall strategy for UAS engagement in our investigation of UAS-involved accidents and incidents and our use of UAS technology as an investigative tool over the next 3 years. Additional resources are required to fully develop this program; the costs and benefits are outlined in the “Emerging Transportation Technologies” section of this report.

Ongoing Significant Aviation Accident and Incident Investigations

Location	Date	Description	Fatalities
San Francisco, CA	07/07/2017	Airbus A320 wrong surface flyover	0
Teterboro, NJ	05/15/2017	Learjet 35 crash short of runway on approach	2
Charleston, WV	05/05/2017	Cargo airplane runway departure after landing	2
Ypsilanti, MI	03/08/2017	MD-83 runway overrun	0
Fort Lauderdale, FL	10/28/2016	DC-10 landing gear collapse	0
Chicago, IL	10/28/2016	GE CF6-80 engine uncontainment on Boeing 767	0
Lockhart, TX	07/30/2016	Balloon impact with powerlines	16
Italy, TX	07/06/2016	Bell helicopter test flight and impact with terrain	2
Fort Lauderdale, FL	10/29/2015	Fire during taxi for takeoff	0

Note: We are devoting significant resources to the accident investigations listed and anticipate producing an accident report or brief for adoption upon the completion of each investigation.

HIGHWAY SAFETY

	(\$000s)	FTEs
FY 2018 Estimate	\$7,706	30
FY 2019 Request	\$8,326	31
Increase/Decrease	\$620	1

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. An increase of 1 FTE is supported by this funding level. No other program changes are planned.

Program Description

The Office of Highway Safety (HS) investigates accidents that have a significant effect on public confidence in highway transportation safety, highlight national safety issues, or that generate high public interest and media attention. Such accidents may include collapses of highway bridge or tunnel structures, mass casualties and injuries on public transportation vehicles (such as motorcoaches and school buses), and collisions at highway–railroad grade crossings. HS is also interested in accidents that involve new safety issues or technologies (such as automated vehicles), and conducts special studies based on trends emerging from NTSB accident investigations and from research and data that identify common risks or underlying causes of crashes, injuries, and fatalities.

The NTSB is the only organization that performs independent, comprehensive, and transparent multidisciplinary investigations to determine the probable causes of highway accidents, with the goal of making recommendations to prevent similar accidents. Our investigations result in recommendations that, if implemented, reduce or eliminate the risks identified in the investigations and provide policymakers with unbiased analysis.

HS comprises the Investigations Division and the Report Development Division.

Investigations Division

The HS Investigations Division manages the multidisciplinary go-teams launched to accident sites to collect the factual and develop the analytical information for investigations. Currently, major HS accident investigations are conducted by one of three teams, with six investigators on each team. Each team consists of an investigator in charge and five investigators with expertise in vehicle, highway, human performance, survival, and motor carrier factors. The teams are supported by a crash reconstructionist and a National Resource Specialist (for a total of 20 investigators). To enhance geographic coverage and reduce response time, team members are located throughout the country,

including in California, Colorado, Delaware, Maine, Massachusetts, Texas, Washington, and Washington, DC.

HS staff is also augmented by personnel from other NTSB offices who provide expertise in vehicle simulations, medical issues, occupant protection, fire science, metallurgy/materials, hazardous materials, statistical data analysis, video analysis, communications (accident notification), public/government/family affairs, legal issues, and recommendation follow-up.

Report Development Division

The HS Report Development Division manages the development of accident investigation reports. Project managers and technical writer-editors review the contents of the docket provided by the investigators for accuracy and completeness, research and develop national highway safety issues based on this information, and write and edit the report. This division is also responsible for managing public hearings and forums on national highway safety issues.

Accomplishments and Workload

This office's accomplishments include issuance of products related to transportation safety arising from completed and ongoing investigations. Products completed October 1, 2016, through September 30, 2017, are highlighted below together with information on other efforts and focus areas important to both the current and future mission of the agency.

Accident Reports

Accident reports, adopted by the Board, are issued for major accidents.

Collision Between a Car Operating With Automated Vehicle Control Systems and a Tractor-Semitrailer Truck Williston, Florida May 7, 2016

At 4:36 p.m. eastern daylight time on Saturday, May 7, 2016, a 2015 Tesla Model S 70D car, traveling eastbound on US Highway 27A (US-27A), west of Williston, Florida, struck a refrigerated semitrailer powered by a 2014 Freightliner Cascadia truck-tractor. At the time of the collision, the truck was making a left turn from westbound US-27A across the two eastbound travel lanes onto NE 140th Court, a local paved road. The car struck the right side of the semitrailer, crossed underneath it, and then went off the right roadside at a shallow angle. The impact with the underside of the semitrailer sheared off the roof of the car. After leaving the roadway, the car continued through a drainage culvert and two wire fences. It then struck and broke a utility pole, rotated counterclockwise, and came to rest perpendicular to the highway in the front yard of a private residence. Meanwhile, the truck continued across the intersection and came to a stop on NE 140th Court, south of a retail business located on the intersection corner. The driver and sole occupant of the car died in the crash; the commercial truck driver was not injured.

The NTSB determined that the probable cause of the Williston, Florida, crash was the truck driver's failure to yield the right of way to the car, combined with the car driver's inattention due to overreliance on vehicle automation, which resulted in the car driver's lack of reaction to the presence of the truck. Contributing to the car driver's overreliance on the vehicle automation was its operational design, which permitted his prolonged disengagement from the driving task and his use of the automation in ways inconsistent with guidance and warnings from the manufacturer.

Safety issues addressed operational design domains for SAE International Level 2 vehicle automation, surrogate means of determining the automated vehicle driver's degree of engagement, event data recorders for automated vehicles, safety metrics and exposure data for automated vehicles, and connected vehicle technology and vehicle-to-vehicle requirements. Safety recommendations were made to the US Department of Transportation, NHTSA, manufacturers of vehicles equipped with Level 2 vehicle automation systems, the Alliance of Automobile Manufacturers, and the Association of Global Automakers. The NTSB also reiterated two recommendations to NHTSA.

Recommendations: 7 new, 2 reiterated
Report Adopted: September 12, 2017

**Motorcoach Collision With Crash Attenuator in Gore Area, US Highway 101
San Jose, California
January 19, 2016**

On January 19, 2016, about 6:37 a.m., a 2014 Motor Coach Industries International Inc. D4505 motorcoach, operated by Greyhound Lines Inc. and occupied by a driver and 21 passengers, was traveling north on US Highway 101 (US-101), in San Jose, California. The weather conditions were dark, with moderate-to-heavy rain and reported winds from the east-southeast at 20 mph. At the US-101 and State Route 85 (SR-85) interchange, the bus moved to the left and entered a 990-foot-long unmarked gore area that separates the US-101 lanes from the left exit high-occupancy-vehicle lane for SR-85. A crash attenuator with a missing retroreflective object marker was positioned at the end of the gore in advance of a concrete barrier. The bus driver maintained the vehicle's path through the gore and collided with the crash attenuator and the concrete barrier.

Following the impact, the bus traveled another 65 feet, rolled 90 degrees, and came to rest on its right side atop the concrete barrier, straddling two lanes of traffic. As a result of the crash, two passengers were ejected and died, and the driver and 13 passengers were injured.

The NTSB determined that the probable cause of the San Jose, California, crash was the failure of the California Department of Transportation to properly delineate the crash attenuator and the gore area, which would have provided improved traffic guidance. Contributing to the crash were the bus driver's error in entering the gore and the out-of-compliance signage, which affected traffic guidance. Contributing to the severity of the injuries was the lack of passenger seat belt use.

Safety issues addressed highway protection, markings, and signage; driver risk factor management and oversight; occupant protection, and collision avoidance systems. Safety recommendations were made to the Federal Highway Administration, the California Department of Transportation, Greyhound, and multiple motorcoach associations. Reiterated recommendations were issued to the Federal Motor Carrier Safety Administration, the National Highway Traffic Safety Administration, the state of California, and to Motorcoach Industries International Inc.

Recommendations: 11 new, 5 reiterated
Report Adopted: March 28, 2017

**Amphibious Passenger Vehicle DUCK 6 Lane Crossover Collision With Motorcoach on State Route 99, Aurora Bridge
Seattle, Washington
September 24, 2015**

On Thursday, September 24, 2015, about 11:11 a.m. Pacific daylight time, a 2005 DUCK 6 amphibious passenger vehicle (APV) was traveling north on the Washington State Route 99 (SR-99) Aurora Bridge in Seattle, Washington. At the same time, a 2009 Motor Coach Industries motorcoach was traveling south in the center lane. The DUCK 6 driver heard a loud noise at the left front of the APV; the vehicle drifted to the right and then veered left suddenly; the driver lost control of the vehicle. The APV crossed the center line into the southbound lanes of oncoming traffic and struck the motorcoach.

Three other vehicles were damaged during the event: a southbound 2011 Ram Trucks pickup truck and two northbound vehicles—a 2006 Toyota Highlander sport utility vehicle and a 2007 Toyota Tundra pickup truck. As a result of this crash, five motorcoach passengers died, and 71 motorcoach and APV occupants reported injuries ranging from minor to serious.

The NTSB determined that the probable cause of the Seattle, Washington, crash was the mechanical failure, due to improper manufacturing by Ride the Ducks International (vehicle manufacturer) and inadequate maintenance by Ride the Ducks of Seattle (operator), of the left front axle housing of the stretch APV DUCK 6, which resulted in loss of vehicle control. Contributing to the severity of the motorcoach occupant injuries was the APV's structural incompatibility with the motorcoach, causing intrusion into the motorcoach sidewall, windows, and interior passenger compartment. Contributing to the severity of the APV passenger injuries were the lack of occupant crash protections and the high impact forces.

Safety issues addressed safety-related defects and the recall process; oversight of APV maintenance and repairs; occupant protection in APVs, and risk management in APV operations. Safety recommendations were made to the National Highway Traffic Safety

Administration, the US Coast Guard, Ride the Ducks International, Ride the Ducks of Seattle, and the Passenger Vessel Association.

Recommendations: 10 new
Report Adopted: November 15, 2016

**Multivehicle Work Zone Crash on Interstate 75
Chattanooga, Tennessee
June 25, 2015**

On June 25, 2015, about 7:10 p.m., a 2007 Peterbilt truck-tractor in combination with a 2005 Great Dane semitrailer, operated by Cool Runnings Express Inc., was traveling northbound in the center lane of Interstate 75, near Chattanooga, Tennessee, when the driver did not respond to the slow-moving traffic ahead and collided with the rear of a 2010 Toyota Prius. Traffic had slowed near milepost 11.7 because of road construction and a work zone lane closure at milepost 12. The truck-tractor continued forward and collided with seven additional vehicles, forcing them into subsequent collisions. Six of the 18 vehicle occupants died and four were injured. A postcrash fire consumed one vehicle. The truck driver's trip had begun earlier that day, about 5:16 a.m., in Haines City, Florida. His destination was the carrier terminal in London, Kentucky.

The NTSB determined that the probable cause of the Chattanooga, Tennessee, crash was the truck driver's failure to respond to the slow-moving traffic within a work zone because of performance decrements likely associated with his fatigue and methamphetamine use. Contributing to the crash was the failure of the pre-employment screening process to identify driver risk factors. Contributing to the severity of the crash was the truck-tractor's high impact speed.

Safety issues addressed the truck driver's performance, current drug testing programs, inadequacies of driver license records and background checks, and truck overrepresentation in work zone crashes. Safety recommendations were made to the Federal Motor Carrier Safety Administration, the Kentucky Transportation Cabinet, the Idaho Transportation Department, the Tennessee Department of Transportation, and the Tennessee Highway Patrol. The NTSB also reiterated one recommendation to the Federal Highway Administration, and reiterated and reclassified one recommendation to the Federal Motor Carrier Safety Administration.

Recommendations: 7 new, 2 reiterated
Report Adopted: October 17, 2016

Accident Briefs

Investigations resulting in accident briefs are more limited in scope than those leading to major accident reports, and have the primary purpose of determining probable cause. These briefs may be adopted by the Office Director under delegated authority or may be adopted by the Board. Four briefs were completed in FY 2017.

Pickup Truck Collision With Multiple Bicycles Cooper Township, Michigan June 7, 2016

Approximately 6:29 p.m. (local time) on Tuesday, June 7, 2016, a 1996 Chevrolet pickup truck operated by a 50-year-old male was traveling northbound on North Westnedge Avenue in Cooper Township, Kalamazoo County, Michigan. The truck approached a northbound group of nine cyclists traveling in a single file line on the 4-foot-wide shoulder adjacent to the travel lane. The cyclists were part of a private bicycle group that was participating in a 28.5-mile recreational ride. The truck left the travel lane and went onto the shoulder, striking all nine cyclists in succession. The truck continued northbound for some distance before coming to final rest across a drainage ditch. The truck driver fled the scene but was later apprehended by responding officers. As a result of the collision, five cyclists died and four cyclists were seriously injured.

The NTSB determined that the probable cause of the Cooper Township, Michigan, crash was the impairing effects of the driver's polysubstance abuse in the hours before the crash.

Recommendations: None
Brief Adopted: April 25, 2017

Stand-Alone Safety Recommendation Letters related to this investigation issued prior to the Brief Adoption date are detailed in the related Stand-Alone Safety Recommendation Letter section below.

Passenger Vehicle Median Crossover Crash Robstown, Texas March 20, 2016

About 1:57 p.m. central daylight time on Sunday, March 20, 2016, a 2013 Hyundai Elantra passenger car (Hyundai) occupied by an 18-year-old driver and three passengers, ranging in age from 17 to 19, was traveling northbound in the left lane of US Highway 77 (US-77) in the city of Robstown, Nueces County, Texas.

This section of US-77 consisted of four lanes, divided by a 42-foot-wide median. The Hyundai began drifting left toward the center median and entered the median edge at a location that included a left-turn lane. Upon entering the median, the driver attempted to steer the vehicle back into the northbound lanes but ultimately lost control of the vehicle. The Hyundai crossed the center median and entered the southbound traffic lanes, where it collided with a 2009 Freightliner truck-tractor in combination with a 2014 flatbed

semitrailer (Freightliner). The driver of the Hyundai was seriously injured and all three passengers died. The driver of the Freightliner was not injured.

The NTSB determined that the probable cause of the Robstown, Texas, crash was the loss of control by the driver of the Hyundai, due to inattention resulting from fatigue.

Recommendations: None
Brief Adopted: December 28, 2016

**Train and Truck Crash on Railroad Right-of-Way and Subsequent Fire
Oxnard, California
February 24, 2015**

On Tuesday, February 24, 2015, in the predawn hours, Metrolink commuter train 102, operated by Amtrak, was en route from Oxnard, in Ventura County, California, to Los Angeles. As the train approached the South Rice Avenue grade crossing about 5:44 a.m., it collided with a 2005 Ford F450 service truck towing a 2000 Wells Cargo two-axle utility trailer. The truck driver had turned right from South Rice Avenue onto the Union Pacific Railroad (UP) track, and the truck became lodged on the track 80 feet west of the grade crossing. The train consisted of a cab/coach car in the lead, three coach cars, and a locomotive at the rear. It was occupied by three crew members (an engineer, a student engineer, and a conductor) and 51 passengers. As a result of the crash, the train engineer died, and 32 passengers and crew members were injured.

The NTSB determined that the probable cause of the Oxnard, California, crash was the truck driver's mistakenly turning onto the railroad right-of-way because of acute fatigue and unfamiliarity with the area.

Safety issues identified included navigation around grade crossings. Safety recommendations were directed to the multiple technology companies providing mapping services and the North American Cartographic Information Society.

Recommendations: 2 new
Brief Adopted: November 15, 2016

**School Bus Roadway Departure
Anaheim, California
April 24, 2014**

About 3:37 p.m. Pacific daylight time on Thursday, April 24, 2014, a 2012 Blue Bird 78-passenger All American school bus, operated by the Orange Unified School District in Anaheim, California, and occupied by a 24-year-old male driver and 11 students, ages 12-14 years old, was returning children home from the El Rancho Charter Middle School. The bus was traveling northbound in the 6500 block of Nohl Ranch Canyon Road in Anaheim. The posted speed limit was 35 mph, but the bus was traveling at a video-estimated speed of 43 mph when it left the roadway. The bus continued up an embankment where it struck a light pole and trees. As a result of the crash, the driver and

four students were seriously injured. Five students sustained minor injuries, and two students were uninjured.

The NTSB determined that the probable cause of the Anaheim, California, crash was the driver's loss of consciousness, resulting in his loss of control of the school bus, which departed the roadway and collided with a light pole and trees. Reducing the severity of passenger injuries in the area of maximum intrusion was the proper use of the available lap/shoulder belts by the student passengers seated in this area.

Safety issues identified included occupant protection and medical fitness to drive. New and reiterated safety recommendations were directed to the Federal Motor Carrier Safety Administration, the state of California, and school bus associations.

Recommendations: 1 new, 4 reiterated
Brief Adopted: October 11, 2016

Stand-Alone Safety Recommendation Letters (related to specific accident investigations)

Stand-Alone Safety Recommendation Letters may be issued at any time during an accident investigation. If the Board determines that the course of action recommended requires immediate attention to avoid imminent loss due to a similar accident, the safety recommendation is designated "Urgent." Noted in this section are Stand-Alone/Urgent Safety Recommendation Letters related to specific accident investigations, but issued apart from the report or brief.

Addressing 911 Communication Problems Cooper Township, Michigan June 7, 2016

As a result of the NTSB investigation of a crash between a pickup truck operated by an impaired driver and 9 bicyclists occupying the shoulder of a roadway in Cooper Township, Michigan, the NTSB identified a serious problem with communication among the agencies that received 911 notifications concerning pre-crash actions by the truck's driver. Consequently, the NTSB issued two safety recommendations to the State of Michigan and the Kalamazoo County Board of Commissioners.

Shortcomings of Driver Qualification Processes for Baltimore City Public Schools and of the Disqualified Driver Database for All Maryland School Districts Baltimore, Maryland November 1, 2016

As a result of the NTSB investigation of a head-on crash between a school bus and a transit bus in Baltimore, Maryland, the NTSB identified deficiencies with the oversight of school bus driver operations and qualifications by the city of Baltimore and by the Maryland State Department of Education. These deficiencies included (1) failure of Baltimore City Public Schools to adequately review or act in response to reports of previous crashes concerning

its school bus drivers, and (2) inconsistencies in the interpretation of state regulations on what conditions disqualify school bus drivers from employment and on when drivers should be entered into the state database of disqualified drivers. Consequently, the NTSB issued one safety recommendation to the State of Maryland and two safety recommendations to the Baltimore Public School System. One of the recommendations to the Baltimore Public School System was designated “Urgent.”

**Addressing Motorcoach Driver Seat Design to Prevent Separation in a Crash
San Jose, California
January 19, 2016**

As a result of an NTSB investigation of a motorcoach collision that occurred in San Jose, California, the NTSB identified a potential problem with the driver seat attachment. This Stand-Alone Safety Recommendation Letter describes the conditions under which the driver seat detached from the floor. Consequently, the NTSB issued one safety recommendation to the motorcoach manufacturer, Motor Coach Industries International Inc.

Special Investigations

Special investigations usually involve the analysis of data from multiple accidents centered around a common safety issue. Products of the special investigation process generally include a written report and stand-alone safety recommendations.

**Pedestrian Safety
Special Investigation Report**

A special investigation of pedestrian safety is currently underway. Fifteen investigations involving pedestrian fatalities have been initiated and are in the process of being completed. These investigations include crashes in Connecticut, the District of Columbia, Maine, Maryland, Minnesota, New York, Virginia, and Wisconsin.

Safety Alerts

Safety alerts are brief information sheets that pinpoint a particular safety issue. They contain information based on findings of investigations and enhance the dissemination of safety information to the traveling public.

**Drowsy Driving Among Young Drivers
February 2017**

According to research by the AAA Foundation for Traffic Safety, one in five fatal crashes involves a drowsy driver, and drivers aged 16 to 24 are at the greatest risk for being involved in a drowsy driving crash. The NTSB issued this safety alert because of the recurring problem of young drivers driving vehicles while fatigued. Many of these situations lead to catastrophic events that result in injuries and fatalities. The safety alert discusses the research associated with drowsy driving and provides young drivers and parents with guidance for proper sleep and greater awareness of the problem.

**Risk Assessment, Driver Distraction, and Seat Belts in Amphibious Passenger Vehicle Operations
November 2016**

APVs are large vessel/vehicle hybrids. Their design limits the driver’s field of vision when operating on land with respect to surrounding traffic and pedestrians. In addition, APV tours often operate in high-density urban areas with heavy traffic and high numbers of pedestrian intersections, or in high-speed areas. APV tour companies must weigh safety against sightseeing value in selecting an appropriate route. Many APV drivers conduct or narrate the tour, as well as operate the vehicle, which constitutes a distraction risk. Lastly, beginning in November 2016, all newly manufactured non-over-the-road buses, a category into which APVs fall by definition, are required to have seat belts. Although seat belts are necessary to protect APV passengers during the land portions of the tour, to mitigate the risk of impeding emergency marine egress, they must be unbuckled during the water portion of the tour. The NTSB issued this safety alert to educate and inform APV operators and permitting authorities.

Other Efforts and Focus Areas

Advanced Driver Assistance Systems – Strategies for Increasing Commercial Vehicle (Heavy-Duty Trucks) Adoption**Roundtable****Schaumburg, Illinois****July 24, 2017**

Advanced driver assistance systems (ADAS)—also known as collision avoidance technologies—can play a significant role in preventing crashes and saving lives. Although we have seen significant growth in the passenger vehicle market, adoption of ADAS technologies in the commercial vehicle market (heavy trucks) and among employer and rental fleets has been slow. A roundtable discussion, “Advanced Driver Assistance Systems: Strategies for Increasing Commercial Vehicle Adoption,” was co-hosted by the NTSB and the National Safety Council. This one-day event focused on heavy-duty trucking.

10th International Conference – Managing Fatigue**San Diego, California****March 20-23, 2017**

The NTSB and the Virginia Tech Transportation Institute co-hosted the 10th International Conference on Managing Fatigue. The main emphasis of the biennial conference is fatigue in transportation, with representation from such other sectors as natural resources, mining, health care, and the military. At the four-day conference, experts from around the world shared the latest findings on fatigue, its causes, and research on the efforts to manage and mitigate its effects. The theme of the conference was “Managing Fatigue to Improve Safety, Wellness, and Effectiveness.” Board Member Christopher Hart provided a capstone

address for the conference, which focused on NTSB investigations and recommendations to reduce fatigue-related accidents.

Reaching Zero Crashes: A Dialogue on the Role of Advanced Driver Assistance Systems
Panel Event and Roundtable
October 27, 2016

According to NHTSA, motor vehicle fatalities were 7.2 percent higher in 2015 than 2014—the highest year-over-year percentage increase in 50 years—and most of these deaths were preventable. Because ADAS can play a significant role in saving lives, HS and SRC, along with the National Safety Council, held a one-day panel event and roundtable to discuss (1) the capabilities, benefits, and availability of current ADAS technologies, such as forward collision warning, automatic emergency braking, lane departure warning and blind spot detection; (2) human factors considerations during the development of these technologies; and (3) public education, training, and efforts to promote them.

Investments in Technology
Retro-Reflectometer

HS purchased a retro-reflectometer to use in our analyses of the retro-reflectivity of objects a driver must see in and along the roadway environment. Retro-reflective treatments are part of crucial infrastructure, such as pavement markings and signs, and of safety applications, such as vehicle treatments, work zone treatments and safety apparel. The instrument measures the effectiveness of such treatments and applications and allows staff to determine a given treatment or application’s compliance with regulations. Third-party testing that caused significant investigative delays in two recent accident investigations led HS to purchase the device. The retro-reflectometer procured by the office is a multifaceted instrument that can be used for a variety of measurement applications. It is anticipated that the instrument may be useful to other modal offices as well.

Ongoing Significant Highway Accident Investigations

Location	Date	Description	Fatalities
Flushing, NY	09/18/2017	A motorcoach struck the left side of a transit bus while the transit bus was turning right through an intersection.	3
Augusta, ME	09/10/2017	After a motorcyclist left the roadway and returned to the roadway, a pickup truck collided with that motorcycle and subsequently collided with five additional motorcycles.	2
Lake Forest, CA	08/25/2017	After being involved in a single vehicle crash, a Tesla Model X experienced a postcrash, uncontained battery fire.	0
Atlanta, GA	03/30/2017	Construction material stored beneath an elevated portion of Interstate 85 ignited. The subsequent fire resulted in the collapse of multiple spans of the elevated structure.	0

Location	Date	Description	Fatalities
Concan, TX	03/29/2017	A pickup truck crossed into the opposing traffic lane and collided with a medium size bus.	13
Biloxi, MS	03/07/2017	A motorcoach became stuck on highway-railroad grade crossing and was struck by a train.	4
Chattanooga, TN	11/21/2016	A school bus departed the roadway and struck a tree.	6
Baltimore, MD	11/01/2016	A school bus crossed into the opposing traffic lane and collided with a transit bus.	6
Palm Springs, CA	10/23/2016	A motorcoach ran into the back of a truck-tractor combination that remained stopped at the end of a traffic queue.	13
Livingston, CA	08/02/2016	A motorcoach departed the roadway and collided with a roadside signpost.	4
St. Marks, FL	07/02/2016	A school bus used to transport migrant workers entered an intersection in front of a combination vehicle traveling on the cross street.	4
Goodland, KS	06/29/2016	A truck tractor in combination with a van semitrailer collided with the rear of a Toyota SUV.	5
Laredo, TX	05/14/2016	A motorcoach, traveling through a curve in wet weather yawed and rolled over.	9
Stroud, AL	03/11/2016	A tanker truck transporting liquid propane experienced a tire failure resulting in the vehicle jack-knifing. The cargo tank collided with a rock and exploded.	0

Note: We are devoting significant resources to the accident investigations listed and anticipate producing an accident report or brief for adoption upon the completion of each investigation.

MARINE SAFETY

	(\$000s)	FTEs
FY 2018 Estimate	\$4,930	19
FY 2019 Request	\$4,942	19
Increase/Decrease	\$12	0

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

The Office of Marine Safety (MS) investigates and determines the probable cause of major marine casualties in US territorial waters, major marine casualties involving US-flagged vessels worldwide, and accidents involving both US public and nonpublic vessels in the same casualty. In addition, the office investigates select catastrophic marine accidents or those of a recurring nature.

The US Coast Guard conducts preliminary investigations of all marine accidents and notifies the NTSB if an accident qualifies as a major marine casualty, which includes any one of the following:

- The loss of six or more lives.
- The loss of a mechanically propelled vessel of 100 or more gross tons.
- Property damage initially estimated to be \$500,000 or more.
- A serious threat, as determined by the Commandant of the Coast Guard and concurred in by the NTSB Chairman, to life, property, or the environment by hazardous materials.

For select major marine casualties, MS launches a full investigative team and presents the investigative product to the Board. For all other major marine casualties, the office launches a field team of marine investigators to the scene to gather sufficient information to develop a marine accident brief. Most of these brief investigation reports are issued by the MS Director through delegated authority; briefs involving public/nonpublic marine accidents and those briefs with recommendations are adopted by the Board.

MS is also responsible for the overall management of the NTSB's international marine safety program, under which we investigate major marine casualties involving foreign-flagged vessels in US territorial waters and those involving US-flagged vessels anywhere in the world. Accidents involving foreign-flagged vessels accounted for 38 percent of NTSB marine accident investigations over the past 5 years. Under the

International Maritime Organization (IMO) *Code of International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident* (Casualty Investigation Code), MS also participates with the Coast Guard as a substantially interested state (SIS) in investigations of serious marine casualties involving foreign-flagged vessels in international waters. For example, the NTSB often participates in accident investigations that involve foreign-flagged cruise ships with US citizens on board. Every year, more than 11 million US citizens travel on board these ships.

The MS international program involves reviewing US administration position papers related to marine accident investigations and participating in select IMO meetings. During the last year, MS staff attended IMO meetings covering topics such as the review and classification of maritime accidents and accident reporting, the certification and training of mariners, and the technical standards and requirements for voyage data recorders.

As part of the international program, MS coordinates with other US and foreign agencies to ensure consistency with IMO conventions, most notably for joint US/flag-state marine accident investigations. MS also cooperates with other accident investigation organizations worldwide, such as the Marine Accident Investigators' International Forum (MAIIF), and tracks developments related to marine accident investigations and prevention.

The NTSB is the only federal organization that performs independent, comprehensive, and transparent multidisciplinary investigations to determine the probable cause of marine accidents, with the goal of making recommendations to prevent similar accidents. The thoroughness and independence of our investigations maintain public confidence in marine transportation systems and provide policymakers with unbiased analysis.

MS comprises the Office of the Director, the Major Investigations Division, and the Product Development/Investigative Quality Division.

Major Investigations Division

The Major Investigations Division manages the multidisciplinary go-teams that launch to accident sites, collect information, and analyze collected information to determine probable cause. Currently, major accident investigations are conducted by one of two teams with six investigators on each team, for a total of 12 investigators. Each team is led by an IIC and includes subject-matter experts in nautical operations, marine engineering and naval architecture, survival factors, and human performance.

Product Development/Investigative Quality Division

The Product Development/Investigative Quality Division administers the investigative quality management program. The division consists of technical writer-editors who are responsible for drafting and editing major marine accident reports, marine accident briefs, safety recommendation letters, special investigation reports, the annual *Safer Seas Digest*, responses to notices of proposed rulemaking, and general correspondence. Staff also reviews the contents of the accident dockets provided by investigative specialists.

Accomplishments and Workload

This office's accomplishments include the issuance of many products related to transportation safety arising from completed and ongoing investigations. Products completed October 1, 2016, through September 30, 2017, are highlighted below, together with information on other efforts and focus areas important to both the current and future mission of the agency.

Accident Briefs

Investigations resulting in accident briefs are more limited in scope than those leading to major accident reports, and have the primary purpose of determining probable cause. These briefs may be issued by the office director under delegated authority or may be adopted by the Board. Not all completed briefs are included here. A total of 39 briefs have been completed by MS in FY 2017.

NTSB Lead Investigations of Public/Non-public Marine Casualties (Board Adopted)* *(Accidents involving Coast Guard and/or Navy vessels with private vessels)

Collision of *Matachin* (Panama) Tow with US Coast Guard Cutter *Thetis* Panama Las Cascadas Reach, Panama Canal, Panama June 2, 2016

On June 2, 2016, about 0111 local time, the dump scow barge 123 being pushed by the Panama-flagged towing vessel *Matachin* collided with the US Coast Guard cutter *Thetis* in Las Cascadas Reach, Panama Canal. Although the *Matachin* and its tow were not damaged, the *Thetis* sustained an estimated \$1.2 million in damage to the hull and deck plate aft, as well as to various systems in the steering gear room. There were no injuries, nor was there any report of pollution.

The NTSB determined that the probable cause of the collision between the *Matachin* tow and the US Coast Guard cutter *Thetis* was the failure of the master of the *Matachin* to maintain a proper lookout and use radar to detect the vessel traffic ahead to avoid a collision. Contributing to the collision was the failure of the pilot and the navigational crew on board the *Thetis* to maintain a proper lookout.

Recommendations: None
Brief Adopted: June 28, 2017

Flooding and Sinking of Fishing Vessel *Capt. David* Atlantic Ocean, About 40 miles East of Oregon Inlet, North Carolina February 15, 2016

On February 15, 2016, the uninspected fishing vessel *Capt. David* became disabled and experienced flooding about 40 miles off Oregon Inlet, North Carolina, while attempting to assist another disabled fishing vessel in developing gale conditions. The US Coast Guard responded by dispatching a shore-based motor lifeboat to assist both disabled vessels. The

US Navy dock landing ship USS *Carter Hall* was operating nearby the stricken vessels and launched its small boat to provide assistance as well. Upon the arrival of the Navy boat at the *Capt. David*'s location, there was contact between the vessels and flooding increased on the *Capt. David*. At the urging of the Navy crew, the fishing vessel's crew abandoned their vessel into the Navy boat about 1615. The fishing vessel later sank, likely the next morning. The crew of the other disabled fishing vessel declined rescue by the Navy boat and the vessel was towed back to Oregon Inlet by the Coast Guard motor lifeboat several hours later. There were no injuries and no pollution reported.

The NTSB determined that the probable cause of the flooding and sinking of the fishing vessel *Capt. David* was an engine cooling water leak that disabled the vessel during a forecasted small craft advisory and developing gale conditions.

Recommendations: None
Brief Adopted: April 25, 2017

**Sinking of Fishing Vessel *Orin C*
Atlantic Ocean, 13 miles East of Cape Ann, Massachusetts
December 3, 2015**

On December 3, 2015, at 2018 local time, the commercial fishing vessel (CFV) *Orin C* sank in the Atlantic Ocean about 13 miles east of Cape Ann, Massachusetts. All three crewmembers abandoned the vessel just prior to sinking and were recovered by US Coast Guard motor lifeboat 47259. However, the captain of the *Orin C* became unconscious in the water prior to being pulled to the motor lifeboat by a Coast Guard crewman. When examined aboard the motor lifeboat, the captain had no pulse. In response, Coast Guard crewmembers performed CPR, but he could not be revived. There were no other injuries and no reports of pollution. The *Orin C* sank in about 300 feet of water and was not salvaged.

The NTSB determined that the probable cause of the sinking of the *Orin C* was the structural failure of the disabled vessel's wooden hull and subsequent flooding of the vessel while being towed in adverse conditions.

The report identified the following safety issues: (1) the absence of a crewmember trained to use the first aid/trauma (FAT) equipment on Coast Guard response boats and (2) the lack of standardization for the contents of FAT kits in response boats.

As a result of its investigation, the NTSB made recommendations to the Coast Guard regarding the standardization of contents of FAT kits for each type of Coast Guard response vessel and the training and qualification of crewmembers in using them.

Recommendations: 2 new
Brief Adopted: February 15, 2017

**Towing by Coast Guard Cutter *Kiska* of Recreational Vessel *Kolina*, Resulting in Loss of Life
26 Nautical Miles South of Maui, Hawaii (Alenuihaha Channel)
November 5, 2015**

On November 5, 2015, about 2305, the crew aboard the 110-foot-long US Coast Guard cutter *Kiska* lost radio contact with the captain of the 30-foot-long recreational vessel *Kolina*. At the time, the cutter was towing the recreational vessel in the Alenuihaha Channel, about 26 nm south of Maui, Hawaii, after the *Kolina* captain had requested aid because of a broken tiller. The Coast Guard began a search-and-rescue/person-in-the-water mission to locate the captain. At 0917 on November 6, the captain was found in the water underneath the *Kolina*, entangled in the mast rigging and unresponsive. The *Kolina* sank about 10 hours after the body was retrieved.

The NTSB determined that the probable cause of the accident involving Coast Guard cutter *Kiska* and recreational vessel *Kolina*, with the death of the *Kolina* captain, was the *Kolina* captain's decision to launch and operate a poorly maintained vessel and his failure to protect his personal safety during the subsequent tow in the Alenuihaha Channel.

Recommendations: None
Brief Adopted: October 3, 2016

Other Investigations of Marine Casualties (Board Adopted)

**Engine Room Fire Aboard Cruise Ship *Carnival Liberty*
Charlotte Amalie, St. Thomas, US Virgin Islands
September 7, 2015**

On September 7, 2015, about 1133 local time, a fire broke out in the engine room aboard cruise ship *Carnival Liberty*. At the time, the vessel was alongside the dock in the Port of Charlotte Amalie, St. Thomas, US Virgin Islands. The master ordered the passengers aboard the vessel to evacuate to the dock. The crew used the ship's water mist- and carbon dioxide firefighting systems to extinguish the fire. No one was injured, nor was any environmental damage reported. Fire damage to the ship was estimated at \$1.725 million.

The NTSB determined that the probable cause of the engine room fire aboard the *Carnival Liberty* was loosened bolts, likely resulting from improper tightening during prior maintenance and vibration of the piping over time, on a fuel supply inlet flange on diesel generator 4, which triggered an uncontrolled fuel spray from the inlet flange onto a hot surface on the diesel generator.

The report identified the following safety issues: (1) a lack of comprehensive crew training and familiarity regarding the use and limitations of fixed water-based local applications systems in machinery spaces; (2) a lack of preplanned procedures to account for all persons aboard; (3) improper maintenance of the fuel supply inlet flange to diesel generator 4.

As a result of this investigation, the NTSB made recommendations to Carnival Cooperation & PLC and to Cruise Lines International Association.

Recommendations: 3 new
Brief Issued: June 21, 2017

Brief Investigations Adopted by Delegated Authority

**Allision of Passenger Vessel *Adventure Hornblower* with San Diego Seawall
San Diego, California
March 31, 2016**

On the afternoon of March 31, 2016, the passenger vessel *Adventure Hornblower* was attempting to dock at the Navy Pier in downtown San Diego, California, following a whale-watching excursion. As the vessel made its approach to the pier, its bow unexpectedly swung to starboard and allided with the pier's passenger embarkation dock. The *Adventure Hornblower* then accelerated forward until it struck the seawall at the foot of the pier. Eight passengers sustained minor injuries in the accident. The allision caused nearly \$1.06 million in damage to the vessel, pier, and seawall.

The NTSB determined that the probable cause of the allision of the *Adventure Hornblower* with the Navy Pier and the downtown San Diego seawall was a failure of the port transmission to disengage from the forward propulsion position due to the operating company's lack of adherence to the transmission manufacturer's recommended periodic maintenance schedule and the lack of routine maintenance and upkeep of the propulsion system's equipment. Contributing to the accident was the lack of instrumentation to provide positive indication of thrust direction or an alarm to indicate the propulsion control system was not responding properly to the captain's commands.

Recommendations: None
Brief Issued: August 25, 2017

**Flooding and Sinking of Fishing Vessel *Alaska Juris*
Bering Sea, west of Adak, Alaska
July 26, 2016**

On July 26, 2016, about 1130 local time, a crewmember on the fishing vessel *Alaska Juris* discovered flooding in the engine room while it was under way in the Bering Sea, approximately 160 miles west of Adak, Alaska. Shortly afterward, the rapid ingress of water caused the main engine and generators to shut down, resulting in a loss of propulsion and electrical power. There was no attempt to dewater the vessel, which sank later that day. All 46 persons on board abandoned ship into liferafts and were rescued without injury. The *Alaska Juris*, which was carrying approximately 87,000 gallons of diesel fuel, had an estimated value of \$4.3 million.

The NTSB determined that the probable cause of the sinking of the fishing vessel *Alaska Juris* was a lack of watertight integrity, which failed to contain flooding in the engine room.

Recommendations: None
Brief Issued: July 24, 2017

**Grounding of Freighter Roger Blough
Gros Cap Reefs, Sault Sainte Marie, Ontario, Canada
May 27, 2016**

At 1312 local time on May 27, 2016, the US-flagged lake freighter (laker) *Roger Blough* ran aground near the Gros Cap Reefs Light off Sault Sainte Marie, Ontario, Canada. The grounding occurred as the vessel entered the Birch Point Course section of the St. Marys River federal navigation channel from Whitefish Bay in eastern Lake Superior. There were no injuries and no pollution reported. The vessel sustained \$4.5 million in damage to its hull and cargo system.

The NTSB determined that the probable cause of the grounding of the lake freighter *Roger Blough* was the second mate's failure to use all navigational resources to determine the ship's position as it approached shallow water near Gros Cap Reefs. Contributing to the accident was inadequate monitoring of the vessel by Vessel Traffic Service (VTS) St. Marys River.

Recommendations: None
Brief Issued: May 11, 2017

**Collision and Subsequent Sinking of Towing Vessel *Specialist*
Hudson River at Tappan Zee Bridge, Pier 31, Tarrytown, New York
March 12, 2016**

About 0500 on Saturday, March 12, 2016, the uninspected towing vessel *Specialist*, transiting southbound on the Hudson River while towing a tower crane barge with two other tugboats, struck a construction barge that was spudded down alongside a concrete pier at the new Tappan Zee Bridge construction site. The *Specialist* subsequently sank, resulting in three crew fatalities. The vessel was raised to the surface on March 24, 2016, and declared a constructive total loss.

The NTSB determined that the probable cause of the collision and sinking of the *Specialist* was inadequate manning, resulting in fatigued crewmembers navigating three tugboats with obstructed visibility from the size of the crane on the barge they were towing and the location of the tugboats alongside the barge.

Recommendations: None
Brief Issued: May 11, 2017

**Fire Aboard Commercial Fishing Vessel *Raffaello*
Satala Shipyard, Pago Pago Harbor, American Samoa
January 17, 2016**

On January 17, 2016, at 2310 local time, a fire broke out on board the uninspected CFV *Raffaello* while it was moored to the fishing vessel *Judibana* at the Satala Shipyard in Pago Pago Harbor, Tutuila Island, American Samoa. The fire started in the captain's stateroom just forward of the machinery space exhaust trunk and was extinguished the next morning by the crews from both vessels along with shoreside firefighters. One of the 17 crewmembers on the *Raffaello* suffered minor burns while fighting the fire. Damage to the vessel was estimated at \$2 million.

The NTSB determined that the probable cause of the fire aboard the CFV *Raffaello* was the lack of insulation on the starboard generator exhaust gas pipe, resulting in the ignition of combustible material nearby.

Recommendations: None
Brief Issued: May 5, 2017

**Equipment Failure on Bulk Carrier *Asia Zircon II*
Pier 34, Port of Galveston, Texas
July 8, 2015**

On July 8, 2015, at 0857 local time, the Singapore-flagged bulk carrier *Asia Zircon II* was discharging a cargo of wind turbine towers in the Port of Galveston, Texas, when the lifting wire rope for one of the ship's two cranes parted while hoisting a tower section out of the cargo hold. The wire failure caused the tower to fall back into the hold, damaging the tower and other tower sections in the hold. Two of the five longshoremen inside the cargo hold at the time suffered non-life-threatening injuries. There was no reported pollution. Damages were estimated to exceed \$1.5 million.

The NTSB determined that the probable cause of the failure of the lifting wire rope of crane no. 4 on the bulk carrier *Asia Zircon II* was inadequate lubrication from ineffective maintenance, resulting in excessive wear of the wire rope.

Recommendations: None
Brief Issued: April 20, 2017

**Grounding of Bulk Carrier *Sparna*
Wauna Channel, Columbia River, About 50 miles Northwest of Portland, Oregon
March 20, 2016**

Just before midnight on March 20, 2016, the bulk carrier *Sparna* was transiting outbound on the Columbia River when it departed the maintained channel and grounded on a rock in the Wauna Channel of the river. The grounding caused damage and flooding to the forward part of the ship. No one was injured, and no pollution resulted from the grounding. Damage

to the *Sparna* exceeded \$500,000; damage to a nearby dock and barge was estimated at about \$60,000.

The NTSB determined that the probable cause of the grounding of bulk carrier *Sparna* was the failure of the pilot and bridge team to actively monitor the position of the vessel in relation to the grounding line and to catch the helmsman's erroneous response to a rudder order issued by the pilot. Contributing to the accident was the loss of rudder effectiveness from successive rpm reductions.

Recommendations: None
Brief Issued: April 10, 2017

**Allision of Passenger Vessel *Carnival Pride* with Pier and Passenger Walkway
Cruise Maryland Terminal, South Locust Point, Baltimore Harbor, Maryland
May 8, 2016**

On the morning of May 8, 2016, the passenger vessel *Carnival Pride* was attempting to dock at the Cruise Maryland Terminal at South Locust Point in Baltimore, Maryland, when its bow struck the pier and fendering, along with an elevated passenger embarkation walkway on shore. The allision caused nearly \$2.1 million in damages. The walkway was destroyed, three vehicles that were under the walkway as it collapsed were damaged, and the vessel had minor cosmetic damage. There were no injuries and no pollution was reported.

The NTSB determined that the probable cause of the *Carnival Pride*'s allision with the pier and elevated passenger embarkation walkway was the staff captain's errors during the docking maneuver, approaching the pier with excessive speed and at too steep of an angle, and the captain's insufficient oversight during the maneuver.

Recommendations: None
Brief Issued: February 24, 2017

**Capsizing and Sinking of Towing Vessel *Ricky J Leboeuf*
San Jacinto River, Kirby Inland Marine Fleeting Area, Channelview, Texas
April 19, 2016**

About 0752 local time on April 19, 2016, the uninspected towing vessel *Ricky J Leboeuf* capsized and later sank while attempting to remove a barge from a fleeting area in the San Jacinto River near Channelview, Texas. Four of the five crewmembers survived, but one deckhand died. The vessel sustained an estimated \$900,000 in damage, rendering it a constructive total loss. About 10,400 gallons of diesel oil, lubricating oil, and other contaminants were released into the river when the vessel sank.

The NTSB determined that the probable cause of the capsizing and sinking of the towing vessel *Ricky J Leboeuf* was the relief captain's ill-advised decision to perform a

downstreaming maneuver in high water conditions without implementing the operating company's risk mitigation strategies or other safeguards.

Recommendations: None
Brief Issued: January 23, 2017

**Collision of *Crimson Gem* Tow with Bulk Carrier *Yangtze Ambition*
Lower Mississippi River, Mile Marker 117.1, Ama, Louisiana
January 28, 2016**

On January 28, 2016, at 0430 local time, the uninspected towing vessel *Crimson Gem* was pushing 20 barges downbound during high-water conditions on the Lower Mississippi River in Ama, Louisiana, when two of its barges collided with the bulk carrier *Yangtze Ambition*, docked at the bottom of a river bend. Damages to the vessel and the barges, including a third barge that made contact with the dock, totaled an estimated \$575,000. There was no injury or pollution.

The NTSB determined that the probable cause of the collision of the *Crimson Gem* tow with the moored bulk carrier *Yangtze Ambition* was the *Crimson Gem* pilot's ineffective maneuvering for the prevailing current in a river bend.

Recommendations: None
Brief Issued: January 5, 2017

**Collision of Bulk Carrier *Aris T* with Tank Barge *WTC 3019*, Towing Vessel
Pedernales, and Shoreside Structures
Lower Mississippi River, Mile Marker 125.2, Norco, Louisiana
January 31, 2016**

On January 31, 2016, at 1953 local time, bulk carrier *Aris T* collided with tank barge *WTC 3019*, towing vessel *Pedernales*, and two facility structures, all of which were located on the left descending bank of the Mississippi River between mile marker 125.2 and mile marker 126.0 at Norco, Louisiana. Also damaged during the collision were one additional shoreside structure, another towing vessel, and two other tank barges, bringing the total damages to more than \$60 million. No pollution resulted from the accident; however, two dock workers reported injuries.

The NTSB determined that the probable cause of the collision of bulk carrier *Aris T* with tank barge *WTC 3019*, towing vessel *Pedernales*, and shoreside structures was the failure of the pilot on the *Aris T* to take early and effective action to mitigate the risk presented by the developing upriver traffic situation, and the distraction of the captain on the *Loretta G. Cenac* from safety-critical navigational functions because of his cell phone use.

Recommendations: None
Brief Issued: January 4, 2016

**Fire Aboard Containership *Gunde Maersk*
Seattle, Washington
December 8, 2015**

On December 8, 2015, at 0509 local time, a fire broke out in Auxiliary Engine Room No. 1 on board the containership *Gunde Maersk* shortly after the vessel departed Terminal 46 in Seattle, Washington. The fire was quickly extinguished by the vessel's high-pressure water mist system. As a result of the fire damage, the vessel lost propulsion and required tugboat assistance to return to its berth. There was no environmental damage and none of the 23 crew members were injured. Damages were estimated at \$380,000.

The NTSB determined that the probable cause of the fire on board the containership *Gunde Maersk* was an improperly installed fitting on a fuel line supplying a fuel injector pump for Auxiliary Engine No. 1.

Recommendations: None
Brief Issued: November 3, 2016

**Fire Aboard Freighter *Alpena*
Fincantieri Bay Shipbuilding, Sturgeon Bay, Wisconsin
December 11, 2016**

On December 11, 2015, about 1740 local time, a fire broke out in the electrical control room for the aft winches aboard the freighter *Alpena* while the vessel was dry docked undergoing work. Shipyard workers evacuated the vessel and notified the local fire department, who extinguished the fire. No one was injured, but the *Alpena* sustained nearly \$4 million in damage.

The NTSB determined that the probable cause of the fire aboard the *Alpena* was a fault in the electrical wiring providing power to the aft anchor winch.

Recommendations: None
Brief Issued: October 26, 2016

**Allision of Fishing Vessel *Ferrigno Boy* with Ventura Harbor Boatyard Travel Lift
Pier
Ventura Harbor, California
July 29, 2015**

On the morning of July 29, 2015, the uninspected CFV *Ferrigno Boy* was returning to Ventura Harbor, California, to offload its squid catch when the main propulsion control system failed to respond to a command for astern propulsion, resulting in an allision with the Ventura Harbor Boatyard travel lift pier. The starboard bow of *Ferrigno Boy* struck the pier, causing a minor inset of the steel hull above the waterline. The lift pier sustained significant structural damage, initially estimated at \$850,000. A sailboat moored near the pier also had minor damage. There were no injuries and no reported pollution.

The NTSB determined that the probable cause of the allision of the *Ferrigno Boy* with the Ventura Harbor Boatyard travel lift pier and the sailing vessel *Solera* was the fishing vessel's transmission control cable not being correctly fastened to the Twin Disc mechanical control valve shift lever in accordance with the manufacturer's recommended instructions.

Recommendations: None
Brief Issued: October 26, 2016

**Sinking of Fishing Vessel *Kupreanof*
Gulf of Alaska, About 50 miles West-Northwest of Cape Spencer, Alaska
June 10, 2015**

About 0300 local time on June 10, 2015, the uninspected CFV *Kupreanof* began taking on water while transiting from Juneau to Bristol Bay, Alaska. About two and half hours later, the vessel sank in 420 feet of water. All four crewmembers were rescued by the Coast Guard soon after abandoning the vessel. No injuries resulted from the accident. About 7,300 gallons of diesel fuel and an unknown quantity of hydraulic and lubricating oil were aboard when it sank. The vessel and the equipment stowed on deck were valued at \$875,000. The *Kupreanof* was not salvaged because of the water depth.

The NTSB determined that the probable cause of the sinking of the fishing vessel *Kupreanof* was the flooding of an aft compartment, likely the lazarette.

Recommendations: None
Brief Issued: October 26, 2016

Investigative Hearings

Investigative Hearings are public hearings related to investigations in which the agency is authorized to obtain testimony under oath.

**US Coast Guard Marine Board of Investigation III (MBI) – Joint Hearing with
NTSB Regarding the Foundering of SS *El Faro* on October 1, 2015
Jacksonville, Florida
February 6-17, 2017**

The Coast Guard conducted its third and final joint MBI regarding this accident. The NTSB IIC, four marine investigators, and a meteorologist questioned witnesses.

Special Investigations

Special investigations usually involve analysis of data from multiple accidents centered around a common safety issue. Products of the special investigation process generally include a written report and stand-alone safety recommendations.

Tropical Cyclone Information for Mariners Safety Recommendation Report

This report urged the National Oceanic and Atmospheric Administration (NOAA), the National Weather Service (NWS; a component of NOAA), and the US Coast Guard to take action on the included safety recommendations. The recommendations addressed, in the interest of mariner safety, the development of tropical cyclone information and its availability to mariners. The recommendations derive primarily from factual information gathered during the NTSB's ongoing investigation into the sinking of the cargo vessel *El Faro* on October 1, 2015.

The factual data revealed that critical tropical cyclone information issued by the NWS is not always available to mariners via well-established broadcast methods. The data also suggest that modifying the way the NWS develops certain tropical cyclone forecasts and advisories could help mariners at sea better understand and prepare for tropical cyclones. Further, factual data on the official forecasts for Hurricane Joaquin and other recent tropical cyclones suggest that a new emphasis on improving hurricane forecasts is warranted.

The NTSB has yet to determine the probable cause of, or contributing factors in, *El Faro's* sinking. Nevertheless, based on the meteorological facts gathered thus far, plus discussions with the NWS and the Coast Guard, the NTSB made 10 recommendations in this report. Two recommendations were addressed to NOAA, seven to the NWS, and one to the Coast Guard.

Recommendations: 10 new
Report Adopted: June 20, 2017

Shared Waterways: Safety of Recreational and Commercial Vessels in the Marine Transportation System Safety Recommendation Report

Several stakeholders had discussed with the NTSB their concerns rising from an increase in encounters between commercial and recreational vessels. Given the number of encounters currently observed between these vessels, the predicted increase in the number of such encounters, and feedback from marine industry representatives, the NTSB sought to better understand the scope of the issue and determine the extent to which the safety of our nation's waterways is impacted.

MS investigators reviewed relevant literature, examined accident data, and visited major ports—Chicago, Illinois; San Diego, Los Angeles/Long Beach, and San Francisco, California; and Portland, Oregon—where they interviewed various port users. Investigators

observed sightseeing tours from the wheelhouses of commercial vessels in Chicago, San Diego, and San Francisco, and rode aboard a pilot vessel in Long Beach and aboard a Harbor Police boat escorting a large passenger vessel in San Diego. The investigators' intent during these rides was to discern first-hand the nature and severity of commercial and recreational vessel interactions and obtain operators' views regarding the extent of the perceived safety hazards they encounter. Additionally, investigators explored the shared waterways safety issue with stakeholders in Memphis and Nashville, Tennessee, and Louisville, Kentucky. Investigators also met with US Coast Guard representatives tasked with waterways management and accident prevention, along with Coast Guard headquarters personnel involved in policy development regarding recreational vessel and marine transportation system oversight.

As a result of this investigation, the NTSB found that local harbor safety committees (HSCs) can improve safety in shared waterways by regularly identifying risks, developing and implementing practices to mitigate these risks, and sharing successful practices with stakeholders and other HSCs.

Investigators determined that all recreational vessel operators need a minimum level of boating safety education to operate safely, and the Coast Guard should renew its efforts to seek legislative authority to require recreational boaters to obtain education that meets National Association of State Boating Law Administrators (NASBLA) or equivalent standards.

Additionally, investigators found that *A Guide to Multiple Use Waterway Management*, a document developed by NASBLA and the National Water Safety Congress (NWSC) that identifies risks and provides mitigation strategies for shared waterways, should be updated at regular intervals due to continuous changes in the waterways' usage. The *Guide* was last updated in 2004.

Throughout the development of this report, investigators learned of numerous best practices that are occurring in the nation's waterways.

As a result of this special investigation, the NTSB made safety recommendations to the US Coast Guard, the NASBLA, and the NWSC, which included a recommendation that these parties work together to review and update *A Guide to Multiple Use Waterway Management* at regular intervals.

Recommendations: 5 new
Report Adopted: January 25, 2017

Support to Foreign Accident Investigations

In FY 2017, MS participated with the Coast Guard as an SIS in the following completed investigations of serious marine casualties involving foreign-flagged vessels in international waters (the NTSB submitted comments to draft reports from the flag states; however, final flag state investigation reports have not been received in all cases):

Location	Date	Description*	Fatalities	Close-out Date
Off Panama coast	12/22/2015	PV <i>Star Pride</i> (Bahamas) – grounding. US passengers aboard. No injuries. IMO-SIS investigation with NTSB assisting the Coast Guard.	0	09/05/2017
Off North Carolina coast	02/07/2016	PV <i>Anthem of the Seas</i> (Bahamas) – in rough seas from New York to Bahamas, vessel had to divert back to New York. Numerous minor injuries. IMO-SIS investigation with NTSB assisting the Coast Guard.	0	09/01/2017
Royal Navy Dockyard, Bermuda	07/20/2016	PV <i>Norwegian Breakaway</i> (Bahamas) – rescue boat wire fall failure. Government of Bahamas requested US assistance in wire rope failure analysis. US granted SIS status. NTSB assisting.	1	06/19/2017
Ionian Sea, 53 nm south of Argostoli, Greece	10/22/2015	PV <i>Splendor of the Seas</i> (Bahamas); Engine room fire. IMO-SIS investigation with NTSB assisting the Coast Guard.	0	04/27/2017

MS is not currently involved in any active IMO Casualty Investigation Code, SIS, investigations.

Other Efforts and Focus Areas

Safer Seas Digest 2016 Published July 27, 2017

Safer Seas Digest 2016 is the fourth edition of this publication, a “one-stop shop” for mariners and others to review concise summaries of accident investigations that were completed in the past year. The yearly digests also provide an overview of the top safety issues arising from these investigations. The publication is used throughout the marine industry in crew training and safety meetings both on board vessels and shoreside. *Safer Seas Digest 2016* represents the NTSB’s continuing commitment to sharing lessons learned through investigations.

Investigative Workshop/Roundtable June 8, 2017

MS held a workshop/roundtable with federal agencies and interested parties to identify the challenges of accident investigations and evidence recoveries involving submerged wreckage. These accidents are primarily either aviation or marine casualties. The workshop documented lessons learned from the *El Faro* VDR recovery and identified requirements, including equipment, technologies and cooperative agreements to facilitate a rapid response in the future.

Ongoing Significant Marine Accident Investigations

Location	Date	Description*	Fatalities
60 nm east of Cape Charles, VA	09/11/2017	CFV <i>Langley Douglas</i> (US) – sinking; unknown cause	0
Lake Charles channel, LA	09/05/2017	UTV <i>Savage Ingenuity</i> (US) – sinking due to current	0
Venice, LA	08/23/2017	<i>Gracie Claire</i> (US) – sinking at dock	0
East of Straits of Singapore (territorial waters)	08/21/2017	USS <i>John S McCain</i> collision with MV <i>Alnic MC</i> (Liberia)	10
New Orleans, LA	08/01/2017	MV <i>Mia-S</i> (Antigua & Barbuda) – allision	0
Pottsboro, TX	07/19/2017	Highpoint Marina – fire destroyed 22 rec vessels	0
Falmouth, MA	07/10/2017	UPV <i>Best Revenge</i> (US) – fire	0
UMR, MM113, Near Cairo, IL	07/09/2017	UTV <i>Eric Haney</i> (US) – foundering	0
30 nm south of Galveston, TX	06/22/2017	CFV <i>Lady Damaris</i> (US) – foundering	0
56 nm southwest of Yokosuka, Japan (territorial waters)	06/17/2017	USS <i>Fitzgerald</i> – collision with MV <i>ACE Crystal</i> (Philippines)	7
Krotz Springs, LA	06/09/2017	UTV <i>Marguerite L Terral</i> (US) – allision with railroad bridge	0
Harvey Canal, LA (New Orleans)	06/07/2017	Crane barge <i>Tory McKinney</i> (US) – breakaway and contact with high tension cables	0
Nashville, TN	06/07/2017	UTV <i>James H Hunter</i> (US) – allision with Shelby Street pedestrian bridge	0
Craig, AK	05/21/2017	CFV <i>Seaborn</i> (US) – fire; spread to nearby CFVs	0
Seattle, WA	05/21/2017	Sagstad Marina – fire; spread to recreational vessels and floating docks	0
Lake Pontchartrain near Slidell, LA	05/02/2017	NTSB Lead: RB-S CG-29113 (Coast Guard) and SV <i>Vanguard</i> (US) – allision with HWY 11 bridge and subsequent sinking of SV	0
Panama Canal, Panama	04/18/2017	NTSB Lead: Tug <i>Cerro Santiago</i> (Panama) – collision with CGC <i>Tampa</i>	0
Columbus, OH	04/17/2017	UTV <i>Todd Brown</i> (US) – sinking	0

Location	Date	Description*	Fatalities
Nashville, TN	03/11/2017	TV <i>Steve Plummer</i> (US) – allision with railroad bridge	0
Pumicestone Bay, AK	03/6/2017	CFV <i>St Dominick</i> (US) – grounding	0
English Channel	02/24/2017	MV <i>Honor</i> (US) – cargo fire	0
St. George Island, AK	02/11/2017	CFV <i>Destination</i> (US) – capsizing and sinking	6
Gulf of Mexico, 100 NM south of SW Pass, LA	01/16/2017	MV <i>Alliance St. Louis</i> (US) – fire	0
Dutch Harbor, AK	12/07/2016	MV <i>Exito</i> (US) – sinking	0
Columbia River, OR	11/19/2016	MV <i>Nenita</i> (US) – loss of propulsion with sinking	0
Off Jacksonville, FL	10/28/2016	TV <i>Atlantic Raider</i> (US) – grounding	0
Bella Bella, British Columbia, Canada	10/13/2016	ATB <i>Nathan E Stewart</i> (US) – grounding	0
Houston, TX	09/06/2016	MV <i>Aframax River</i> – allision with dolphin at ITC pier and subsequent fire	0
Off San Juan Harbor Entrance, PR	08/17/2016	PV <i>Caribbean Fantasy</i> (Panama) – engine room fire and evacuation of passengers/crew	0
Lake Tahoe, NV	08/16/2016	SPV <i>Tahoe Queen</i> (US) – fire	0
40NM southeast Sandy Hook, NJ	08/15/2016	CFV <i>Lady Gertrude</i> (US) – sinking	0
King Cove, AK	07/14/2016	CFV <i>Ambition</i> (US) – foundering	0
Corpus Christi, TX	07/14/2016	UTV <i>Admiral</i> (US) – fire	0
Ketchikan, AK	06/16/2016	PV <i>Celebrity Infinity</i> (Malta) - allision	0
Off Turtle Bay, Mexico	05/13/2016	SPV <i>Maximus</i> (US) – foundering	0
Crooked Island, Bahamas	10/01/2015	NTSB Lead: SS <i>El Faro</i> (US) – sinking	33

Note: We are devoting significant resources to the accident investigations listed and anticipate producing an accident report or brief for adoption upon the completion of each investigation.

*Vessel types:

- ATB – Articulated Tug Barge
- CFV – Commercial Fishing Vessel
- CGC – Coast Guard Cutter
- MV – Motor Vessel
- PV – Passenger Vessel
- RB-S – Response Boat-Search and Rescue
- SPV – Small Passenger Vessel
- SV – Sailing Vessel
- TV – Towing Vessel
- UTV – Uninspected Towing Vessel

RAILROAD, PIPELINE AND HAZARDOUS MATERIALS

	(\$000s)	FTEs
FY 2018 Estimate	\$9,146	36
FY 2019 Request	\$9,769	37
Increase/Decrease	\$623	1

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. An increase of 1 FTE is supported by this funding level. No other program changes are planned.

Program Description

The Office of Railroad, Pipeline and Hazardous Materials Investigations (RPH) consists of four divisions: Railroad; Pipeline and Hazardous Materials; Human Performance and Survival Factors; and Report Development. RPH investigates accidents involving railroads, pipelines, and hazardous materials and evaluates the associated emergency response. Based on these investigations, the NTSB may issue safety recommendations to federal and state regulatory agencies, unions, industry and safety standards organizations, carriers and pipeline operators, equipment and container manufacturers, producers and shippers of hazardous materials, and emergency response organizations. Office staff also issue Safety Alerts to industry.

Railroad Division

Since 1967, Congress has assigned the primary responsibility for railroad accident investigations to the NTSB. As in the other surface modes, the NTSB investigates and analyzes select accidents, determines their probable causes, and issues recommendations to prevent similar accidents.

Staff investigate accidents and incidents involving passenger and freight railroads, as well as commuter rail transit systems and other fixed guideway systems. These accidents are typically collisions or derailments, some of which involve fatalities, severe injuries, release of hazardous materials, and evacuation of residences.

Staff do not investigate every railroad accident reported to the FRA or every rail transit accident reported to the FTA. To most efficiently use NTSB resources, criteria have been established to help highlight for investigation those accidents that pose significant safety issues. The division also assesses selected railroad safety issues, often based on a set of accident investigations specifically undertaken as the basis for such study. In other cases, the special studies may focus on analyses of regulations, railroad safety programs and procedures, and audit reviews of management and operations practices.

Pipeline and Hazardous Materials Division

The Pipeline and Hazardous Materials Division staff investigate accidents occurring during the transport of natural gas or other hazardous liquids such as gasoline or propane through underground pipeline systems, as well as accidents that threaten public safety by the release of hazardous substances. Pipeline investigations focus on accidents that involve fatalities or result in substantial property or environmental damage. This division may also investigate select hazardous materials accidents that highlight safety issues of national importance or involve a specific accident prevention issue.

The hazardous materials staff investigate accidents involving the release of hazardous materials in all modes of transportation, including aviation, highway, railroad, and marine. An investigation may include analysis of the performance of hazardous materials containers, such as rail tank cars, highway cargo tanks, and smaller non-bulk packaging. The division also investigates environmental response issues in all modes, including pipeline.

Human Performance and Survival Factors Division

The Human Performance and Survival Factors Division investigates the human factors and survivability aspects of railroad, pipeline, and hazardous materials accidents. The human factors range from individual actions, training, and tools; through work crew resource management, oversight, and supervision; to organizational safety management and safety culture. The survivability issues range from occupational protection systems such as lighting, seat restraints, and crashworthiness of occupied spaces; through emergency response processes, training, and drills; to community-based programs for improved public awareness, evacuations, and 811 and 911 notifications.

Investigations typically involve inquiries that extend well beyond the debris field of an accident site. Failures of operational systems rarely are isolated to the last component to break or malfunction. Rather, the reasons for system failures often are traceable to management decisions and corporate cultural influences. Once these systemic failures are identified and understood, the staff works to develop corresponding safety recommendations. Specific topics evaluated include drug and alcohol usage, work/rest cycles and human fatigue, individual and team training, organizational safety culture and safety management, and public awareness.

Report Development Division

The Report Development Division is responsible for drafting and editing railroad, pipeline, and hazardous materials reports and briefs, responses to notices of proposed rulemaking, papers, congressional testimony, and speeches (or portions thereof) on matters pertaining to railroad, pipeline, and hazardous materials safety.

Accomplishments and Workload - Railroad

This office's accomplishments include the issuance of numerous products related to transportation safety arising from completed and ongoing investigations. Products completed October 1, 2016, through September 30, 2017 are highlighted below together with information on other efforts and focus areas important to both the current and future mission of the agency.

Railroad Accident Reports

Accident reports, adopted by the Board, are issued for major accidents.

Highway-Railroad Grade Crossing Collision Valhalla, New York February 3, 2015

On February 3, 2015, at 6:26 p.m., a vehicle driven by a 49-year-old woman traveled northwest on Commerce Street in Valhalla, New York, toward a highway-railroad grade crossing. The driver entered the boundary of the grade crossing and stopped, then moved beyond the boundary and stopped again, adjacent to the railroad tracks. The grade crossing warning system activated and the gate came down, striking the rear of the vehicle. The driver exited her vehicle, examined the gate, then returned to her vehicle and moved forward onto the tracks. Meanwhile, a Metro-North Railroad train approached the grade crossing. The engineer activated the emergency brakes and collided with the vehicle at 51 mph. The train and the vehicle continued north, damaging the electrified third rail which pierced the vehicle and penetrated the lead railcar. Five passengers died and nine passengers and the engineer were injured, all in the lead railcar. The driver of the vehicle also died.

The NTSB determined that the probable cause of the accident was the driver of the sport-utility vehicle, for undetermined reasons, moving the vehicle onto the tracks while the Commerce Street highway-railroad grade crossing warning system was activated, into the path of Metro-North Railroad train 659. Contributing to the accident was the driver of the sport-utility vehicle (1) stopping beyond the stop line, within the boundary of the highway-railroad grade crossing, despite warning signs indicating the approach to the grade crossing, and (2) reducing the available time to clear the grade crossing by exiting the vehicle after the grade crossing warning system activated because the driver's attention was diverted by the grade crossing warning system crossing gate arm striking her vehicle. Contributing to the severity of the accident was the third rail penetrating the passenger compartment of the lead passenger railcar and the postaccident fire.

The NTSB made new recommendations to the FTA; Metro-North; Long Island Rail Road, Amtrak, Port Authority Trans-Hudson Corporation, and Southeastern Pennsylvania

Transportation Authority; the New York Department of Transportation; and, the town of Mount Pleasant, New York.

Recommendations: 6
Report Adopted: July 25, 2017

**Collision of Two Union Pacific Railroad Freight Trains
Hoxie, Arkansas
August 17, 2014**

On August 17, 2014, at 2:28 a.m. central daylight time, southbound Union Pacific Railroad (UP) freight train IMASNL-16 collided with northbound UP freight train IQNLPI-17 at milepost 228.6, while traversing the turnout at control point Y-229 on the UP Hoxie subdivision in Hoxie, Arkansas. The engineer and the conductor from the southbound train died, and the engineer and the conductor from the northbound train were seriously injured.

The NTSB determined that the probable cause of the accident was the failure of the southbound train crewmembers to respond to the signal indications requiring them to slow and stop their train prior to control point Y-229 because they were fatigued and had fallen asleep as a result of (1) the locomotive engineer's inadequately treated obstructive sleep apnea, (2) the conductor's irregular work schedule, and (3) the train crew's operating in the early morning hours when they were predisposed to sleep. Contributing to the accident were (1) the lack of a functioning PTC system, (2) the use of an automatic horn sequencer that, when activated, negated the operation of an electronic alertness device, (3) the FRA's failure to promulgate rules regarding sleep disorders, and (4) the absence of federal regulations requiring freight railroads to use fatigue modeling tools for train crew work schedules.

As a result of this investigation, the NTSB issued safety recommendations to the FRA, BNSF Railway, Canadian National Railway, Canadian Pacific Railway, CSX Transportation, Kansas City Southern Railway, Norfolk Southern Railway, intercity railroads, commuter railroads, all class I railroads, and UP Railroad. In this report, the NTSB also reiterated two safety recommendations to the FRA.

Recommendations: 5 new, 2 reiterated
Report Adopted: December 19, 2016

During the investigation prior to the Board meeting, the NTSB issued three "Urgent" safety recommendations to the FRA, the Association of American Railroads, the American Short Line and Regional Railroad Association, and the American Public Transportation Association.

Recommendations: 3 new (Urgent)
Recommendations Issued: February 4, 2015

Railroad Accident Briefs

Investigations resulting in accident briefs are more limited in scope than those leading to major accident reports, and have the primary purpose of determining probable cause. These briefs may be issued by the Office Director under delegated authority or adopted by the Board. Not all completed briefs are included here. There have been 10 briefs completed by the Railroad Division in FY 2017.

BNSF Railway Train Derailment and Subsequent Train Collision, Release of Hazardous Materials, and Fire Casselton, North Dakota December 30, 2013

On Monday, December 30, 2013, at 2:10 p.m. central standard time, a westbound BNSF Railway Company train with 112 cars loaded with grain derailed 13 cars while traveling on main track 1 at milepost 28.5 near Casselton, North Dakota. The first car that derailed (the 45th car) fouled the adjacent track, main track 2. At 2:11 p.m., an eastbound BNSF train with 104 tank cars loaded with petroleum crude oil (crude oil), traveling on main track 2, struck the derailed car that was fouling the track and derailed two head-end locomotives, a buffer car, and 20 cars loaded with crude oil. After the collision, about 476,000 gallons of crude oil were released and burned. No injuries were reported by residents or either of the train crews. The BNSF reported damages of \$13.5 million, not including lading and environmental remediation.

The NTSB determined that the probable cause of the collision of the oil train with the derailed grain train car was a broken axle on the 45th car of the grain train caused by an internal void that was created during axle manufacture. Contributing to the cause of the derailment were inadequate interchange rules used to locate internal material defects in secondhand-use axles. Contributing to the severity of the accident was the release and pooling of a highly flammable product that resulted in a fire and caused additional cars to fail.

As a result of this investigation, the NTSB issued safety recommendations to the Pipeline and Hazardous Materials Safety Administration (PHMSA) and the FRA. Also in this brief, the NTSB reclassified four previously issued recommendations to the FRA and PHMSA.

Recommendations: 3 new, 4 reclassified
Brief Adopted: February 7, 2017

Derailment of Washington Metropolitan Area Transit Authority Metrorail Train in Interlocking Falls Church, Virginia July 29, 2016

On July 29, 2016, about 6:14 a.m. eastern daylight time, outbound (westbound) WMATA Metrorail train 602 derailed while traversing a crossover in the East Falls Church interlocking, operating on the Silver Line in Falls Church, Virginia. About 63 passengers

were on board the six-car passenger train, all of whom were evacuated out of the lead car, assisted by the Metro Transit Police Department. Three passengers reported injuries, including one who was hospitalized.

The NTSB determined that the probable cause of this accident was a wide track gage condition resulting from the sustained use of deteriorating wooden crossties because of WMATA's ineffective inspection and maintenance practices and inadequate safety oversight.

Recommendations: None
Brief Adopted: December 1, 2016

Railroad Safety Recommendation Reports

Investigators often identify safety issues during investigations that warrant further scrutiny. Safety recommendation reports are used to make recommendations on issues identified during such investigations for which a major report is not warranted. Safety recommendation reports may be issued at any time during an accident investigation. If the Board determines that a recommended course of action requires immediate attention to avoid imminent loss of life from a similar accident, the safety recommendation is designated "Urgent."

Inward- and Outward-facing Audio and Image Recorders as Investigative and Safety Tools Southeastern Pennsylvania Transportation Authority (SEPTA) Upper Darby, Pennsylvania February 21, 2017

On February 21, 2017, at 8:10 a.m. eastern daylight time, SEPTA train 57 was traveling west at 10 mph when it collided with the rear of train 67, which had stopped on loop track 2 near the 69th Street station. The trains were not equipped with audio or image recorders in the operating cabs or forward-facing cameras, which would have proved invaluable in investigating this accident. Four cars derailed from train 57, and three derailed from train 67. The derailed cars from train 67 struck train 51 as it traveled in the opposite direction on loop track 1. A train operator in the control compartment of the lead car of each train operated the trains in manual mode. Each train included cars powered by an electrified third rail. Two passengers were on board the striking train; no passengers were on trains 67 or 51. Both passengers and the operators of trains 57 and 67 were injured.

This Safety Recommendation Report contains no statements regarding the probable cause of the accident. As a result of the ongoing accident investigation, the NTSB issued one safety recommendation to the FTA and two safety recommendations to SEPTA.

Recommendations: 3 new
Report Adopted: August 24, 2017

Rail Transit Vehicle Safe Braking
Southeastern Pennsylvania Transportation Authority
Philadelphia, Pennsylvania
January 4, 2017

On January 4, 2017, at 12:47 p.m. eastern standard time, SEPTA trolley car 9101, carrying 41 passengers, was traveling north on trolley route number 10 when it stopped at the southeast corner of Lancaster Avenue and 38th Street, Philadelphia, Pennsylvania, to offload passengers. SEPTA trolley car 9085, carrying five passengers, traveling in the same direction, collided with the rear of the stopped SEPTA trolley car at an estimated speed of 11 miles per hour. Emergency responders transported both operators and 46 passengers to local hospitals for non-life-threatening injuries.

This Safety Recommendation Report contains no statements regarding the probable cause of the accident. As a result of the ongoing accident investigation, the NTSB issued one safety recommendation to the FTA.

Recommendations: 1 new
Report Adopted: May 1, 2017

Railroad Special Investigations

Special investigations usually involve the analysis of data from multiple accidents centered around a common safety issue. Products of the special investigation process generally include a written report and stand-alone safety recommendations.

Bumping Posts Special Investigation Report

A special investigation of bumping posts is currently underway. Two investigations involving accidents in Hoboken, New Jersey, and Brooklyn, New York, have been initiated and are in the process of being completed. The key issues of this special investigation are bumping posts, fatigue, positive train control, and sleep apnea.

SEPTA – Three Accidents in Pennsylvania Special Investigation Report

A special investigation of SEPTA is currently underway. Three investigations involving accidents in Pennsylvania have been initiated and are in the process of being completed. These investigations include one accident in Philadelphia and two accidents in Upper Darby. The primary issue of this special investigation is system safety oversight.

Railroad Safety Alerts

Safety alerts are brief information sheets that pinpoint a safety issue. An alert contains information based on findings of investigations and enhances the dissemination of safety information to the traveling public.

Watchman/Lookout: Your Coworkers Depend on You
BNSF Railway Westbound Train
Edgemont, South Dakota
January 17, 2017

On January 17, 2017, about 10:09 a.m. mountain standard time, a BNSF Railway westbound train traveling at 35 mph struck and killed two roadway workers, including the watchman/lookout. The three members of a roadway work group had been cleaning snow and ice from a track switch on a main track in Edgemont, South Dakota. The engineer sounded the train horn and bell, and both members of the train crew applied emergency braking; however, there was no response from the work group, and the train was unable to stop before reaching the work location.

After assessing the accident site, investigators found that the sight distance was about half the distance required by FRA regulations, which require a work group be able to clear the track and be in a previously arranged place of safety for at least 15 seconds before a train moving at the maximum authorized speed can pass the work location. Witness statements indicated that the job briefing had not covered several important topics such as the required sight distance, the required time needed to clear to a place of safety, the location of the place of safety, and the type of warning the watchman/lookout would use to notify the work group of an approaching train. Investigators also found that, prior to the accident, the watchman/lookout may not have been vigilant in watching for approaching trains. The NTSB issued a Safety Alert to all railroads. (Adopted July 18, 2017.)

Ongoing Significant Railroad Accident Investigations

Location	Date	Description	Fatalities
Arlington, TX	09/22/2017	Remote-controlled locomotive struck and killed crewmember	1
Upper Darby, PA (2 of 2)	08/22/2017	Two SEPTA trains collided	0
Hyndman, PA	08/02/2017	Derailed propane car leaked; subsequent fire	0
Washington, DC (Ivy City)	06/27/2017	Train struck two crewmembers	2
Queens Village, NY	06/10/2017	Train struck train workers	1
Rye, NY	05/18/2017	Derailed commuter train (14 injured)	0
Graettinger, IA	03/10/2017	Ethanol train derailed on trestle into water	0
Upper Darby, PA (1 of 2)	02/21/2017	Two SEPTA trains collided	0
Edgemont, SD	01/17/2017	Train struck two maintenance-of-way workers	2
Philadelphia, PA	01/04/2017	Two SEPTA trolleys collided (46 hurt)	0
Brooklyn, NY	01/04/2017	Train collided with bumping post in Atlantic Terminal	0
Brooklyn, NY	11/03/2016	Train struck two track workers	2
Hoboken, NJ	09/29/2016	Train collided with bumping post in terminal	1
West Palm Beach, FL	07/06/2016	Vehicle struck at grade crossing	1

Panhandle, TX	06/28/2016	Two freight trains collided; derailment/fire	2
Chester, PA	04/03/2016	Train struck backhoe; derailment	2
Granger, WY	03/15/2016	Two UP trains collided head-on	0
Cimarron, KS	03/14/2016	Train derailed; emergency braking	0
Kansas City, KS	09/29/2015	Train struck remote control locomotive operator	1
Heimdal, ND	05/06/2015	Crude oil train derailed, fire, evacuation	0
Roswell, NM	04/28/2015	Two freight trains collided	1
Pine Bluff, AR	04/04/2015	Locomotive hit conductor switching cars	1

Note: We are devoting significant resources to the accident investigations listed and anticipate producing an accident report or brief for adoption upon the completion of each investigation.

Accomplishments and Workload - Pipeline

This division's accomplishments include the issuance of many products related to transportation safety arising from completed and ongoing investigations. Products completed October 1, 2016, through September 30, 2017, are highlighted below, together with information on other efforts and focus areas important to both the current and future mission of the agency.

Pipeline Accident Briefs

Investigations resulting in accident briefs are more limited in scope than those leading to major accident reports, and have the primary purpose of determining probable cause. These briefs may be issued by the office director under delegated authority or may be adopted by the Board. The pipeline staff completed one brief in FY 2017.

Colonial Pipeline Company Petroleum Product Leak Centreville, Virginia September 21, 2015

On September 21, 2015, at 12:03 p.m. eastern daylight time, an employee of Bonefish Grill in Centreville, Virginia, called the Fairfax County 911 Center to report a gasoline odor. The Fairfax County Fire and Rescue Department immediately dispatched units to the restaurant in the Centre Ridge Marketplace shopping center. After arriving at the scene, firefighters confirmed everyone had left the restaurant; they established an incident command center and began the investigation. They did not detect the presence of flammable vapor inside Bonefish Grill and ruled out a natural gas leak; however, they noted a gasoline odor coming from the storm drains at the shopping center. Firefighters detected the presence of flammable vapor in most of the storm drains behind Bonefish Grill and Chipotle. Flammable vapor in some storm drains in front of Bonefish Grill was as high as 100 percent of the lower explosive limit; however, no liquid was visible in the storm drains.

The NTSB determined that the probable cause of the release of gasoline and other refined petroleum liquids from the Colonial pipeline was a through-wall corrosion fatigue crack that developed at a dent in the pipeline from residual and operational stress and exposure to the underground environment. Contributing to the accident were vague PHMSA regulations that allowed the dent to remain in the pipeline. Also, contributing to the delay in recognizing the release were the limitations of pipeline Supervisory Control and Data Acquisition systems to detect small pipeline leaks.

As a result of this investigation, the NTSB issued new safety recommendations to PHMSA, Colonial Pipeline Company, Association of Oil Pipe Lines, and the American Petroleum Institute.

Recommendations: 4 new
Brief Adopted: June 5, 2017

Ongoing Significant Pipeline Accident Investigations

Location	Date	Description	Fatalities
Minneapolis, MN	08/02/2017	Explosion at Minnehaha Academy	2
Millersville, PA	07/02/2017	Utilities house explosion	1
Firestone, CO	04/17/2017	House explosion	2
Canton, IL	11/16/2016	Third-party operator struck pipe	1
Helena, AL	10/31/2016	Track hoe struck gas pipeline	1
Tekamah, NE	10/17/2016	Release of 7,000 barrels of anhydrous ammonia	1
Silver Spring, MD	08/10/2016	Apartment explosion	7

Note: We are devoting significant resources to the accident investigations listed and anticipate producing an accident report or brief for adoption upon the completion of each investigation.

Ongoing Significant Hazardous Materials Accident Investigations

Location	Date	Description	Fatalities
Fredericksburg, VA	11/03/2016	CSX tank car leaked ethanol	0
New Martinsville, WV	08/27/2016	Axiall Corporation tank car leaked chlorine; evacuation and injuries	0
Brampton, Ontario, Canada	06/03/2016	Battery fire on delivery truck	0

Note: We are devoting significant resources to the accident investigations listed and anticipate producing an accident report or brief for adoption upon the completion of each investigation.

RESEARCH AND ENGINEERING

	(\$000s)	FTEs
FY 2018 Estimate	\$11,964	43
FY 2019 Request	\$12,667	44
Increase/Decrease	\$703	1

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. An increase of 1 FTE is supported by this funding level. No other program changes are planned.

Program Description

The Office of Research and Engineering (RE) provides technical expertise to NTSB accident investigations in all modes of transportation. The office, which includes five divisions and one program area, also conducts safety studies, generates periodic statistical reviews of aviation accidents, and provides medical and toxicology expertise for investigations in all modes.

Safety Research Division

The Safety Research Division examines accidents, accident trends, and technological changes to identify problems and associated remedial actions that will reduce transportation risk and improve the safety of the transportation system. Division staff includes transportation research and data analysts, who provide statistical support to other NTSB offices and develop safety studies and other safety research products. The division also responds to requests for data analysis and statistical information from Board Members, Congress, and the public. Some of these requests require a rapid response to support Board Members and investigators during the initial phase of an accident investigation.

Materials Laboratory Division

The Materials Laboratory Division performs expert multidisciplinary engineering and scientific analyses to determine whether the performance of materials and structures is related to the cause or severity of an accident. Engineers also analyze wreckage to determine the causes of fires and explosions. The division provides chemical and forensic science support, as well as technical advice and support for experimental testing and research in the physical sciences.

Vehicle Recorder Division

The Vehicle Recorder Division extracts, formats, and analyzes data from aircraft flight data recorders (FDR) and CVRs as well as from recorders installed in locomotives, large ships, and some highway vehicles. Staff also examines recorded electronic audio and video information captured by aircraft, ship, train, and support communication systems; provides electronic engineering support for all accident investigation modes in examining communication and control systems; provides time synchronization to correlate voice, data, and video recorder outputs; uses advanced digital and analog filtering and signal representation techniques to extract critical recorder information; and performs forensic examinations of personal electronic devices and other computer hardware.

Vehicle Performance Division

The Vehicle Performance Division provides specialized aeronautical, mechanical, structural, and biomechanical engineering support; three-dimensional laser scanning and accident reconstruction; photogrammetry and video analysis; and animation and graphics support for all modes. Staff uses computational and visualization technology to provide accurate time-motion histories of the sequence of events and evaluates data from multiple sources to determine vehicle and occupant motion and the underlying causes of that motion. The division also develops video animations of accident scenarios, evaluates occupant injury mechanisms, and participates in and directs research into other special projects as required.

Medical Investigative Consultation Service

RE medical staff evaluates the medical aspects of investigations, including medical fitness, pathology, toxicology, injury causation, and biomechanics. Examples of medical issues addressed include operator incapacitation, injury prevention, night vision, hypoxia, substance impairment, obstructive sleep apnea, and use of prescription and over-the-counter medications as well as illicit substances.

Accomplishments and Workload

Safety Research Division

In FY 2017, Safety Research Division staff responded to 328 requests for data analysis and statistical information from other NTSB offices, Board Members, Congress, and the public. In addition to responding to analysis requests, Safety Research Division staff support accident investigations. These are some examples of the division's efforts:

Reducing Speeding-Related Crashes Involving Passenger Vehicles Safety Study

According to NHTSA, speeding-related fatalities composed 29 percent (9,613) of the 32,719 fatalities on public roads during 2013. Speeding causes hundreds of thousands of

injuries and billions of dollars in medical costs each year. This study evaluated the effectiveness of current and emerging countermeasures designed to reduce speeding associated risks. The evaluation included intervention programs at the national, state, and local levels. The study focused on passenger vehicles, which are involved in most speeding-related deaths and injuries.

Report Adopted: July 25, 2017

**BNSF Railway Train Derailment and Subsequent Train Collision, Release of Hazardous Materials, and Fire
Casselton, North Dakota
December 30, 2013**

A BNSF Railway Company train loaded with grain derailed near Casselton, North Dakota. An eastbound BNSF train loaded with petroleum crude oil traveling on an adjacent track struck a derailed car and then also derailed. About 476,000 gallons of crude oil were released and burned. Staff provided geographic information and mapping support to the investigation.

Report Adopted: February 7, 2017

**Amphibious Passenger Vehicle DUCK 6 Lane Crossover Collision With Motorcoach on State Route 99, Aurora Bridge
Seattle, Washington
September 24, 2015**

A motorcoach was struck by a 1945 DUCK APV modified for tour operations. Staff provided geographic information and mapping support to the investigation.

Report Adopted: November 15, 2016

**Multivehicle Work Zone Crash on Interstate 75
Chattanooga, Tennessee
June 25, 2015**

A combination truck-tractor and semitrailer struck a line of slowed traffic while approaching a highway work zone. Staff provided geographic information and mapping support to the investigation.

Report Adopted: October 17, 2016

**School Bus Roadway Departure
Anaheim, California
April 24, 2014**

A 2012 Blue Bird 78-passenger All American school bus equipped with lap/shoulder belts at all seats departed the roadway and impacted a light pole and trees. Staff provided geographic information and mapping support to the investigation.

Report Adopted: October 11, 2016

**School Bus Rollover
Chattanooga, Tennessee
November 21, 2016**

A school bus departed the roadway, overturned, and collided with a tree. Staff is providing data analysis in support of the investigation.

**School Bus Collision With Transit Bus
Baltimore, Maryland
November 1, 2016**

A school bus collided with a transit bus traveling in the opposite direction. Staff is providing data analysis in support of the investigation.

**Motorcoach Collision With Truck-Tractor Semitrailer Combination Vehicle
Palm Springs, California
October 23, 2016**

A motorcoach collided with the rear of a truck-tractor combination vehicle at the end of a traffic queue. Staff is providing geographic information and mapping support to the investigation.

**Engine Room Fire on Roll-On Roll-Off Vessel *Caribbean Fantasy*
San Juan, Puerto Rico
August 17, 2016**

The *Caribbean Fantasy*, a Panamanian flagged roll-on roll-off passenger vessel, experienced an engine fire while en route from Santo Domingo, Dominican Republic to San Juan, Puerto Rico. The fire spread, and the ship later ran aground. Staff conducted text-mining analyses of vessel communications.

**Motorcoach Roadway Departure
Livingston, California
August 2, 2016**

A motorcoach departed the roadway and collided with a roadside sign post. Staff provided geographic information and mapping support to the investigation.

**Sinking of Cargo Ship *El Faro*
Vicinity of Crooked Islands, Bahamas
October 1, 2015**

Staff conducted text-mining analyses and provided geographic information and mapping support to the investigation.

International Advocacy

Safety Research Division staff participated in several international advocacy efforts in FY 2017. Staff participated in the ICAO Accident Investigation Panel; participated in an ICAO working group to provide guidance on protection of accident and incident investigation records; and led an ICAO working group to revise standards, recommended practices, and guidance for conducting post-accident medical testing of aviation flight crews.

Materials Laboratory Division

Materials Laboratory engineers examine parts and wreckage from more than 150 accidents in a typical year from all transportation modes and document findings through formal factual reports, study reports, analytical reports, and safety recommendations. Examples of these efforts include:

**BNSF Railway Train Derailment and Subsequent Train Collision, Release of Hazardous Materials, and Fire
Casselton, North Dakota
December 30, 2013**

A BNSF Railway Company train loaded with grain derailed near Casselton, North Dakota. An eastbound BNSF train loaded with petroleum crude oil traveling on an adjacent track struck a derailed car and then also derailed. About 476,000 gallons of crude oil were released and burned. Staff conducted a metallurgical failure analysis of a car axle.

Report Adopted: February 7, 2017

**Natural Gas Explosion of a School
Minneapolis, MN
August 2, 2017**

A school was destroyed by a natural gas explosion when a leak from a jurisdictional gas pipe occurred during maintenance work. There were nine injuries and two fatalities. Staff conducted laboratory examinations of the gas shutoff valve.

**Natural Gas Explosion of a House
Millersville, PA
July 2, 2017**

A house was destroyed by a natural gas explosion and four homes were damaged when a jurisdictional gas pipe tapping tee developed a leak. There were three injuries and one fatality. Staff determined the root cause of the tapping tee leak.

**Derailment and Fire of an Ethanol Unit Train
Graettinger, Iowa
March 10, 2017**

A UP ethanol unit train derailed. Fourteen of the cars released about 322,000 gallons of ethanol near Graettinger, Iowa, causing a fire. Staff conducted an on-scene evaluation of the track and a metallurgical failure analysis of the track.

**Gasoline Pipeline Rupture
Helena, Alabama
October 31, 2016**

A rupture occurred in a 36-inch diameter gasoline pipeline operated by Colonial Pipeline near Helena, Alabama, causing one fatality, and several injuries. Staff conducted a metallurgical failure analysis of the ruptured pipe.

**Uncontained Engine Failure of a Boeing 767 During Takeoff Roll
Chicago, Illinois
October 28, 2016**

American Airlines flight 383, a Boeing B767 300, powered by two General Electric CF6-80C2B6 turbofan engines, experienced a right engine uncontained failure and subsequent fire during the takeoff ground roll at the Chicago O'Hare International Airport. Staff conducted a metallurgical failure analysis of a fractured second stage turbine disk.

**DC-10 Landing Gear Collapse
Fort Lauderdale, Florida
October 28, 2016**

A FedEx DC-10 experienced a left main landing gear collapse and post-impact fire on landing at Fort Lauderdale Hollywood International Airport. Staff conducted a metallurgical failure analysis of the failed landing gear.

**Anhydrous Ammonia Pipeline Rupture
Tekamah, Nebraska
October 17, 2016**

A rupture occurred in an 8-inch diameter Magellan Pipeline Co. anhydrous ammonia transmission pipeline in Burt County, Nebraska. The rupture released about 300,000 gallons, causing one fatality and the evacuation of dozens of people. Staff conducted a metallurgical failure analysis of the ruptured pipe.

**Boeing 737 Uncontained Engine Failure and Loss of Inlet Cowel
Pensacola, Florida
August 27, 2016**

A Boeing 737 operating as Southwest Airlines flight 3472 experienced an uncontained engine failure and cabin depressurization while climbing through flight level 310. The left engine sustained a fan blade fracture. Staff conducted extensive metallurgical evaluations of the fractured blade pieces and other blade assemblies from the fan disk to determine the root cause of the fracture.

**Railroad Tank Car Breach and Release of Chlorine
New Martinsville, West Virginia
August 27, 2016**

While being loaded at an Axiall Corporation facility, a railroad tank car fractured circumferentially along the tank underside at the termination of a stub sill, allowing the release of 17,000 gallons of chlorine. Staff conducted a metallurgical failure analysis of the fracture and evaluated nondestructive testing methods to detect weld flaws at the stub sill. This work is supporting updated tank car rulemaking by the FRA.

**Engine Room Fire on Roll-On Roll-Off Vessel *Caribbean Fantasy*
San Juan, Puerto Rico
August 17, 2016**

The *Caribbean Fantasy*, a Panamanian-flagged roll-on roll-off passenger vessel, experienced an engine fire while en route from Santo Domingo, Dominican Republic to San Juan, Puerto Rico. The fire spread and the ship later ran aground. Staff conducted an on-scene cause and origin investigation of the engine room fire and reviewed the fire suppression design and efficacy. This work also involved laboratory measurement of

flange bolt torques and Fourier transform infrared spectroscopy of fuel rail gasket materials.

**Apartment Building Explosion and Fire
Silver Spring, MD
August 10, 2016**

An explosion and fire at the Flower Branch Apartments resulted in seven fatalities and dozens of injuries. Staff conducted failure analyses of natural gas regulators, and ancillary natural gas jurisdictional piping (before the meter).

**Balony Kubicek BB85Z Hot Air Balloon Crash and Fire
Lockhart, Texas
July 30, 2016**

A Balony Kubicek BB85Z hot air balloon crashed into a field after striking high voltage power lines. The 15 passengers and pilot onboard were fatally injured, and the balloon was substantially damaged by impact forces and post-crash fire. Staff conducted on-scene evaluation of the wreckage and documented the cause, origin, and effects of the fire.

**Fed Ex Delivery Truck Fire
Brampton, Ontario Canada
June 1, 2016**

After two aircraft flights from Florida to Canada, a lithium-ion battery shipment (four boxes) caught fire during final destination delivery via Fed Ex truck. Staff investigated the cause and origin of the battery fire.

**Inflight Fracture of a Lockheed 382G Forward Pressure Bulkhead
Iliamna, Alaska
February 12, 2016**

The airplane experienced a rupture in the forward pressure bulkhead canted web causing a rapid depressurization during flight. Staff determined the root cause of the bulkhead fracture. A manufacturer service bulletin specifying updated inspection intervals was issued as a result of this investigation.

Vehicle Recorder Division

In a typical year, the Vehicle Recorder laboratories receive about 500 recording devices and complete more than 500 readouts, transcripts, and studies in support of aviation, rail, marine, and highway investigations. Here are some examples of these efforts:

Collision Between a Car Operating With Automated Vehicle Control Systems and a Tractor-Semitrailer Truck Williston, Florida May 7, 2016

A 2015 Tesla Model S 70D car being operated with automated vehicle control systems struck a tractor-semitrailer truck. The car struck the right side of the semitrailer, crossed underneath it, and then went off the right roadside at a shallow angle. The driver and sole occupant of the car died in the crash; the commercial truck driver was not injured. Staff worked with Tesla to extract vehicle performance data from the Tesla's electronic control unit and documented the findings in a factual report.

Report Adopted: September 12, 2017

Highway-Railroad Grade Crossing Collision Valhalla, New York February 3, 2015

A sport-utility vehicle was on tracks at a grade crossing and struck by a Metro-North passenger train. Five passengers died and nine passengers and the engineer were injured, all in the lead railcar. The driver of the sport-utility vehicle also died. Staff launched on-scene, downloaded multiple train event recorders, and documented the findings in a factual report.

Report Adopted: July 27, 2017

Collision with Terrain, Promech Air Inc., de Havilland DHC-3 Ketchikan, Alaska June 25, 2015

A single-engine, turbine-powered, float-equipped de Havilland DHC-3 (Otter) airplane collided with mountainous, tree-covered terrain about 24 miles east-northeast of Ketchikan, Alaska. The commercial pilot and eight passengers sustained fatal injuries, and the airplane was destroyed. Staff downloaded several personal electronic devices and avionics, documented findings in factual reports, and completed a study on the replay of data through a cockpit display.

Report Adopted: April 25, 2017

**Loss of Control at Takeoff, Air Methods Corporation, Airbus Helicopters AS350 B3e
Frisco, Colorado
July 3, 2015**

An Airbus Helicopters AS350 B3e helicopter registered to and operated by Air Methods Corporation, lifted off from the Summit Medical Center Heliport, Frisco, Colorado, and then crashed into a parking lot. The pilot was fatally injured, and the two flight nurses were seriously injured. The helicopter was destroyed by impact forces and a postcrash fire. Staff were unsuccessful in extracting data from multiple heavily damaged devices, but documented their efforts in factual reports.

Report Adopted: March 28, 2017

**Motorcoach Collision with Crash Attenuator in Gore Area US Highway 101
San Jose, California
January 19, 2016**

A Greyhound motorcoach struck a barrier in a gore area of US Highway 101 and overturned. An engineer was launched to the scene, downloaded the engine control module, and worked with onboard video from the accident motorcoach and a trailing motorcoach.

Report Adopted: March 28, 2017

**BNSF Railway Train Derailment and Subsequent Train Collision, Release of
Hazardous Materials, and Fire
Casselton, North Dakota
December 30, 2013**

A BNSF Railway Company train loaded with grain derailed near Casselton, North Dakota. An eastbound BNSF train loaded with petroleum crude oil traveling on an adjacent track struck a derailed car and then also derailed. About 476,000 gallons of crude oil were released and burned. Staff completed factual reports on the locomotive event recorders, forward facing image recorders, and cell phone records.

Report Adopted: February 7, 2017

**Amphibious Passenger Vehicle DUCK 6 Lane Crossover Collision With Motorcoach
on State Route 99, Aurora Bridge
Seattle, Washington
September 24, 2015**

A motorcoach was struck by a 1945 DUCK APV modified for tour operations. Staff launched to the scene, recovered motorcoach engine data and video that captured the crash sequence, and documented the findings in factual reports.

Report Adopted: November 15, 2016

**Midair Collision
Moncks Corner, South Carolina
July 7, 2015**

A Cessna 150M and a Lockheed Martin F-16CM, operated by the US Air Force, collided in midair near Moncks Corner, South Carolina. Staff recovered flight data from the F-16 and completed a factual report detailing the findings.

Report Adopted: November 14, 2016

**Midair Collision
San Diego, California
August 16, 2015**

A Cessna 172M and an experimental North American Rockwell NA265-60SC Sabreliner collided in midair about 1 mile northeast of SDM, San Diego, California. Staff downloaded the Sabreliner's CVR, conducted a group meeting, and produced a transcript of the recording.

Report Adopted: November 14, 2016

**Crash During Nonprecision Instrument Approach to Landing, Execufight
Flight 1526, British Aerospace HS 125-700A
Akron, Ohio
November 10, 2015**

A British Aerospace Hawker 125 departed controlled flight while on approach to landing at AKR and impacted an apartment building. Staff downloaded the airplane's CVR, documented the contents of the recording, and conducted a sound spectrum study.

Report Adopted: October 18, 2016

**Multivehicle Work Zone Crash on Interstate 75
Chattanooga, Tennessee
June 25, 2015**

A combination truck-tractor and semitrailer struck a line of slowed traffic while approaching a highway work zone. Staff launched on-scene, recovered and downloaded a total of nine recording devices, and documented the findings in factual reports.

Report Adopted: October 17, 2016

**Transit Bus and Motorcoach Collision
Flushing, New York
September 18, 2017**

A motorcoach struck a New York Metropolitan Transit Authority transit bus at an intersection. Staff launched on-scene, recovered and downloaded multiple recording devices, and is working to document the contents.

**Employee Fatalities – CSX/Amtrak
Washington, DC
June 28, 2017**

Two CSX employees were struck and killed by a southbound Amtrak train. Staff launched on-scene, recovered and downloaded event recorders and image recorders, and is working to document the contents.

**Derailment and Fire of an Ethanol Unit Train
Graettinger, Iowa
March 10, 2017**

A UP ethanol unit train derailed. Fourteen of the cars released about 322,000 gallons of ethanol near Graettinger, Iowa, causing a fire. Staff is working on data and videos from multiple locomotives and will document the findings in factual reports.

**School Bus Rollover
Chattanooga, Tennessee
November 21, 2016**

A school bus departed the roadway, overturned, and collided with a tree. Staff launched on-scene, recovered and downloaded multiple recording devices, and is working to document the contents.

**School Bus Collision With Transit Bus
Baltimore, Maryland
November 1, 2016**

A school bus collided with a transit bus traveling in the opposite direction. Staff launched on-scene, recovered multiple data and image recordings, and is working to document the contents.

**Uncontained Engine Failure of a Boeing 767 During Takeoff Roll
Chicago, Illinois
October 28, 2016**

American Airlines flight 383, a Boeing B767 300 powered by two General Electric CF6-80C2B6 turbofan engines, experienced a right engine uncontained failure and

subsequent fire during the takeoff ground roll at the Chicago O’Hare International Airport. Staff downloaded the CVR and FDR, completed the CVR transcript, and documented the findings in factual reports.

**DC-10 Landing Gear Collapse
Fort Lauderdale, Florida
October 28, 2016**

A FedEx DC-10 experienced a left main landing gear collapse and post-impact fire on landing at Fort Lauderdale Hollywood International Airport. Staff downloaded the CVR and FDR, completed the CVR transcript, and are working to document the findings in factual reports.

**Controlled Flight Into Terrain
Togiak, Alaska
October 2, 2016**

A Cessna 208B flying a scheduled air taxi and commuter flight under 14 *CFR* Part 135 and VFR collided with terrain. All occupants (both flight crew and one passenger) died. Staff is working to recover data from multiple damaged devices that were on the airplane and will document the findings in a factual report.

**Balony Kubicek BB85Z Hot Air Balloon Crash and Fire
Lockhart, Texas
July 30, 2016**

A Balony Kubicek BB85Z hot air balloon crashed into a field after striking high voltage power lines. The 15 passengers and pilot onboard were fatally injured and the balloon was substantially damaged from impact forces and the post-crash fire. Staff launched on-scene, recovered twenty devices, and documented the contents in factual reports.

**Sinking of Cargo Ship *El Faro*
Vicinity of Crooked Islands, Bahamas
October 1, 2015**

The US-flagged cargo ship *El Faro* sank during Hurricane Joaquin. Engineers recovered the ship’s voyage data recorder and completed multiple factual reports including all the sources of *El Faro* data and the bridge audio’s transcript (more than 500 pages).

Vehicle Performance Division

In a typical year, Vehicle Performance staff members produce more than 50 study reports and animations, launch to accident sites to acquire evidence for performance reports, and participate in the development of safety recommendations and modal accident reports. Here are some examples of these efforts:

Collision Between a Car Operating With Automated Vehicle Control Systems and a Tractor-Semitrailer Truck Williston, Florida May 7, 2016

A Tesla model S sedan operated in autonomous mode collided with a truck tractor in combination with a semitrailer making a left turn at an intersection in front of the Tesla. Staff performed vehicle simulations to determine the likely sequence of events during the accident, a second staff member evaluated the injuries sustained in the crash, and a third staff member created an animation to depict the range of possible truck motions during the accident.

Report Adopted: September 12, 2017

Highway-Railroad Grade Crossing Collision Valhalla, New York February 3, 2015

Metro-North Railroad passenger train 659 struck a sport-utility vehicle at a highway-railroad grade crossing, and then subsequently struck the third rail, leading to 343 feet of third rail piercing the sport-utility vehicle and entering the lead rail car. Staff used computer modeling to evaluate the stresses in the third rail joints arising from the compressive and bending forces that would have been applied by the impact from the vehicles during the accident.

Report Adopted: July 25, 2017

Colonial Pipeline Company Petroleum Product Leak Centreville, Virginia September 21, 2015

An estimated 4,000 gallons of petroleum product were released by a leak caused by a through-wall corrosion fatigue crack that developed at a dent and was propagated by residual and operational stresses, accelerated by corrosion occurring in the underground environment. Staff used computer modeling to evaluate the stresses arising from the creation of the dent along with the residual and operational stresses that occurred after the dent was formed.

Report Adopted: June 5, 2017

**Motorcoach Collision With Crash Attenuator in Gore Area US Highway 101
San Jose, California
January 19, 2016**

A Greyhound motorcoach struck a barrier in a gore area of US Highway 101 and overturned. Staff performed laser scanning of the accident site and vehicle, identified a potential safety issue in the design of the driver's seat attachment, and performed a biomechanics study to evaluate injury causes and prevention possibilities. In support of the biomechanics study, staff evaluated video evidence to aid in calculating the forces encountered during the crash.

Report Adopted: March 28, 2017

**Loss of Control at Takeoff Air Methods Corporation Airbus Helicopters AS350 B3e
Frisco, Colorado
July 3, 2015**

An Airbus Helicopters AS350 B3e helicopter registered to and operated by Air Methods Corporation lifted off from the Summit Medical Center Heliport, Frisco, Colorado, and then crashed into a parking lot. The pilot was fatally injured, and the two flight nurses were seriously injured. The helicopter was destroyed by impact forces and a postcrash fire. Staff documented the ability of a properly configured helicopter to maintain control in the prevailing weather conditions. Staff also evaluated injury causation and the crashworthiness of the helicopter, proposed a recommendation to improve knowledge of improved safety features among helicopter users, and assembled video for the Board Meeting.

Report Adopted: March 28, 2017

**BNSF Railway Train Derailment and Subsequent Train Collision, Release of
Hazardous Materials, and Fire
Casselton, North Dakota
December 30, 2013**

A BNSF Railway Company train loaded with grain derailed near Casselton, North Dakota. An eastbound BNSF train loaded with petroleum crude oil traveling on an adjacent track struck a derailed car and then also derailed. About 476,000 gallons of crude oil were released and burned. Staff used vehicle simulations to evaluate train stopping performance for different types of brake systems. That work has been extended to quantify how many cars would be stopped short of the point of derailment and how much the kinetic energy of the cars would be reduced if trains were equipped with advanced braking systems. Staff also assembled video for the Board Meeting.

Report Adopted: February 7, 2017

**Amphibious Passenger Vehicle DUCK 6 Lane Crossover Collision With Motorcoach
on State Route 99, Aurora Bridge
Seattle, Washington
September 24, 2015**

A motorcoach was struck by a 1945 DUCK APV modified for tour operations. Staff performed finite element modeling to evaluate the stresses in the DUCK axle (which had fractured in the accident) and associated components.

Report Adopted: November 15, 2016

**Midair Collision
Moncks Corner, South Carolina
July 7, 2015**

A Cessna 150M and a Lockheed Martin F-16CM, operated by the US Air Force, collided in midair near Moncks Corner, South Carolina. Staff calculated the position and orientation of each aircraft and used laser scans of exemplar airplanes to determine the ability of the pilot in each aircraft to detect the other aircraft. Staff also simulated the views from each cockpit during the accident sequence, and simulated the information that could be made available to each pilot with existing technology, which could have provided early alerting and prevented the collision. Additional staff compiled the information into a series of animations for the Board Meeting.

Report Adopted: November 14, 2016

**Midair Collision
San Diego, California
August 16, 2015**

A Cessna 172M and an experimental North American Rockwell NA265-60SC Sabreliner collided in midair about 1 mile northeast of SDM, San Diego, California. Staff calculated the position and orientation of each aircraft and used laser scans of exemplar airplanes to determine the ability of the pilot in each aircraft to detect the other aircraft. Staff also simulated the views from each cockpit during the accident sequence, and simulated the information that could be made available to each pilot with existing technology, which could have provided early alerting and prevented the collision. Additional staff compiled the information into a series of animations for the Board Meeting.

Report Adopted: November 14, 2016

**Crash During Nonprecision Instrument Approach to Landing Execufight Flight
1526 British Aerospace HS 125-700A
Akron, Ohio
November 10, 2015**

A British Aerospace Hawker 125 departed controlled flight while on approach to landing at AKR and impacted an apartment building in Akron, Ohio. Staff evaluated the aircraft performance during the approach to landing.

Report Adopted: October 18, 2016

**Multivehicle Work Zone Crash on Interstate 75
Chattanooga, Tennessee
June 25, 2015**

A combination truck-tractor and semitrailer struck a line of slowed traffic while approaching a highway work zone. Staff assisted in reconstructing the crash sequence.

Report Adopted: October 17, 2016

**School Bus Roadway Departure
Anaheim, California
April 24, 2014**

A 2012 Blue Bird 78-passenger All American school bus equipped with lap/shoulder belts at all seats departed the roadway and impacted a light pole and trees, with the driver and four of the eleven students on board sustaining serious injuries. Staff evaluated the effectiveness of the lap/shoulder belts through biomechanical simulations and the capability of the onboard video recording system installed in the bus. Staff also helped draft the accident investigation report.

Report Adopted: October 11, 2017

**Gates Learjet 35A Crash on Landing
Teterboro, New Jersey
May 15, 2017**

A Gates Learjet 35A departed controlled flight while on a circling approach to runway 1 at the Teterboro Airport and impacted a commercial building and parking lot. Staff is evaluating the vehicle performance during the accident flight.

**Shorts SD3-30 Crash on Landing
Charleston, West Virginia
May 5, 2017**

Air Cargo Carriers flight 1260, a Shorts SD3-30, N334AC, crashed during landing on runway 5 at the Charleston Yeager International Airport. Staff is evaluating the vehicle performance during the accident flight.

**Collision Between a Pickup Truck and a Medium-Size Bus
Concan, Texas
March 29, 2017**

A 2007 Dodge Ram 3500 pickup truck traveling north on U.S. Highway 83 departed the northbound travel lane and crossed into the southbound travel lane, colliding with the front left corner of a 2004 Ford E350 cutaway chassis with a 13-passenger Turtle Top Vanterra medium-size bus body traveling in the opposite direction. Staff is evaluating the vehicle performance and impact forces experienced during the crash.

**Derailment and Fire of an Ethanol Unit Train
Graettinger, Iowa
March 10, 2017**

A UP ethanol unit train derailed. Fourteen of the cars released about 322,000 gallons of ethanol near Graettinger, Iowa, causing a fire. Staff used computer modeling to evaluate the stresses in the rail involved in the derailment, and also evaluated the effects of alternative braking technology on the number of cars expected to reach the point of derailment and their kinetic energy at that point.

**Boeing MD-83 Runway Overrun
Ypsilanti, Michigan
March 8, 2017**

Ameristar Air Cargo Inc. flight 9363, a Boeing MD-83, ran off the end of runway 23L after executing a rejected takeoff at Willow Run Airport. Staff is evaluating the vehicle performance during the accident flight.

**Rail Tank Car Release of Chlorine
New Martinsville, West Virginia
August 27, 2016**

Tank car AXLX 1702, experienced a sudden tank shell crack shortly after it was filled with liquefied compressed chlorine at the Axiall Corporation rail car loading facility, releasing the entire 90-ton load of chlorine. Staff used computer modeling to evaluate stresses associated with the welds connecting the tank shell to the supporting substructure in the area where the crack occurred.

Bell 525 In-Flight Breakup**Italy, Texas****July 6, 2016**

A Bell 525 helicopter broke up in flight during a developmental flight test and impacted terrain. Staff evaluated the vehicle motion and vibration characteristics of the helicopter during the accident flight and previous test flights.

Collision Between a Truck and a Bus**St. Marks, Florida****July 2, 2016**

A 2005 Freightliner truck-tractor in combination with an enclosed semitrailer struck a 1979 Blue Bird bus occupied by a driver and at least 33 passengers at the intersection between US Highway 98 and state road SR-363. Staff performed vehicle simulations to determine the likely sequence of events during the accident.

Motorcoach Roadway Departure**Laredo, Texas****May 14, 2016**

The driver lost control of the motorcoach as he was negotiating a curve on US-83 in light rain with a wet road surface, and the motorcoach departed the roadway to the right and rolled over onto its left side. Staff performed vehicle simulations to determine the likely sequence of events during the accident.

Sinking of Cargo Ship *El Faro***Vicinity of Crooked Islands, Bahamas****October 1, 2015**

The US-flagged cargo ship *El Faro* sank during Hurricane Joaquin. Staff used computer modeling to evaluate the potential for failure of the securement of the cargo containers and vehicles during the voyage, and additional staff is developing an animation to communicate the sequence of events leading to the sinking.

Technological Upgrades

New software has been acquired to calculate fatigue crack growth within a finite element program and separately for simplified geometries in another program. New software has also been acquired to evaluate the potential for ice build-up on aircraft in flight. Three-dimensional geometry captured through laser scanning or drone photogrammetry have been printed in 3D to help explain accident situations. The geometry has also been imported for finite element analysis, and color contours were added to multiple 3D-printed models to indicate the stress levels in the part under use.

Medical Investigative Consultation Service

Medical staff participate in numerous NTSB accident investigations in all transportation modes each year, evaluating and addressing medical issues through formal factual and analytical reports, safety recommendations, coordination with other agencies, and formal presentations to the NTSB and external audiences. Annually, medical staff participate in more than 150 medical accident investigations and complete more than 250 reports. In FY 2017, medical investigations were completed for the following major accidents:

Collision Between a Car Operating With Automated Vehicle Control Systems and a Tractor-Semitrailer Truck

Williston, Florida

May 7, 2016

A 2015 Tesla Model S 70D car being operated with automated vehicle control systems struck a tractor-semitrailer truck. The car struck the right side of the semitrailer, crossed underneath it, and then went off the right roadside at a shallow angle. The driver and sole occupant of the car died in the crash; the commercial truck driver was not injured. Medical staff evaluated both drivers for medical conditions and the use of substances.

Report Adopted: September 12, 2017

Highway-Railroad Grade Crossing Collision

Valhalla, New York

February 3, 2015

A sport-utility vehicle (SUV) was on tracks at a grade crossing and struck by a Metro-North passenger train. Five passengers died and nine passengers and the engineer were injured, all in the lead railcar. The driver of the sport-utility vehicle also died. Medical staff launched on scene and participated in the medical evaluation of the engineer and SUV driver, and the evaluation of the emergency medical response.

Report Adopted: July 25, 2017

Loss of Control at Takeoff, Air Methods Corporation, Airbus Helicopters

Frisco, Colorado

July 3, 2015

An Airbus Helicopters AS350 B3e helicopter registered to and operated by Air Methods Corporation, lifted off from the Summit Medical Center Heliport, Frisco, Colorado, and then crashed into a parking lot. The pilot was fatally injured, and the two flight nurses were seriously injured. The helicopter was destroyed by impact forces and a postcrash fire. Medical staff participated in the injury evaluation of the occupants, identifying the initial

traumatic injuries were not fatal and the cause of the pilot's death was from the post impact fire.

Report Adopted: March 28, 2017

**Motorcoach Collision with Crash Attenuator in Gore Area, US Highway 101
San Jose, California
January 19, 2016**

A Greyhound motorcoach struck a barrier in a gore area of US Highway 101 and overturned. Medical staff evaluated the driver for medical conditions and medication use.

Report Adopted: March 28, 2017

**Amphibious Passenger Vehicle DUCK 6 Lane Crossover Collision With Motorcoach
on State Route 99, Aurora Bridge
Seattle, Washington
September 24, 2015**

A motorcoach was struck by a 1945 DUCK APV modified for tour operations. Medical staff launched on scene and participated in the evaluation of the drivers of the vehicles for medical conditions and substance use.

Report Adopted: November 15, 2016

**Crash During Nonprecision Instrument Approach to Landing
Akron, Ohio
November 10, 2015**

A British Aerospace Hawker 125 departed controlled flight while on approach to landing at AKR and impacted an apartment building in Akron, Ohio. Medical staff evaluated the flight crew for medical conditions and substance use.

Report Adopted: October 18, 2016

**Multivehicle Work Zone Crash on Interstate 75
Chattanooga, Tennessee
June 25, 2015**

A combination truck-tractor and semitrailer struck a line of slowed traffic while approaching a highway work zone. The medical evaluation revealed the use of methamphetamine by the truck driver contributed to the accident.

Report Adopted: October 17, 2016

**School Bus Roadway Departure
Anaheim, California
April 24, 2014**

A 2012 Blue Bird 78-passenger All American school bus equipped with lap/shoulder belts at all seats departed the roadway and impacted a light pole and trees, with the driver and four of the eleven students on board sustaining serious injuries. Medical staff participated in the review of video evidence, which revealed the probable cause, and injury evaluation of the occupants.

Brief Adopted: October 11, 2016

**Transit Bus and Motorcoach Collision
Flushing, NY
September 18, 2017**

A New York Metropolitan Transit Administration transit bus was struck by a motorcoach operated by Dahlia Tours. Medical staff coordinated toxicology studies and is reviewing the medical information for both drivers.

**Two SEPTA Trains Collided
Upper Darby, PA
August 22, 2017**

Two SEPTA light rail trains collided. Medical staff reviewed medical information and is ensuring complete toxicology testing of the operators.

**Train Struck Train Workers
Queens Village, NY
June 10, 2017**

A worker was fatally struck by a train while performing repair work to some track. Medical staff is investigating the health conditions, medications, and substance use of the worker.

**Derailed Commuter Train
Rye, NY
May 18, 2017**

A MetroNorth commuter train derailed while exceeding temporarily reduced speed limits. Medical staff is investigating the health conditions, medications, and substance use of the engineer.

Shorts SD3-30 Crash on Landing
Charleston, WV
May 5, 2017

Air Cargo Carriers flight 1260, crashed on landing, killing two flight crew. Medical staff is investigating the health conditions, medications, and substance use of the flight crew.

Collision of Two Passenger Trolleys
Philadelphia, Pennsylvania
January 4, 2017

A SEPTA trolley struck the rear of another SEPTA trolley on the same track. Medical staff investigated and analyzed the health conditions and medications of the train crew.

Passenger Train Failed to Stop and Overrode Bumping Post
Brooklyn, New York
January 4, 2017

Long Island Rail Road (LIRR) train 2817 struck a bumper and derailed. Medical staff investigated and analyzed the health conditions and medications of the train crew.

School Bus Rollover
Chattanooga, Tennessee
November 21, 2016

A school bus departed the roadway, overturned, and collided with a tree. As a result, six student passengers were killed. Medical staff participated in the evaluation and analysis of the health conditions and medications of the driver and injury analysis of the occupants.

School Bus Collision With Transit Bus
Baltimore, Maryland
November 1, 2016

A school bus collided with a transit bus traveling in the opposite direction. Both bus drivers and four transit bus passengers were killed. Staff investigated the health conditions, medications, and substances used by both drivers.

Controlled Flight Into Terrain
Togiak, Alaska
October 2, 2016

A Cessna 208B flying a scheduled air taxi and commuter flight under 14 *CFR* Part 135 and VFR collided with terrain. All occupants (both flight crew and one passenger) died. Medical staff investigated and analyzed the health conditions, medications, and substance use of the flight crew.

**Passenger Train Failed to Stop and Overrode Bumping Post
Hoboken, New Jersey
September 29, 2016**

New Jersey Transit train 1614 struck a bumper and derailed. Medical staff launched on scene and participated in the evaluation and analysis of the health conditions and medications of the train crew.

TRAINING CENTER

	(\$000s)	FTEs
FY 2018 Estimate	\$1,139	4
FY 2019 Request	\$1,146	4
Increase/Decrease	\$7	0

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

The NTSB Training Center is an organizational component of the Office of the Managing Director. Budget exhibits have historically shown these activities as program resources outside the policy and direction line that incorporates the Office of the Managing Director. The Training Center is responsible for training our partners in investigations, training internal staff, developing training plans, and overseeing the development and implementation of workforce development programs.

Accomplishments and Workload

The Training Center continues to move forward in its evaluation of courses to further refine the offerings and improve instruction in all areas of technical, investigative, and other mission support. The Training Center continues to offer new course content in investigative skills, such as UAS systems and mobile forensics, that target processes, procedures, and technical issues critical to the agency's mission of accident investigation. These courses are generally open only to NTSB investigative and support staff.

FY 2017 is the NTSB's fifth year using the Talent Management System, which aids in scheduling, approving, and evaluating all staff training. Content and use of the system continues to expand. The system tracks and maintains a permanent record of all staff education and training activities and provides a valuable tool for developing and tracking staff competencies and skills. It is also used as an online training venue as well as a course evaluation tool. As the system's vendor moves to a new platform in FY 2018, we are working to ensure that all of NTSB's Learning Management system requirements are met.

Full-time training officers and advisers coordinate the development of group training by regularly conducting needs analyses and assessments for each office and by focusing on longer term training requirements. Workforce development course offerings undergo continuous evaluation and improvement to adapt to the NTSB's changing needs and priorities. The skills developed and enhanced by workforce development training are

highly transferable and add significant value to the investigative processes as well as mission support functions.

These are some of the ongoing activities of the Training Center:

- ***Providing GA forums/symposia:*** Several years ago, the Training Center developed and hosted a Volunteer Pilots Safety Stand Down Day. The success of this safety seminar prompted the Training Center to develop and present other seminars on a regular and continuing basis. The NTSB partners with the FAA and other interested groups to develop programs addressing the regulatory and private aspects of GA safety. In the last several years the NTSB has produced 12 safety seminars, on various topics, that have received high marks from the aviation community. In November 2016, the Training Center and AS staff delivered a safety seminar in Alaska on LOC that addressed the specific complexities and issues of flying in a challenging geographic area. In March 2017, the Training Center and AS staff delivered the first annual Inspection Authorization Renewal Safety Seminar. In September 2017, the Training Center and AS staff delivered a safety seminar in Ronkonkoma, New York, on LOC, specifically addressing accidents which occurred in the New York, New Jersey, and Connecticut tri-state area.

Future safety seminars will continue to concentrate on areas of GA operations that have the highest fatality rates and on trending issues identified by an increasing number of accidents. As appropriate, the Training Center continues to partner with other federal agencies and such private organizations as the Airline Owners and Pilots Association, the Experimental Aircraft Association, and the Society of Aviation and Flight Educators.

- ***Expanding workforce development for all NTSB Staff:*** We continue to expand the course offerings for NTSB career professionals. Recent additions to this effort include courses on Project Management, Problem Solving, and Covey's 7 Habits of Highly Effective People, in addition to Scrum Master training and retirement training. The workforce development curriculum is designed to address important cross-functional and leadership competencies at the agency.
- ***Strongly emphasizing technical training for NTSB investigators:*** We continue to upgrade and refine investigators' skills with such courses as Root Cause Analysis, System Safety Fundamentals for Investigators, Cognitive Interviewing, Accident Site Photography, technically advanced aircraft training (Garmin G1000), SMS Analysis, and NTSB-tailored Accident Report Writing.
- ***Offering investigation courses for other federal agencies:*** The Training Center is often contacted to develop and present classes for other agencies in aviation accident investigation. Thus far, the Training Center has developed and provided training for the US Department of Energy, the FBI, the US Army National Guard, and the Coast Guard. In FY 2016, we held two classes for the Coast Guard; in FY 2017, we held four classes. Additionally, the Training Center is in discussions with the US Air Force Reserve to

develop training for reservists; meanwhile, we continue to present both a 2-week Aircraft Accident Investigation class (now in its 8th year), and a 1-week Helicopter Accident Investigation class for the US Army National Guard.

- ***Evaluating and updating current courses and developing courses to produce new revenue streams.*** The Training Center staff performs an evaluation on each course that we offer and make swift and necessary corrections for the next iteration. We also add modules as necessary based on upcoming and new transportation tools. For example, in FY 2017 we added a hands-on module for UAS.
- ***Continuing to increase awareness of the NTSB and its mission by offering TWA 800 briefings to other federal agencies and groups involved with transportation safety and security.***

FY 2017 Activities

Courses With Public Enrollment	Students
Courses at Training Center:	
Aircraft Accident Investigations Orientation for Aviation Professionals (2 offerings)	59
Cognitive Interviewing	52
Family Assistance	39
Aircraft Accident Investigations	94
Investigating Human Fatigue Factors	40
Inspection Authorization Renewal Safety Seminar	94
Pilot Impairment Safety Seminar	33
Helicopter Accident Investigations	25
Accident Investigation Orientation for Rail Professionals	57
Subtotal Courses at Training Center	493
Offsite Courses:	
Managing Communications During a Major Transportation Accident - JetBlue	51
Managing Communications During a Major Transportation Accident – Sikorsky	19
Loss of Control Lessons Learned Safety Seminar - Alaska	150
Subtotal Off Site Courses	220
Private Courses at Training Center:	
Aviation Accident Investigation – US Coast Guard	102
Aircraft Accident Investigation – US Army National Guard	28
Helicopter Accident Investigation – US Army National Guard	29
Advanced Marine Mishap Analysis and Reporting – US Coast Guard	50
Subtotal Private Courses at Training Center	209
Total (October 1, 2016 – September 30, 2017)	922

Courses Conducted Exclusively for NTSB Employees	Students
508-Compliance Training (8 offerings)	41
7 Habits of Highly Effective People Foundations	7
Achieving Work-Life Balance	11
Advanced Training for Microsoft Excel	10
Aircraft Accident Investigation	1
Branding for Business and Personal Success	25
Building Coalitions Workshop	25
Cessna G-1000 Training (3 offerings)	3
Civil Treatment for Employees (CTE) Training Webinars (6 offerings)	458
Conflict Competency: Lunch and Learn Workshop	12
Contracting Officers Representative (COR) Level II	14
Digital Forensics	7
Effective Negotiations Techniques	8
Flexibility and Adaptability	9
NTSB Investigations - What Every Legal Professional Needs to Know	2
Hazwoper Refresher 8-hour course	11
Investigating Human Fatigue Factors	1
Leadership Development Series: Managing Conflict with The High Conflict Employee	24
Leadership Development Series: Prevention of Workplace Harassment	17
Media Relations Training (2 offerings)	17
Meeting Management	5
Mid-Career Retirement	29
New IQ Solution (2 offerings)	73
NTSB Ethics Training (4 offerings)	103
OSHA 2225 Respiratory Protection and Fit Test (8 offerings)	154
Planning for Retirement for FERS and CSRS Employees	28
Problem Solving	10
Problem Solving for Effective Decision Making	5
Project Management PMP Prep (2 offerings)	11
Road to Number 1: Engagement and Accountability	25
SCRUM Master Training	14
Total (October 1, 2016 – September 30, 2017)	1,160

ADMINISTRATIVE LAW JUDGES

	(\$000s)	FTEs
FY 2018 Estimate	\$1,988	8
FY 2019 Request	\$1,994	8
Increase/Decrease	\$6	0

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

The NTSB serves as the court of appeals for airmen and aircraft mechanics against whom the FAA has taken a certificate action, and for mariners against whom the Coast Guard has taken a certificate action. The agency's administrative law judges hear, consider, and issue initial decisions on administrative appeals regarding FAA aviation enforcement actions. Included are appeals of the following:

- Orders issued by the FAA Administrator amending, modifying, suspending, or revoking, in whole or in part, certificates of airmen, air agencies, and air carriers for alleged violations of the *Federal Aviation Regulations* or for lack of qualifications.
- FAA actions denying applications for the issuance or renewal of airman certificates, including airman medical certificates.
- Certain FAA civil penalty orders issued against individuals, pilots, flight engineers, mechanics, or repairmen where the amount in dispute is less than \$50,000.

The judges also adjudicate claims under the Equal Access to Justice Act for fees and expenses stemming from FAA certificate and civil penalty actions.

The NTSB currently has three judges assigned to headquarters in Washington, DC, (including one who teleworks full time from Arlington, Texas), and one vacancy. The judges hold hearings primarily based on their circuit assignments. The Pilot's Bill of Rights, Public Law No. 112-53 (August 3, 2012), requires judges to apply the Federal Rules of Evidence and Federal Rules of Civil Procedure to their proceedings. Either the certificate holder or the FAA can appeal a judge's decision in these cases to the five-member Board. The Board's review on appeal of an administrative law judge's decision is based on the record of the proceeding, which includes hearing testimony (transcript), exhibits, the judge's decision, and appeal briefs submitted by the parties.

The FAA has the right to appeal the Board’s decisions to the US Court of Appeals when it determines that the decisions “will have a significant adverse impact” with respect to aviation safety duties and powers designated to be carried out by the FAA. Under the Pilot’s Bill of Rights, airmen and mechanics now also have the right to appeal all adverse Board decisions to a US District Court or to a US Court of Appeals. The District Court’s review of the Board’s decision is based on the evidence from the record before the Board, including hearing testimony, transcripts, exhibits, decisions, and briefs submitted by the parties. The Court of Appeals has the power to affirm, modify, or set aside the decision, in whole or in part, or, if the need is determined, to order further proceedings by the Board. The decision of the Court of Appeals is subject to review by the US Supreme Court on writ of *certiorari*.

Section 716 of the Aviation Investment and Reform Act for the 21st Century, Public Law 106-181 (April 5, 2000), expanded the NTSB’s jurisdiction to include, upon petition by the affected certificate holder, reviews of FAA designations of safety enforcement actions as emergencies that require the order to be effective immediately. The Board has delegated this review authority to its administrative law judges. However, in the event of an appeal to the Board from a law judge’s decision on the merits of the emergency or other immediately effective order, the Board may, at its discretion, note in its order disposing of the appeal its views on the law judge’s ruling on the petition, and such views serve as binding precedent in all future cases. The Pilot’s Bill of Rights provides for substantive independent and expedited review by the US District Court of any decision by the FAA Administrator to make such an order effective immediately.

An administrative law judge must issue an Oral Initial Decision regarding the appeal of an emergency order or an immediately effective order within 30 days of receipt. If the law judge’s decision is appealed to the full Board, an Opinion and Order must be issued within 60 days of the appeal’s initial receipt.

Marine certificate actions are heard first by the Coast Guard administrative law judges and may be appealed to the Vice Commandant of the Coast Guard. The ruling of the Vice Commandant may then be appealed to the NTSB’s full Board. The same higher appellate process is followed for marine certificate actions.

Accomplishments and Workload

The Office of Administrative Law Judges accomplished the following during FY 2017:

- Met its goal of conducting hearings and rendering decisions in emergency cases within 30 days of the receipt of an appeal; the office rendered decisions on 42 emergency appeals and held 14 emergency hearings.
- Made rulings, within the 5-day statutory time frame, on 25 petitions challenging the FAA Determination that an Emergency Exists in Air Safety.
- Issued a total of 85 decisions and held 27 hearings.
- Processed 242 new appeals.

INFORMATION TECHNOLOGY AND SERVICES

	(\$000s)	FTEs
FY 2018 Estimate	\$6,815	26
FY 2019 Request	\$6,832	26
Increase/Decrease	\$17	0

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

The OCIO provides strategic direction and operational support for NTSB information systems, and develops and distributes programs and products for use by the agency and the public. The office consists of four divisions and one program area, as described below.

Computer Services Division

The Computer Services Division (CSD) provides computer and network services for headquarters and regional offices, including Internet access, web services, e-mail, backup, continuity of operations infrastructure, and disaster recovery. The help desk staff performs a wide range of tasks, including desktop/laptop setup, repair, and replacement; network connectivity; and software installation and upgrades. In short, the CSD is responsible for deploying and maintaining essential systems and services that range from desktop telephones to enterprise storage systems, cell phones, and tablets.

Systems Support Division

The Systems Support Division (SSD) develops, distributes, and maintains agency-specific applications, provides web design and content management, and provides database administration services. Applications include accident data collection, storage, analysis, and dissemination for all modes, as well as management of systems for accident records, safety recommendations, correspondence, FOIA requests, and general administration. This division also develops office-centric applications for modal and/or support office business functions.

Records Management Division

The Records Management Division (RMD) maintains the archives of accident investigation files, NTSB reports, and other agency records. It is responsible for fulfilling public requests for information, including FOIA requests; providing training for the docket

management system and guidance on redaction policies and techniques; and monitoring the privacy and confidentiality of data and information. This division also provides general records management.

Enterprise Architect Division

The Enterprise Architect Division (EAD) supports the NTSB mission and strategic goals by providing a blueprint—in logical or business terms, as well as technology terms—for how the organization operates today, plans to operate in the future, and intends to invest in technology. Enterprise architecture defines the business, processes, and information necessary to operate the business, support technologies, and transitional processes required to implement new technologies in response to changing business needs.

Information Technology Security Program

The Chief Information Security Officer (CISO) protects the availability, confidentiality, and integrity of IT resources through the application of requirements specified in OMB Circular A-130, the Federal Information Security Management Act (FISMA), and various US Department of Commerce National Institute of Standards and Technology publications. The IT security program uses a risk-based, cost-effective approach to secure information and systems, identify and resolve current IT security weaknesses and risks, and protect against future vulnerabilities and threats.

Accomplishments and Workload

Computer Services Division

The CSD successfully resolved more than 3,300 help desk requests in FY 2017, for the NTSB’s distributed locations (headquarters, regional offices, and teleworkers). The division’s IT specialists also launched on multiple major accident investigations to further assist members and staff on-scene. Additionally, the division provided both front- and back-end computing services to the agency with minimal downtime from unplanned outages. Perhaps most significantly, the CSD deployed new laptops with faster, more robust hardware to the entire agency, significantly assisting NTSB users in their work. In conjunction with this effort, the following initiatives have been deployed:

- Adding Wi-Fi connectivity, which has improved accessibility and performance in the core mission processes, especially during on-scene investigation.
- Introducing personal identity verification (PIV) cards as an accepted means of authentication for government-furnished laptops; we plan to continue to advance these efforts agency-wide.
- Deploying Windows 10, bringing the agency up to date with the latest desktop operating system, a best practice for maintaining a resilient security posture.
- Removing air cards, significantly reducing our mobile communications budget (in conjunction with adding Wi-Fi and enabling cell phone tethering).
- Updating enterprise encryption, thereby reducing a significant security threat.

Systems Support Division

In its continuing effort to provide critical mission support, the SSD released into production one of its most noteworthy enterprise-wide applications, the Product Management Application (PMA), into which all NTSB staff have now transitioned. PMA facilitates the processes of the agency's Executive Secretariat Division (to include the tracking of agency correspondences and notation items), the creation and tracking of safety recommendations, and facilitates the various approval processes in the production of agency reports.

Significant updates were made to several of the SSD's other in-house applications, to include the National Archives and Records (NARA) tracking tool, the new International Advocacy Travel Form, the Case Appeal Filing System, ADMS, the Project (Investigation) Status Board, and the soon-to-be released Notification of Serious Incident Report. Additionally, the SSD helped make several improvements to the OCIO's processes, to include the IT Change Management and software approval processes.

The SSD remains dedicated to monitoring the health of the agency's IT application environments, thus playing an integral role in risk management. Accordingly, the division is planning upgrades to several platforms in future fiscal years, including moving to a cluster-based structured query language database platform for additional redundancy and failover support, and upgrading the Microsoft SharePoint platform on which the agency's intranet, internet, and several in-house applications depend.

As an essential member of the Service & Support team, the SSD closed 285 Service (portal postings, add/edit sites, etc.) and 228 Incident (application/dB-related) requests.

Records Management Division

RMD posted 1,601 accident dockets in FY 2017, bringing the total of dockets now available on the NTSB public website to 14,787. During the same period, the division received 437 FOIA requests and processed 371. We also provided guidance to NTSB staff on records retention and privacy issues concerning a new internal system being developed by RE. In addition, FOIA staff implemented all the requirements for the updated FOIA and submitted General Records Schedule 6.1 Capstone (e-mails) to NARA in accordance with the requirements of this program.

Enterprise Architecture Division

During FY 2017, the EAD is considering ways to standardize, analyze, and visualize NTSB data to more effectively comprehend and identify trends and patterns, and to enable us to make better decisions. As part of this, the division is gathering requirements for the M-ADMS to standardize business processes and data agency-wide. The M-ADMS will enable all modal offices to standardize the accident investigation process, resulting in structured data.

The EAD is also involved in the Data Analytics Pilot to develop data analysis methods and processes for AS, using such analysis to identify the important safety issues for accident

reduction and prevention. The project is continuing to analyze data and has identified multiple areas that need further exploration. With EAD's help, the team has benchmarked tools for data analysis and visualization. The team has also delivered a proof-of-concept dashboard for the Aviation Safety mode. We plan to extend this project agency-wide as funding becomes available.

Finally, the EAD continued providing guidance, design oversight, and technical advice in all NTSB software development efforts, IT consulting services to various divisions, and contracting officer's technical representative services to various IT initiatives.

IT Security Program

During FY 2017, the CISO continued to ensure NTSB compliance with FISMA by maintaining a continuous monitoring program to provide ongoing cybersecurity and compliance reviews of network and computer assets. We maintained NTSB certification and accreditation for general support, our accident investigation system, and laboratory support systems, and completed a favorable FY 2017 FISMA review. For the seventh consecutive year, the Inspector General's audit found that the agency's IT security program complies with FISMA requirements.

Other Focus Areas

Looking forward, OCIO will focus significant efforts in FY 2018, FY 2019, and well into the future on two major initiatives:

1. The NTSB Digital Transformation Program, which will include continuous evolution of agency processes, data analytics, and technologies to harness additional opportunities for innovation and disruption to create efficiencies and new/revised business processes. These efforts will greater assist in accomplishing agency mission and operational goals by delivering NTSB actionable information in service to the public. This effort is more fully described in the FY 2017 NTSB Agency Reform Plan.
2. Meeting the goals identified in the May 11, 2017 Presidential Executive Order on Strengthening the Cybersecurity of Federal Networks and Critical Infrastructure.

Collectively, these two initiatives focus on the need to efficiently and effectively deliver services and products on a more secure and reliable technical platform while re-evaluating agency processes, procedures, technologies and use of data in meeting mission objectives. Foundational to meeting these initiatives, OCIO will need to upgrade its long outdated technical platform, while moving to the Cloud as appropriate. Separate, but in line with meeting the May 11 Executive Order, is addressing the mandates of the enhanced government-wide FISMA addressing all aspects of cybersecurity and risk management.

ADMINISTRATION

	(\$000s)	FTEs
FY 2018 Estimate	\$8,667	33
FY 2019 Request	\$8,688	33
Increase/Decrease	\$21	0

Overview of the Request

The funding level for this program activity includes the pro-rated impact of the FY 2018 1.9 percent pay raise and a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

The Office of Administration coordinates and manages infrastructure and support activities for the NTSB, providing support in the areas of human resource management, labor relations, facilities management, safety, security, and acquisition and lease management. Physical inventory, shipping and receiving, and management of the NTSB conference center and training center facilities are also major functions. Four divisions carry out the office's work: Administrative Operations and Security, Acquisition and Lease Management, Human Resources (HR), and Safety.

Administrative Operations and Security

The Administrative Operations and Security Division is responsible for the day-to-day support for the direction and operation of NTSB facilities and our building management program including security, property management, facilities management, mail services, and transportation.

Acquisition and Lease Management

The Acquisition and Lease Management Division manages the NTSB acquisition program and provides best value business solutions to support the NTSB mission. The division is a full-service acquisition organization that awards and administers contracts and agreements, manages the NTSB Purchase Card Program, awards and manages real property leases for both the NTSB headquarters and regional offices, and provides customers with acquisition guidance and training.

Human Resources

The HR Division is responsible for human capital planning and management, policy and program development, and recruitment and hiring. The division also manages labor and

employee relations, benefits, pay and leave, performance management and awards, the telework program, and the employee assistance program.

Safety

The Safety Division is responsible for ensuring compliance with federal, state, and local statutory and regulatory mandates, guidelines, standards, and procedures, and for ensuring safe working conditions for NTSB employees (in the office and at on-scene investigations). This includes planning, implementing, and evaluating the NTSB occupational safety and health program to reduce the potential for human and economic losses associated with incidents and accidents.

Accomplishments and Workload

Administrative Operations and Security

The Administrative Operations and Security Division maintains an agreement with the General Services Administration (GSA) to meet the requirements of Homeland Security Presidential Directive (HSPD) 12 for PIV credentials for all employees and contractors. This agreement continues the implementation of the physical access control system (PACS) upgrades for all NTSB locations to comply with HSPD-12 program requirements. A new security system maintenance and monitoring contract has been awarded which includes the PACS upgrade for the NTSB headquarters, Training Center, and regional offices facilities. The PACS upgrade will be completed in FY 2018.

In March 2017, the division conducted its annual Property Management accountable asset inventory and validation, which included a new property management program and database. The upgraded system improved inventory tracking, provided more detailed information, and improved the validation of assigned assets for employees.

Acquisition and Lease Management

In FY 2017, the Acquisition and Lease Management Division executed 378 contract actions to support the agency's mission. The division also continued to provide support and training to investigators regarding the acquisition process and the roles and responsibilities of purchase cardholders to better prepare them for requesting and receiving mission-critical goods and services.

Human Resources

The HR Division works with the Office of Personnel Management (OPM) each year to administer the Federal Employee Viewpoint Survey (FEVS). Beginning with the 2016 FEVS, office directors received feedback on employee engagement specific to their organizations. With a high response rate (74.2 percent in 2017), the NTSB's survey results provide valuable information for improving the work environment, enhancing the agency's high productivity and mission accomplishment. With the 2017 survey, the NTSB will have

comparative data to identify best practices in improving employee engagement that can be shared agency-wide.

In the first quarter of FY 2017, NTSB completed recruitment actions for an eventual six new employees. In January 2017, the government-wide hiring freeze began. HR re-evaluated agency vacancies in response to the new OMB requirements and developed criteria and processes to meet mission requirements, which allowed the agency to continue to fill positions. Subsequently, when the hiring freeze was lifted, the agency was able to plan recruitment actions to fill positions in the first quarter of FY 2018.

To increase efficiency and effectiveness, we expanded the use of technology in administering our human resource management programs and implemented an upgraded version of USAStaffing to support recruitment efforts. The upgrades to the automated recruitment system were launched by OPM to improve the applicant experience and to increase efficiency in recruiting, announcing jobs, and handling applications. To expand our outreach to a more diverse talent pool, the division partnered with LinkedIn, increasing agency presence on social media and thus reaching more potential applicants. To improve accountability and to better engage General Schedule employees in the performance management process, we implemented OPM's automated performance management system, USAPerformance.

HR continued efforts to ensure that the agency maintained the necessary tools to support and guide employees as they execute mission-critical tasks. First, to assist NTSB employees with the unique situations they face when investigating an accident, as well as other work-life balance issues, we launched a new contract for employee assistance program services, using an innovative marketing approach and education to raise the program's visibility and to alert employees to the improved services. The division also led the agency to full certification of the Senior Executive Service (SES) performance management program, helping the agency to recruit and retain the highest caliber of SES employees.

Safety

The NTSB's Occupational Safety and Health Program (OSHP) has been fully implemented with the introduction of the OSHP Manual in 2014. In 2017, the Safety Division completed the OSHP Audit and provided its findings to the Occupational Safety and Health Administration in our 2017 Annual Report to that agency. The Safety Division will continue to lead efforts to improve the agency's safety culture through internal audits, increased safety-related training, and a focus on the Fatigue Risk Management Program.

APPENDIX A: MOST WANTED LIST

The NTSB issued its first Most Wanted List (MWL) of Transportation Safety Improvements in October 1990 to highlight specific recommendations that could significantly reduce transportation accidents, deaths, and injuries. Since then the MWL, now organized by topic area, is the NTSB's premier advocacy tool. It identifies the top safety improvements that can be made across all modes to prevent accidents in the future. Listed below are the 10 MWL issue areas that the NTSB is currently highlighting through its advocacy efforts:

INCREASE IMPLEMENTATION OF COLLISION AVOIDANCE TECHNOLOGIES

Humans make mistakes. Transportation operators must always walk a demanding line of alertness and vigilance, but collision avoidance technologies can provide a lifesaving safety net. Technologies such as collision warning and autonomous emergency braking in highway vehicles and PTC in trains will result in fewer accidents, fewer injuries, and fewer lives lost. These technologies are available today. They should be implemented today.

ENSURE THE SAFE SHIPMENT OF HAZARDOUS MATERIALS

Increased volumes of hazardous materials—especially flammable liquids—are moving by rail. Meanwhile, expanded lithium battery use poses a threat to safe airplane operation. Hazardous materials must be moved safely to avoid deadly accidents and environmental damage. It is also critical to renew focus on proper emergency response training and notification as well as adequate resource allocation to ensure first responders are prepared to handle hazardous materials in the event of an accident.

PREVENT LOSS OF CONTROL IN FLIGHT IN GENERAL AVIATION

Nearly half of all GA accidents are caused by loss of control in flight. To prevent unintended departures from flight and better manage stalls, pilots need more training and a better awareness of the technologies that can help prevent these tragedies. NTSB data from 2008–2014 confirm that loss of control continues to be the biggest killer in GA. Better training on how to eliminate distraction, avoid stalls, and manage weather issues will put pilots back in control and give them better command of their outcomes.

IMPROVE RAIL TRANSIT SAFETY OVERSIGHT

Ineffective safety oversight is a contributing factor in many rail transit accidents. It is critically important that rail transit systems be constantly monitored and improved to maintain and enhance safety so that small problems can be caught before they become big ones. Without changes in public transit system oversight, accidents will continue to happen.

END ALCOHOL AND OTHER DRUG IMPAIRMENT IN TRANSPORTATION

Alcohol is one of many impairing drugs and continues to contribute to transportation fatalities. Marijuana decriminalization, increasing use of dangerous synthetic drugs, and a dramatic rise in over-the-counter and prescription medication use and abuse mean that impaired vehicle operation has become a more complex problem than ever. Every transportation death caused by alcohol or other drug impairment is preventable. Ending the epidemic of impairment in transportation depends on passing and enforcing laws and educating the public.

REDUCE FATIGUE-RELATED ACCIDENTS

Fatigue can be just as deadly in transportation as alcohol and drug impairment, and fatigued drivers and operators regularly cause accidents. Finding and treating fatigue-related medical issues and knowing the fatiguing effects of medications are part of the solution. Ultimately, fatigue-related accidents can be prevented if drivers, commercial vehicle operators, and safety-critical personnel get adequate rest.

REQUIRE MEDICAL FITNESS

Operators, maintenance personnel, and other safety-critical transportation professionals must be medically fit to keep the public safe. Company owners and government regulators must develop policies to ensure that safety-critical personnel are medically fit for duty, and transportation professionals have a personal responsibility to ensure their own health and welfare.

ELIMINATE DISTRACTIONS

In transportation, distraction kills. Drivers and operators in all modes of transportation must keep their hands, eyes, and minds focused on operating their vehicle. Ultimately, eliminating distractions in transportation will require changes in regulations as well as in driver and operator thinking and behavior.

STRENGTHEN OCCUPANT PROTECTION

Proper use of seat belts and restraints—specifically for young children, even on airplanes—is key to surviving an accident or crash. But the threat does not end there. Once passengers survive a crash due to effective occupant protection, it is important they do not then succumb to postcrash fire or injury caused by structural or debris impacts. To minimize deaths and injuries in all modes of transportation, occupant protection systems need to be better designed to preserve survivable space and ensure ease of evacuation.

EXPAND RECORDER USE TO ENHANCE TRANSPORTATION SAFETY

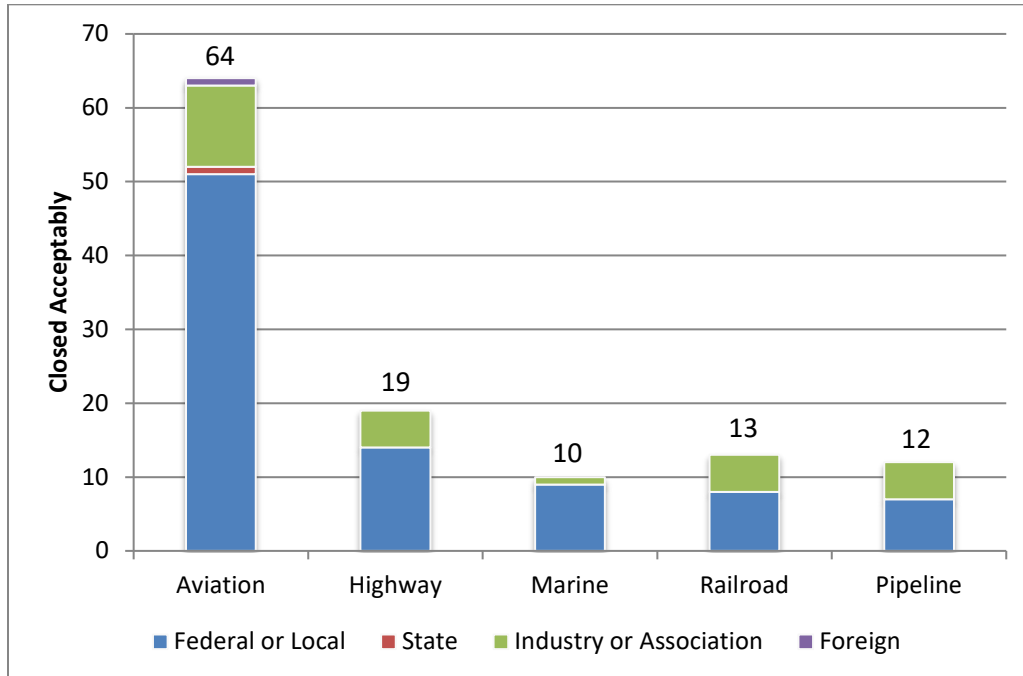
Data from recorders can help investigators determine the cause of an accident, but an operator can also use recorders to identify and correct unsafe operations and prevent accidents in the first place. However, many vessels, vehicles, trains, and aircraft still lack

this readily available and affordable technology. Regulators must mandate recorder use, and operators must proactively install the technology so that valuable data can be used to improve safety.

APPENDIX B: STATUS OF SAFETY RECOMMENDATIONS

Recommendations Closed

The chart below breaks out the 118 NTSB recommendations closed in an acceptable status in FY 2017, by mode of transportation.



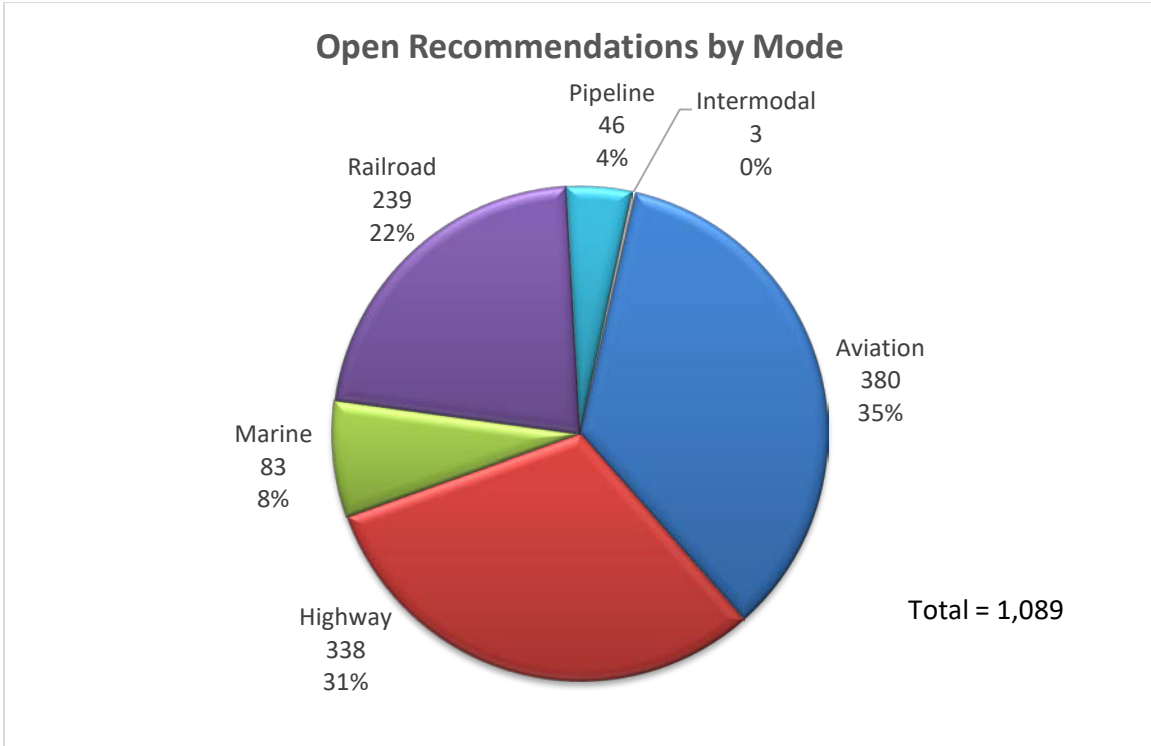
New Recommendations Issued

The following table displays the number of new recommendations issued by the NTSB in FY 2017, by mode of transportation:

Mode	Federal	State	Industry or Association	Foreign	Total
Aviation	55	0	21	2	78
Highway	30	11	19	0	60
Marine	17	0	6	0	23
Railroad	12	1	7	0	20
Pipeline	2	0	2	0	4
Total	116	12	55	2	185

Open Recommendations

The chart below displays the distribution of the 1,089 open safety recommendations by transportation mode as of September 30, 2017.



APPENDIX C: AVIATION SAFETY REGIONAL OFFICES

	Eastern Region	Central Region	Western Pacific Region	Alaska Region
Coverage Area	<p>Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Mississippi, Alabama, Georgia, and Florida, as well as the District of Columbia, Puerto Rico, and the US Virgin Islands</p>	<p>Ohio, Michigan, Indiana, Wisconsin, Illinois, Minnesota, Iowa, Missouri, Arkansas, Louisiana, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Wyoming, Colorado, and New Mexico</p>	<p>Montana, Idaho, Utah, Arizona, Nevada, Washington, Oregon, California, and Hawaii, as well as the territories of Guam and American Samoa</p>	<p>Entire state of Alaska</p>
Staff Office Location	<p>Main office: Ashburn, Virginia</p> <p>Satellite work sites: Laconia, New Hampshire; Naples, Miami, and Winter Springs, Florida; Atlanta and Marietta, Georgia; Randolph, New Jersey; New York, New York; Clear Brook, Virginia; Valley Head, Alabama; Cary, Fuquay Varina, and Zebulon, North Carolina</p>	<p>Main office: Denver, Colorado</p> <p>Satellite work sites: Idaho Springs, Colorado; Barrington, Bartlett, Burbank, Carol Stream, Geneva, Morris, and Naperville, Illinois; Minneapolis and Rochester, Minnesota; Mansfield, Arlington, Conroe, and New Braunfels, Texas; and Greenville, Wisconsin</p>	<p>Main office: Federal Way, Washington</p> <p>Satellite work sites: Chandler and Mesa, Arizona; Butte, Montana; Gardena, Desert Hot Springs, Long Beach, Rancho Palos Verdes, Roseville, San Mateo, San Rafael, San Dimas, and Vacaville, California; Portland, Oregon; and Lynnwood, Newport, Puyallup, and Seattle, Washington</p>	<p>Main office: Anchorage, Alaska</p>

APPENDIX D: HISTORICAL INFORMATION

NTSB Salaries and Expenses Funding History (in millions)

FY	Amount
2000*	\$56.8
2001*	\$62.8
2002*	\$67.9
2003*	\$72.0
2004*	\$73.1
2005*	\$76.1
2006*	\$75.9
2007	\$79.3
2008	\$84.4
2009	\$91.0
2010	\$98.0
2011*	\$97.8
2012	\$102.4
2013*	\$97.0
2014	\$103.0
2015	\$104.0
2016	\$105.2
2017	\$106.0

* Includes across-the-board rescissions

Current Board Members

Name	Board Title	Appointment	Term Expiration
Robert L. Sumwalt	Chairman	August 10, 2017	December 31, 2022
Bella Dinh-Zarr	Member	March 30, 2015	December 31, 2018
Earl F. Weener	Member	June 22, 2010	December 31, 2015*
Vacant	Member		
Vacant	Member		

* Under 49 *U.S.C.* section 1111(d), when the term of office of a Board Member ends, the Member may continue to serve until a successor begins service as a Board Member.

Emergency Fund Activity

Fiscal Year	Appropriations (Rescissions)	Obligation Activity	Balance	Purpose/Source
2000			\$2,000,000	No Activity
2001			\$2,000,000	No Activity
2002		\$491,687	\$1,508,313	Extraordinary costs related to the crash of American Airlines Flight 587 at Belle Harbor, NY
2003		\$4,914	\$1,503,399	Adjustment of FY 2002 Obligations
2004		(\$138,000)	\$1,641,399	Adjustment of FY 2002 Obligations
2004	\$358,601		\$2,000,000	Appropriation (P.L. 108-199)
2004	(\$2,116)		\$1,997,884	Rescission (P.L. 108-199)
2005			\$1,997,884	No activity
2006			\$1,997,884	No activity
2007			\$1,997,884	No activity
2008			\$1,997,884	No activity
2009			\$1,997,884	No activity
2010			\$1,997,884	No activity
2011			\$1,997,884	No activity
2012			\$1,997,884	No activity
2013			\$1,997,884	No activity
2014			\$1,997,884	No activity
2015			\$1,997,884	No activity
2016			\$1,997,884	No activity
2017			\$1,997,884	No activity

Training Center Costs and Revenues

	FY 2015	FY 2016	FY 2017
Earned revenue	\$797,072	\$1,057,083	\$954,567
Subleases	\$593,329	\$594,309	\$0
Total revenue	\$1,390,401	\$1,651,392	\$954,567
Costs:			
Pay	\$770,086	\$839,126	\$864,886
Travel	\$96,655	\$94,029	\$70,495
Contracts	\$359,725	\$269,436	\$339,963
Supplies	\$10,105	\$23,727	\$13,589
Equipment	\$0	\$130,979	\$6,849
Costs before space rental	\$1,236,571	\$1,357,297	\$1,295,781
Space rental	\$2,670,206	\$2,675,675	\$2,616,876
Net operating costs	\$3,906,777	\$4,032,972	\$3,912,657
Overall deficit	\$2,516,376	\$2,381,580	\$2,958,090

FTE Staffing FY 2000 - FY 2017

FY	FTE
2000	427
2001	416
2002	426
2003	427
2004	421
2005	417
2006	387
2007	377
2008	388
2009	393
2010	384
2011	403
2012	412
2013	412
2014	402
2015	418
2016	419
2017	414

FTE Staffing at Year End by Headquarters and Field Offices

FY	Headquarters	Regional	Total
2000	346	81	427
2001	345	71	416
2002	337	89	426
2003	329	98	427
2004	314	107	421
2005	308	109	417
2006	286	101	387
2007	292	85	377
2008	286	102	388
2009	293	100	393
2010	283	101	384
2011	296	107	403
2012	304	108	412
2013	307	105	412
2014	299	103	402
2015	307	111	418
2016	304	115	419
2017	299	115	414

FTE Staffing by State and Region FY 2017

Location	Administrative Law Judges	Aviation Safety	Highway Safety	Information Technology Services	Marine Safety	Administration	Safety Recommendations and Communications	Policy & Direction	Rail, Pipeline & Hazardous Materials	Research & Engineering	Training Center	Total
Alaska		6										6
Colorado		10	2									12
Illinois		8		1					2			11
Indiana									1			1
Louisiana									1			1
Minnesota		2										2
Texas	1	8	6						1		1	17
Wisconsin		1										1
Alabama		1										1
Connecticut								1				1
Delaware			1									1
Florida		3			1		1					5
Georgia		3							1			4
Maine			1									1
Massachusetts			1									1
New Hampshire		1										1
New Jersey		1							1			2
New York		1										1
North Carolina		3										3
Virginia		10				1			1		3	15
Washington, DC	6	46	17	27	17	35	33	50	24	43	1	299
Arizona		2										2
California		10	1						3			14
Montana		1										1
Oregon		1			1							2
Washington		8	1									9
Grand Total	7	126	30	28	19	36	34	51	35	43	5	414

*Regions:

Alaska
Central
Eastern
Western

International Investigations

*FY 2017 Costs by Accident**

Description	Location	Costs
A Boeing 737-800, operated by FlyDubai, impacted airport terrain during a second approach attempt in bad weather.	Rostov-on-Don, Russia	\$106,767
A B747-400 crashed while landing at Manas International Airport.	Bishkek, Kyrgyzstan	\$100,924
UPS rejected takeoff due to blown tire indication.	Incheon, Republic of Korea	\$100,890
Emirates B777-300, crash during landing.	Dubai, United Arab Emirates	\$59,171
Li Battery fire on Fed Ex delivery truck.	Brampton, Ontario, Canada	\$48,581
Delta Boeing 747-400 with PW4056 engines had uncontained LPT failure.	Russian Airspace	\$36,850
A Korean Air Boeing 777-300 had an uncontained release of high pressure turbine material and subsequent fire in the No. 1 engine during takeoff.	Tokyo, Japan	\$30,480
A Raytheon B200; VH-ZCR experienced LOC after takeoff.	Melbourne, Australia	\$26,167
During takeoff from São Paulo airport, the right hand engine of a Brazilian registered Airbus 320, registration number PT-MZY, lost power, causing a rejected takeoff.	Sao Paulo, Brazil	\$26,076
A Boeing 777-200, was reported missing while enroute from Kuala Lumpur International Airport.	Kuala Lumpur, Malaysia	\$23,754
Lamia Airlines BAE AVRO RJ 85 with Honeywell engines crashed on approach.	Medellin, Colombia	\$22,885
Go Air (Indian air carrier) A320 PW11127 (geared turbofan) engine uncommanded shutdown.	Delhi, India	\$21,414
An Irish AAIU reported that the helicopter crashed offshore while conducting SAR operations.	Blacksod Bay, Ireland	\$20,522
The helicopter experienced an in-flight break-up.	Fundres, Italy	\$19,429
A Guyana registered Cessna 208 airplane experienced an unusual sound emanating from the aircraft engine.	Georgetown, Guyana	\$18,597
Delta 744 PW4056 uncontained LPT failure.	Tokyo, Japan	\$17,815
An Augusta Westland tilt rotor AW609 experienced LOC during a test flight.	Tronzano Vercellese, Italy	\$16,180

Description	Location	Costs
An Airbus 320 No.1 engine failed, in-flight shutdown, smoke in cockpit, cabin.	Suvarnabhumi Airport, Thailand	\$14,730
A Japan Airlines Boeing 777-300ER airplane experienced an uncontained left engine failure during takeoff from Tokyo International Airport.	Tokyo, Japan	\$13,591
August Westland helicopter was involved in an accident after communication was lost with the helicopter.	La Mojonera, Mexico	\$13,324
MU-2B was lost from radar at FL240 in vicinity of the Bahamas.	Eleuthera, Bahamas	\$10,170
Colombian Aerolinea de Antioquia ADA Jetstream J32 TPE331 engine failure.	Monteria, Colombia	\$9,793
Boeing 787 pressurization incident.	London, United Kingdom	\$9,623
BAE Systems Avro 146-RJ100 stick pusher activated shortly after takeoff.	Malmö, Sweden	\$8,973
Helicopter loss of directional control and resulting heavy landing on an offshore platform in North Sea with damage to helideck.	North Sea, United Kingdom	\$8,206
A BAE Systems Jetstream 41 runway overrun.	Siddharthanagar, Nepal	\$6,191
Safe Skies for Africa (SSA)	Nigeria, Kenya	\$35,146
Grand Total		\$826,248

* Report includes accidents with more than \$5,000 in FY 2017 expenses and is cumulative through September 30, 2017. Costs include payroll as well as travel and other direct costs.

*Total Accident Costs by Fiscal Year 2012 - 2017**

FY	Costs
2012 (a)	\$1,641,132
2013 (b)	\$2,366,274
2014 (c)	\$976,642
2015 (d)	\$1,838,241
2016 (e)	\$1,664,764
2017 (f)	\$826,248

* Beginning with FY 2012, the agency can capture both payroll and other direct costs such as travel through its cost accounting systems. The totals above reflect these costs.

- (a) Includes \$149,707 billed to DOT under the SSA Program.
- (b) Includes \$42,727 billed to DOT under the SSA Program.
- (c) Includes \$64,897 billed to DOT under the SSA Program.
- (d) Includes \$120,026 billed to DOT under the SSA Program.
- (e) Includes \$138,115 billed to DOT under the SSA Program.
- (f) Includes \$35,146 billed to DOT under the SSA Program.

US Transportation Fatalities, 2015 - 2016

Mode	Description	2015	2016 ¹
Highway:	Passenger cars	12,761	13,412
	Light trucks and vans	9,878	10,302
	Pedestrians	5,495	5,987
	Motorcycles	5,029	5,286
	Pedalcycles ²	829	840
	Medium and heavy trucks	665	722
	Buses	49	40
	Other ³	779	872
	Total, Highway	35,485	37,461
	Grade Crossings: ⁴	(236)	(266)
Rail:	Freight, passenger, and commuter rails ⁵	624	660
	(Trespassing) ⁶	(452)	(487)
	Rail Transit ⁷	84	73
	Total, Rail	708	733
Marine:	Recreational boating	626	701
	Cargo transport	41	11
	Commercial fishing ⁸	17	16
	Commercial passenger	4	2
	Total, Marine	688	730
Aviation:	General aviation	378	386
	Airlines	0	0
	Air taxi	27	19
	Commuter	1	8
	Foreign/unregistered ⁹	12	4
	Total, Aviation ¹⁰	416	412
Pipeline:	Gas	11	13
	Liquids	1	3
	Total, Pipeline	12	16
	Total	37,309	39,339

- ¹ Numbers for 2016 are preliminary estimates. Aviation data are from the NTSB; marine data are reported by the US Department of Homeland Security; all other data are reported by the US DOT.
- ² Pedalcycles include bicycles and other cycles.
- ³ Other refers to vehicle nonoccupants (excluding pedestrians and pedalcyclists) and occupants in other or unknown vehicle types.
- ⁴ Grade crossing fatalities are reported as a separate category but should not be added to the total because they are included in the highway and rail fatalities as appropriate.
- ⁵ Freight, passenger, and commuter rail data are reported by the FRA.
- ⁶ Trespassing fatalities are reported as a separate category but should not be added to the total because they are included in the freight, passenger, and commuter rail fatalities. Trespassing fatalities are not available for rail transit.
- ⁷ Rail transit data are reported by the FTA and include fatalities involving heavy rail, light rail, cable car, inclined plane, monorail/automated guideway, streetcar rail, and hybrid rail.
- ⁸ Commercial fishing refers to operational fatalities.
- ⁹ Foreign/unregistered includes non-US registered aircraft involved in accidents in the United States.
- ¹⁰ Total fatalities may not equal the sum of each category because accidents may involve multiple categories.

Status of Action by State for Motor Vehicle Safety Recommendations






State	Child Passenger Safety	Primary Seat Belt Enforcement	Passenger Restriction (a)	Cell Phone	Ignition Interlock	Motorcycle Helmets
Alabama	Partial	Partial	Yes	Partial	Yes	Partial
Alaska	Yes	Yes	Yes	Partial	Yes	
Arizona	Yes		Partial	Partial	Yes	
Arkansas	Partial	Partial	Yes	Partial	Yes	
California	Yes	Yes	Yes	Partial	Yes(b)	Yes
Colorado	Yes		Yes	Partial	Yes	
Connecticut	Yes	Partial	Yes	Partial	Yes	
Delaware	Yes	Yes	Yes	Partial	Yes	
District of Columbia	Yes	Yes	Yes	Partial	Yes	Partial
Florida	Partial	Partial		Partial		
Georgia	Yes	Partial	Yes	Partial		Yes
Hawaii	Yes	Yes	Partial	Partial	Yes	
Idaho	Partial		Partial	Partial		
Illinois	Yes	Yes	Yes	Partial	Yes	
Indiana	Yes	Yes	Yes	Partial		
Iowa	Partial	Partial		Partial		
Kansas	Yes	Yes	Partial	Partial	Yes	
Kentucky	Yes	Yes	Yes	Partial		
Louisiana	Partial	Yes	Partial	Partial	Yes	Yes
Maine	Yes	Yes	Yes	Partial	Yes	
Maryland	Yes	Yes	Partial	Partial	Yes	Partial
Massachusetts	Yes		Partial	Partial		Yes
Michigan	Yes	Partial	Yes	Partial		
Minnesota	Yes	Yes	Yes	Partial		
Mississippi	Partial	Partial		Partial	Yes	Partial
Missouri	Yes		Partial	Partial	Yes	Yes
Montana	Partial		Partial			
Nebraska	Partial		Partial	Partial	Yes	Yes
Nevada	Partial		Partial	Partial	Yes(c)	Partial
New Hampshire	Partial		Yes	Partial	Yes	
New Jersey	Yes	Yes	Yes	Partial		Yes
New Mexico	Partial	Yes	Yes	Partial	Yes	
New York	Yes	Partial	Yes	Partial	Yes	Yes
North Carolina	Yes	Yes	Yes	Partial		Yes
North Dakota	Yes			Partial		
Ohio	Yes		Yes	Partial		

State	Child Passenger Safety	Primary Seat Belt Enforcement	Passenger Restriction (a)	Cell Phone	Ignition Interlock	Motorcycle Helmets
Oklahoma	Yes	Partial	Yes	Partial		
Oregon	Yes	Yes	Yes	Partial	Yes	Yes
Pennsylvania	Yes		Partial	Partial		
Rhode Island	Yes	Yes	Yes	Partial	Yes	
South Carolina	Yes	Yes	Partial	Partial		
South Dakota				Partial		
Tennessee	Yes	Partial	Yes	Partial	Yes	Yes
Texas	Yes	Yes	Yes	Partial	Yes	
Utah	Yes	Yes(d)	Yes	Partial	Yes	
Vermont	Yes		Yes	Partial	Yes	Yes
Virginia	Yes		Yes	Partial	Yes	Partial
Washington	Yes	Yes	Yes	Partial	Yes	Yes
West Virginia	Yes	Partial	Yes	Partial	Yes	Partial
Wisconsin	Yes	Yes	Yes	Partial		
Wyoming	Yes		Partial	Partial		
Total	Yes = 37 + DC Partial = 12	Yes = 22 + DC Partial = 12	Yes = 31 + DC Partial = 14	Yes = 0 Partial = 49 + DC	Yes = 30 + DC	Yes = 13 Partial = 6 + DC

- (a) "Restriction" refers to drivers in the intermediate (also referred to as provisional or second) stage. Unless accompanied by a supervising driver who is at least 21 years old, these drivers are limited to no more than one passenger under age 20, family excepted, until they receive an unrestricted license or for at least 6 months.
- (b) California's all offender ignition interlock law will be effective 1/1/19.
- (c) Nevada's all offender ignition interlock law will be effective 10/1/18.
- (d) Utah's primary seat belt law applies to all seating positions but is only effective 5/15/15 through 7/1/18.



The NTSB is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—highway, marine, railroad and pipeline. The NTSB determines the probable cause of the accidents and issues safety recommendations aimed at preventing future accidents. For more information, visit www.nts.gov.

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