

NATIONAL TRANSPORTATION SAFETY BOARD

FISCAL YEAR 2020
BUDGET REQUEST





National Transportation Safety Board

Washington, DC 20594

Office of the Chairman

March 11, 2019

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

The Honorable Nancy Pelosi
Speaker
United States House of Representatives
Washington, DC 20515

Dear Mr. President and Madam 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 \$110.4 million for fiscal year (FY) 2020. This appropriation level equals the annualized amount provided in the FY 2019 Continuing Resolution. The request funds 423 full-time equivalent (FTE) positions.

Starting with FY2018, Congress provided us additional funding to build and maintain our ability to keep pace with the technological changes in the transportation industry and growing need to use sophisticated data analysis tools. This increase has been critical in our ability to effectively investigate accidents involving emerging developments in the transportation industry such as automated and alternatively fueled vehicles, commercial space travel, unmanned aircraft systems, and high-speed rail. We have invested in increasing our technical expertise, gaining first-hand experience, and developing a network of contacts in these areas. We have also refined and expanded data collection and analytics tools which enhance our investigative process and products. The most notable of these efforts is the expansion of the Accident Data Management System (ADMS), a tool used to collect investigation related data, from aviation to all investigative modes.

The NTSB's many accomplishments are detailed in the enclosed budget submission.

Information is provided on completed accident investigations, other safety related activities and products, and the recently released Most Wanted List 2019 – 2020. This report highlights the top safety improvements that can be made across all modes to prevent accidents in the future.

In addition to these safety-related accomplishments, we are proud of our sound financial management and the resulting 16th consecutive unmodified (clean) audit opinion for the FY 2018 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 ensure NTSB's continued position as a global leader in promoting transportation safety.

Sincerely,



Robert L. Sumwalt, III
Chairman

Enclosure

cc: The Honorable David Price
Chairman
Subcommittee on Transportation, HUD, and
Related Agencies
Committee on Appropriations
US House of Representatives

The Honorable Mario Diaz-Balart
Ranking Member
Subcommittee on Transportation, HUD, and
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Committee on Appropriations
US House of Representatives

The Honorable Susan Collins
Chairman
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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 2020 Budget Request



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ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ADMS	Accident Data Management System
AMA	Rick Husband Amarillo International Airport
AS	NTSB Office of Aviation Safety
ASI	aviation safety investigator
AST	Federal Aviation Administration’s Office of Commercial Space Transportation
ATC	air traffic control
BNSF	BNSF Railway; formerly the Burlington Northern Santa Fe Railway
BOD	Binding Operation Directive
CAST	Commercial Aviation Safety Team
CDC	Centers for Disease Control and Prevention
CDT	central daylight time
CFIT	controlled flight into terrain
CFO	NTSB Office of the Chief Financial Officer
<i>CFR</i>	<i>Code of Federal Regulations</i>
CFV	commercial fishing vessel
CG	center of gravity
CHP	California Highway Patrol
CISO	Chief Information Security Officer
CO ₂	carbon dioxide
COOP	Continuity of Operations Plan
COR	Contracting Officer’s Representative
CRM	crew resource management

CSD	NTSB Computer Services Division
CSRS	Civil Service Retirement System
CST	central standard time
CSX	CSX Transportation
CVR	cockpit voice recorder
CY	calendar year
DATA	NTSB Data Analytics Technical Advisors group
DHS	US Department of Homeland Security
DOT	US Department of Transportation
EAD	NTSB Enterprise Architect Division
EDT	eastern daylight time
EEO	Equal Employment Opportunity
EEODI	NTSB Office of Equal Employment Opportunity, Diversity, and Inclusion
EST	eastern standard time
FAA	Federal Aviation Administration
FDR	flight data recorder
FERS	Federal Employees Retirement System
FHWA	Federal Highway Administration
FISMA	Federal Information Security Management Act
FMCSA	Federal Motor Carrier Safety Administration
FOIA	Freedom of Information Act
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FTE	full-time equivalent
FV	fishing vessel

FY	fiscal year
GA	general aviation
GAJSC	General Aviation Joint Steering Committee
GDOT	Georgia Department of Transportation
GM	General Motors
GNOBFA	Greater New Orleans Barge Fleet Association
GSA	General Services Administration
HPT	high-pressure turbine
HR	NTSB Human Resources Division
HS	NTSB Office of Highway Safety
HSPD-12	Homeland Security Presidential Directive 12
IACS	International Association of Classification Societies
ICAO	International Civil Aviation Organization
IIC	investigator-in-charge
IIHS	Insurance Institute for Highway Safety
IMC	instrument meteorological conditions
IMO	International Maritime Organization
IT	information technology
LIRR	Long Island Rail Road
LOC	loss of control
M-ADMS	multi-modal Accident Data Management System
MAIIF	Marine Accident Investigators' International Forum
MEDICS	Medical Investigation Catalog System
mm	mile marker
MOU	Memorandum of Understanding

MOW	maintenance-of-way
mph	miles per hour
MTA	Metropolitan Transportation Authority
MV	motor vessel
MS	NTSB Office of Marine Safety
MWL	Most Wanted List
NASA	National Aeronautics and Space Administration
NHTSA	National Highway Traffic Safety Administration
NJT	New Jersey Transit
NLE	National Level Exercise
nm/NM	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NOTAM	notice to airmen
NTSB	National Transportation Safety Board
NWS	National Weather Service
OCIO	NTSB Office of the Chief Information Officer
OMB	Office of Management and Budget
OPM	Office of Personnel Management
OSA	obstructive sleep apnea
OSHA	Occupational Safety and Health Administration
OSHP	Occupational Safety and Health Program
OSV	offshore supply vessel
PACS	physical access control system
PATG	Togiak Airport, Togiak, Alaska
PDT	Pacific daylight time

PIV	personal identity verification
PTC	positive train control
PV	passenger vessel
RE	NTSB Office of Research and Engineering
RMD	NTSB Records Management Division
Ro/Ro	roll-on/roll-off ship
RPH	NTSB Office of Railroad, Pipeline and Hazardous Materials Investigations
SAC	Small Agency Council
SAE	SAE International (formerly Society of Automotive Engineers)
SAIB	Special Airworthiness Information Bulletin
SEPTA	Southeastern Pennsylvania Transportation Authority
SFRTA	South Florida Regional Transportation Authority
SMS	safety management system
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
TDA	NTSB Transportation Disaster Assistance Division
TRB	Transportation Research Board
UAE	United Arab Emirates
UAS	unmanned aircraft system
UK	United Kingdom
UP	Union Pacific Railroad

<i>U.S.C.</i>	<i>United States Code</i>
USS	United States Ship (US Navy commissioned vessel)
UTV	uninspected towing vessel
VDR	voyage data recorder
VFR	visual flight rules
VMC	visual meteorological conditions

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—as well as accidents related to the transportation of hazardous materials. We develop and advocate recommendations to prevent future accidents or reduce their effects in terms of loss of life, injury, or damage to property, and coordinate assistance to victims and their family members impacted by transportation accidents. The NTSB conducts safety studies and prepares safety reports based on analyses of transportation accident and incident data to identify needed safety improvements.

The enclosed budget submission reflects the President’s request of \$110.4 million for fiscal year (FY) 2020. This funding level is equal to the FY 2018 enacted appropriation and the annualized amount provided in the FY 2019 Continuing Resolution and funds 423 full-time equivalents (FTEs).

The appropriation for FY 2018 increased our funding from \$106.0 million in FY 2017 to \$110.4 million. This increase was in response to our articulated need to address emerging transportation technologies and the use of increased data analysis in our investigative processes. The increased funding has already had a positive impact on our mission.

Staff from across the agency are actively involved in work related to emerging transportation technologies including automated and alternatively fueled vehicles, commercial space transportation, unmanned aircraft systems (UAS), and high-speed rail. Significant investments have been made in new and expanded systems related to increased data gathering and analytics. The most notable of these is the expansion of the Accident Data Management System (ADMS) to gather and use data across all investigative modes. Efforts in these areas are extensive and are outlined in more detail in the “FY 2018 Initiatives Update” section of this report.

We appreciate the sustained funding at the \$110.4 million level into FY 2019 and FY 2020. Work in these areas will continue into the next several years and stable funding allows us to address the continuing evolution of technologies and capabilities. Substantial investments of labor hours are required to meet these objectives, and we are working to move toward our targeted FTE level of 423 FTEs. At this level, we will be able to maintain current investigative efforts as well as integrate gained expertise and capabilities into the investigative process.

This submission contains highlights of FY 2018 accomplishments and workload in all offices, including details of safety products such as accident investigation reports and briefs, safety alerts, safety studies, and special investigation reports. The submission discusses the agency’s efforts to increase the public’s access to information about our investigations and safety recommendations. It also points out agency efforts to increase

cybersecurity and improve the resiliency and performance of NTSB’s IT network and infrastructure.

We are excited about the benefits already seen from our investments of resources in the initiatives discussed in this submission. The \$110.4 million resource level for FY 2020 will allow the NTSB to continue to meet its challenges and to serve as a global leader in the promotion of transportation safety.

FY 2018 INITIATIVES UPDATE

One of the NTSB’s goals is to serve as a global leader in conducting independent accident investigations, producing studies and creating products essential to transportation safety. In furtherance of this goal, the agency has identified as critical objectives building our ability to understand and respond to emerging transportation technologies and developing robust usage of data analytics in our investigative and internal processes. In our FY 2018 and FY 2019 budget submissions, we highlighted both the needs in these areas and the resources required to act on these objectives. The enacted appropriation level of \$110.4 million in FY 2018 provided additional resources, and we have accelerated our efforts toward achieving these objectives. The increased funding does two important things: It allows us to begin to build back to FTE levels that allow for labor hours to be devoted to these areas, and it provides funding for necessary outreach, research, hardware, software, and training.

Below are some specific examples of efforts initiated or expanded in FY 2018 to act upon these high-priority initiatives. This work will continue into the next several years and will require sustained funding to address the continuing evolution of technologies and capabilities. Substantial investments of time and resources will be needed to achieve the expertise and preparedness required to maintain the NTSB’s leadership role in accident investigation and transportation safety.

Automated and Alternatively Fueled Vehicles

Highway Safety

The NTSB’s Office of Highway Safety (HS) investigated the first fatal crash involving an automated vehicle in the United States, in Williston, Florida, on May 7, 2016. Since that time, HS has investigated several crashes involving highway automated vehicles and alternative energy systems. These include events involving electric vehicle battery fires, a self-driving shuttle bus, and cars with automated controls that crashed into (respectively) a fire truck, a pedestrian, a roadside barrier, and a hydrogen fuel delivery vehicle.

The technological and regulatory landscape of automated vehicles is complex. Investigations of automated vehicle accidents focus on new technologies that are unique to individual manufacturers, and the lack of government standards for the technology poses challenges. The NTSB’s use of the party system in our investigations allows us to gain knowledge and expertise on these systems from manufacturers and agencies who have suitable and needed technical qualifications. The goals of these investigations are the same as those for all NTSB investigations—to determine probable cause and, if deemed beneficial, to make recommendations to relevant recipients to reduce the potential for similar crashes to occur in the future.

A critical component of these investigations is the examination of the automated vehicle systems, including their implementation and functioning. Current NTSB investigations

involve vehicles with varied implementation of automated vehicle systems, including one in which the vehicle was not equipped with traditional steering controls. Some of the objectives of these investigations include determining the automated vehicle's design, performance, and functionality. Additionally, as part of our investigations, we typically retrieve and interpret recorded data and evaluate the automated vehicle's control system logic for the event. These are areas in which the NTSB is rapidly gaining expertise and benefitting greatly from additional training and research.

With the additional funding received in FY 2018, HS increased staff participation in automated vehicle and alternatively fueled vehicle technology training, conferences, demonstrations, and speaking engagements. The ability to send multiple staff members to events helps to build knowledge and expertise rapidly and consistently. HS staff participated in the following activities:

- Formal education – Attended the SAE International (SAE) Introduction to Highway Automated Vehicles Course held at NTSB Headquarters, the SAE Hybrid and Electric Vehicle Technologies symposium, the Bosch Demo Advanced Vehicle Proving Grounds, the Transportation Research Board's (TRB) Automated Vehicle Symposium, and the SAE Heavy Vehicle Event Data Recorder training.
- Automated Vehicle Technologies Project – HS management is working with a university that will provide training tailored to the NTSB and focusing on automated vehicle technologies (design, performance, functionality, recorded data, simulation) as well as alternatively fueled vehicles.
- International Outreach – Exchanged knowledge and expertise at the Intelligent Transportation Society World Congress, which in 2018 focused on advanced vehicle technologies being developed and deployed worldwide. Staff met with the International Association of Fire and Rescue Services regarding information on electric vehicle fire incidents, and exchanged insight and experience on automated vehicle technology and alternatively fueled vehicles with investigative and regulatory agencies from Korea, Japan, Singapore, the United Arab Emirates (UAE), Norway, and the Netherlands.
- Domestic Outreach – Continued ongoing investigative work with Tesla, Uber, Navya, and Volvo, and attended briefings and visits with such entities as Apple, WAYMO (Google), Lyft, Velodyne, Aurora Tech, General Motors (GM), Insurance Institute for Highway Safety (IIHS), Daimler, the Johns Hopkins University Applied Physics Laboratory, National Highway Traffic Safety Administration (NHTSA) (cyber security), Auto Alliance, and Denso. Staff also attended demonstrations related to automated vehicles by GM and Daimler and had conversations with first responders, police, fire, emergency medical services, and tow truck drivers regarding their needs concerning automated vehicle and alternatively fueled technologies.

As demonstrated by these examples, staff is leveraging NTSB resources to quickly gain knowledge and expertise specific to the technologies involved in our ongoing accident

investigations of automated vehicles and alternatively fueled vehicles. Further, staff is developing cooperative relationships with industry, academia, and other federal agencies to enhance automated vehicle safety through our investigative experience.

Office of Research and Engineering

Several divisions from the Office of Research and Engineering (RE) are actively engaged in training, conferences, demonstrations and speaking engagements involving both automated vehicles and alternative energy systems. RE staff were involved in the following:

- Participated in GM’s orientation and demonstration of its Level 2 highway vehicle automation technology (Super Cruise) and attended the Bosch demonstration of advanced vehicle technologies noted above.
- Attended presentations and live crash test at the IIHS vehicle research center in Ruckersville, Virginia.
- Attended an SAE class on automated highway vehicle technology.
- Co-organized two sessions and attended the 2018 TRB Automated Vehicles Symposium in San Francisco, California.
- Materials Lab staff provided scientific expertise for the investigation of a fire accident at a hydrogen fueling station used for refueling electric vehicles that rely on proton exchange membrane fuel cells.
- Materials Lab staff provided scientific expertise for the investigation of numerous fires associated with the transportation of lithium ion batteries.

Automated vehicles often provide a wealth of data specific to the crash itself and, at times, related to the vehicle operation over its lifetime. Understanding this data is critical to understanding the crash dynamics and the use and operation of the vehicle, but it comes at a cost both in terms of data storage and staff time. An example of this challenge can be seen in the Vehicle Recorder Division. Automated vehicles typically record numerous parameters like those of flight data recorders (FDR) seen in newly manufactured commercial airplanes that have highly complex systems. However, in the case of autonomous vehicles, the types of data recorded are not standardized, the format and access to the data vary widely, and the information is not recorded in standardized, crash-protected devices. This increases the burden on staff. As the technologies advance and more data is available on these advanced vehicles, sustained funding will be needed to keep pace with innovations.

Commercial Space

The number of US commercial space (Federal Aviation Administration [FAA]-licensed) launches and reentries continues to increase annually. According to the FAA’s Office of Commercial Space Transportation (AST), there have been 28 licensed launches and reentries through October of calendar year (CY) 2018 compared to 23 in CY 2017. Because

the NTSB will be required to investigate any accidents, we must maintain investigator education and technical proficiency with this growing mode of transportation, must increase outreach to industry stakeholders and other government agencies, and must continue to develop investigative policies and procedures.

In FY 2018, the Office of Aviation Safety (AS) and RE investigative staff attended commercially provided industry training to increase their knowledge of launch systems technology, operations, and regulations. This training included curriculum on United Launch Alliance Atlas V and Delta IV vehicles that was attended by over 15 AS and RE staff. In addition, AS staff observed several commercial launches and started to build a reference library to ensure that investigators have access to necessary technical data. These training opportunities continue to expand and, along with the growing technical library, staff will be well prepared to determine necessary probable causes and suitable safety recommendations stemming from any commercial space accidents.

AS investigators continued to increase outreach to industry stakeholders and other government agencies in FY 2018 to ensure that the entire industry is prepared for an NTSB mishap investigation. Staff continues to take part in the Space Quad Agency Working Group (Quad Chair), which consists of safety/investigative staff from FAA AST, the National Aeronautics and Space Administration (NASA), NTSB, and the US Air Force that will ensure the agencies are well prepared for any accident investigation. In addition, in the last quarter of FY 2018, AS staff took part in a simulated accident exercise with Virgin Galactic and Spaceport America in New Mexico; AS staff also attended numerous industry conferences and other industry meetings including the Space Safety Council Meeting.

In FY 2019, AS will be adding the position of Chief Technical Advisor for Space and Advanced Aerospace Transportation Investigations to develop the Office's overall investigation program for accidents involving emergent aerospace technologies, including commercial space transportation systems. This advisor will serve as the agency's accident investigation expert in these areas, working with the Director, Deputy Director, and agency leadership to set agency and US policy, as well as develop and advise on requisite procedures, training programs, and human capital and funding plans to ensure AS's readiness to investigate accidents related to emergent aerospace technologies. The most immediate task for this advisor will likely include the pursuit of new regulations to clarify for industry and other government agencies the NTSB's definition of a commercial space mishap accident, mishap incident, and corresponding notification procedures. This important effort will clarify for industry stakeholders and the public the circumstances in which an NTSB investigation will be initiated.

Unmanned Aircraft Systems

NTSB involvement with UAS takes on two main aspects. First, as UAS are an ever-growing segment of civil aviation, the NTSB must discharge its responsibilities for investigating accidents and determining probable cause ("UAS Investigations"). Second, the convergence of small UAS (sUAS) with high quality cameras and post-processing tools has created a valuable tool for investigators to document accident sites in a more thorough

and expeditious manner at very low cost and to provide products that clearly demonstrate the accident scenario to the public. To leverage this technology, the NTSB has developed a program for using sUAS and associated technologies (“UAS Operations”).

UAS Investigations

The use of civil UAS, particularly sUAS, is growing rapidly. With a significant increase in the number of UAS operations in the National Airspace System, the risk of accidents or incidents involving UAS will also increase. Because the NTSB is charged with investigating UAS accidents and serious incidents, we must maintain investigator knowledge and technical proficiency with this growing segment of aviation.

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 specified in 49 *Code of Federal Regulations (CFR)* Part 830. The NTSB received numerous notifications of minor incidents under the rule and conducted multiple investigations, including a full investigation and final report of the first confirmed collision of a modern sUAS (drone) and a manned aircraft. The number of sUAS operating under 14 *CFR* Part 107 has grown rapidly, as has the number of operations conducted under waivers to that regulation for flights at night, in low visibility conditions, beyond-visual-line-of-sight, or directly over people. As the industry matures, and as the FAA develops further waivers for these higher risk activities, the potential for NTSB investigations further expands. In anticipation of this growth, AS is engaged in the following initiatives:

- Executing a training program for investigative staff, including in-house and commercially provided training, to increase staff knowledge of unmanned aircraft technology, operations, and regulations. This training program continues to expand to ensure (1) quick response to accident and serious incident scenes and (2) staff knowledge and expertise to facilitate the determination of probable cause and suitable safety recommendations stemming from UAS accidents and serious incidents.
- Revising 49 *CFR* 830 to capture those unmanned aircraft operations that represent a higher risk activity to the public, such as commercially operated delivery drones or flights directly over people. Staff is currently in discussions with the FAA over the best way to integrate the NTSB reporting regulation with their developing regulatory framework.
- Conducting outreach and training activities with government and industry to remain engaged with the emerging segments of the industry. Staff participates with the FAA/Industry UAS Safety Team and follows other groups such as the Drone Advisory Committee and FAA Symposium. Additionally, staff has met with emerging commercial UAS operators currently in design, development, and field-testing stages of their operation.

- Conducting site visits and technical exchange meetings with other government agencies including NASA, General Services Administration (GSA), and the Department of Defense to collaborate on related technology research, government-wide UAS usage, and operational lessons learned.

UAS Operations

In 2015, the agency began to explore the innovative uses of UAS technologies to facilitate on-scene investigation work. sUAS-mounted remote sensors and video offer substantial benefits to investigators including, but not limited to, wreckage search; accident site mapping of wreckage and ground scars; point-view photography and video of difficult-to-access evidence; sightline evaluation; and 3D modelling of components, terrain, and obstructions. sUAS support has been valuable across the transportation modes investigated by the NTSB, particularly in aviation, rail, and highway. Beginning with a research, development, and proof-of-concept program, we have demonstrated that such technology improves the efficiency of on-scene work and enhances the quality of investigative data across all modes of transportation.

Through the UAS Operations program, AS developed a complete flight program, with procedures, manuals, and training that exceed FAA minimums. Since the spring of 2016, when the initial operating capability of the NTSB UAS team began, we have conducted dozens of missions in support of aviation, rail, and highway accidents, created accurate geo-referenced maps, built 3D models of accident scenes for analysis in other advanced processing tools, and provided high quality aerial imaging. The UAS team is fully integrated into investigative decision-making, ensuring a rapid and efficient coordination of UAS assets.

UAS aerial imaging, mapping, and modeling is fast becoming a standard tool for accident investigation agencies worldwide, and the NTSB is committed to the use of sUAS capabilities as part of the agency's strategic plan goal to be a global leader in conducting independent accident investigations. To accomplish this goal, the NTSB will require additional sUAS aircraft, support equipment, analysis tools, and training to fully integrate the use of the technology in all our modal investigations for years to come. In calendar year 2018, the Congress provided the NTSB with sUAS purchase authority, which greatly improved the agency's ability to more cost-effectively acquire and utilize UAS technology in support of its accident investigation mission.

High-Speed Rail

US railroads have begun to invest in high-speed corridors that will provide efficient high-speed passenger transportation. High-speed rail is a mature technology that has operated across Europe and Asia for decades, and the funding provided in FY 2018 allowed

the Office of Railroad, Pipeline, and Hazardous Materials Investigations (RPH) to begin to learn from international expertise in this area.

RPH-10 (Rail) and RPH-40 (System Safety) have coordinated an approach for learning about the diverse and rapidly evolving high-speed passenger rail industry: One group is focused on technology, while a second is focused on operations. Our technology inquiries have examined system architectures and devices used for high-speed train signals, rail structures, dispatching and communications, railcar crashworthiness, and automated control networks and simulations. Our operations inquiries addressed local, regional, and cross-border regulations, standards, and oversight practices; training and certifications; and risk assessments and mitigations.

In FY 2018, examples of opportunities provided RPH personnel in the areas of high-speed rail and positive train control (PTC) include these:

- Two teams traveled to the United Kingdom (UK) where they attended the International Railway Engineering Conference and interacted with the Rail Accident Investigation Branch, establishing contacts and learning about risks associated with high speed rail operations, as well as discussing investigative techniques. They discussed UK rail safety regulation with the Office of Rail and Road and met with personnel from several railways as well as the European Union Agency for Railways. Through discussion, tours, and firsthand experience, NTSB staff gained insight into oversight, regulation, investigative process and techniques, risk management and mitigation, contracting, operations, equipment, and maintenance.
- A team traveled to Tokyo, Japan, to meet with the Japan Transport Safety Board, a division of the Ministry of Land, Infrastructure, Transport, and Tourism. NTSB staff discussed topics related to structure, mission, and investigative practices and results. Teams also traveled to the Republic of Ireland, France, Italy, and Spain to meet with various government agencies and rail companies to gain diverse perspectives on high speed rail operations.
- NTSB personnel attended the International Conference on Railway Technology, which included topics related to high speed rail and the InnoTrans 2018 International Rail Conference, focused on new rail technology.

Through these outreach activities, RPH staff gained important insight into current and emerging operational and safety challenges associated with high-speed rail routes that involve multiple operators, regional regulatory constraints, and cross-border expectations for rail safety.

While much has been accomplished, efforts need to continue into FY 2019 and beyond. With sustained funding, we will build upon the recently established relationships with the world-class European and Asian high-speed rail operators and with their regulators and technology developers. Anticipated additional areas of focus include emerging high-speed

rail technologies used for passenger and freight services in the United States and in the Middle East.

Data Gathering and Analysis

The NTSB has been incrementally expanding our data analytics capabilities, using the resources provided to us, with the aim of improving the efficiency and effectiveness of our investigations. With successful efforts in requirements development and pilot projects related to these capabilities, the agency was prepared to respond quickly to commit resources when increased funding was received.

Multi-Modal Accident Database Management System (M-ADMS)

In FY 2017, the NTSB identified a need, based in part on the demonstrated value of its aviation accident and incident database, to develop similar data systems for the other transportation modes in the NTSB's legislative mandate: railroad, highway, marine, and pipeline. The system will also be used by RE. In FY 2018, the NTSB issued a contract order to develop an accident data collection and storage system spanning all modes, with the promise of enabling the NTSB to leverage this data for both mission and programmatic benefit. We plan to fully deploy the system by the end of FY 2019. To date, we have completed these actions:

- Collected input from, and produced requirements documentation for, all modal offices.
- Begun requirement collection for RE.
- Deployed an initial beta version of both the Marine and Highway data systems, based on requirements already gathered.
- Collected ongoing user feedback from the Marine and Highway offices to ensure that the system meets their needs.
- Prepared for deployment in FY 2019 of an updated version of both the Marine and Highway systems that includes changes made based on input provided by the offices.
- Expanded the agency's taxonomy of occurrences and causal findings to extend to Marine and Highway investigations, in addition to Aviation investigations (other modes to follow).
- Deployed an initial beta version of a flexible query tool that will allow data retrieval across all modes, including the existing Aviation system.

Current Data Analysis Program—RE

Current efforts to increase the use of data in decision-making are built on a foundation of past and current data-gathering and analysis activities. RE provided significant resources and expertise to such efforts in FY 2018, including these:

Chief Data Scientist

In support of its data analytics efforts, the NTSB developed a Chief Data Scientist position in RE, which it filled in FY 2018. This staff member is responsible (1) for providing authoritative vision, advice, and expertise to agency senior leadership on the responsible application of data science methods and techniques to identify, analyze, and interpret emerging safety trends in transportation accident investigation data, and (2) for collaborating and building partnerships with agency leadership and staff to standardize data collection, enforce data integrity, and enhance investigation workflow processes across all NTSB offices.

This employee will also represent the agency in national and international deliberations focused on standardizing the collection, storage, and management of transportation safety data, and in developing data sharing and data system integration best practices. In addition, he will serve as an expert consultant to the ICAO General Assembly of the United Nations and the Executive Committee of the CAST/ICAO Common Taxonomy Team.

Medical Investigative Consultation Service

- Completed new Medical Investigation Catalog System (MEDICS) software this year; it will be operational in early 2019. MEDICS is an enterprise application that replaces manual processes and greatly enhances the management of health records and information for persons involved in accidents. It is customized to match the needs of NTSB medical officers, investigators, and managers, and enables further insight into accident causation and associated injuries. It also provides secure storage for electronic medical records, injury information, autopsy, and toxicology test results associated with each accident investigation.

Safety Research Division

- Served as an integral part of the agency-wide data analytics program. This division provided technical expertise for the agency's strategic objective to broaden its use of data and analytics. This includes providing data and text mining, statistical modeling and analysis, geospatial data visualization, and other types of data analysis products to all NTSB offices (investigative and non-investigative), and to the NTSB's DATA group.
- Shared best practices in aviation safety data collection, systems, and analytics through panel working group participation at the United Nations International Civil Aviation Organization (ICAO), with the GAJSC safety analysis team, and through technical presentations at the International Air Transport Association, National Air Carrier Association, and the 2018 InfoShare Conference for the

FAA, Commercial Aviation Safety Team (CAST), and Aviation Safety Information Analysis and Sharing program.

- Created event sequence and causal findings coding taxonomies for the marine accident investigation module of the agency's M-ADMS.
- Developed the capability to use Python programming and machine-learning fundamentals to solve and automate complex data analysis tasks to enhance accident investigations and analysis of transportation safety recommendations.
- In partnership with CIO and AS offices, contracted for the development of a new accident data query tool and data dictionary manual. These will be available on our website and enhance the ability of internal and external users to analyze NTSB investigation data for all modes of transportation.

Materials Laboratory Division

- Enhanced laboratory data processes, obtained a new 3D laser scanning arm with enhanced resolution and scanning speed for measuring objects and new infrared spectrometer computer and software, and updated X-ray computerized tomography scanner software.
- Implemented an upgrade of the laboratory information management system.
- Conducted training on the advantages, issues, and failure modes of 3D printing of a component for the aviation industry.

Vehicle Recorder Division

- Developed the REVEAL program, which employs enhanced color-mapping techniques for displaying data in an unknown binary data file to identify data patterns and support chip-level recovery from damaged memory devices in recorders. This advanced software assists in reverse-engineering processes to identify and convert data when assistance from the manufacturer is not available.
- Upgraded RAPTR software and initiated its use in 2018, the culmination of a multi-year contract between the NTSB and the Air Force Research Laboratory in Rome, NY. The software provides an advanced, integrated platform with video and sound analysis capabilities that greatly streamlines the process of developing comprehensive recorder transcripts for accident investigations. It can also be easily modified and enhanced as new signal-processing techniques develop.
- Awarded a contract to develop PREVIEW software, a new application that will enable authorized investigators to remotely playback onboard accident video and audio recordings in a secure network environment, with user access logged and recorded for each case. Public release of many of these recordings is specifically prohibited by law, and they may not be stored on computers issued to agency investigators. However, investigative staff working remotely need to be able to view these recordings and the associated documents. This innovative new software will share and safeguard sensitive data while reducing the time

and expense previously required for staff to travel from locations across the country to NTSB headquarters to access these materials, thus increasing investigative efficiency.

Vehicle Performance Division

- Developed the capability to use Google Earth to animate vehicle motions with text notations of specific events and overlays of graphical representations of data and video content.
- Developed the Accident Critical Events Sequence application that documents the chronological sequence of events in an accident. This provides a data repository where key events can be stored and modified throughout an investigation, enhancing team collaboration and accident report development.

New Data Analytics Initiative

In FY 2018, AS completed a proof-of-concept initiative in partnership with the NTSB’s Office of the Chief Information Officer (CIO) and RE. The initiative explored ways to address emerging aviation safety risks and opportunities and to support evidence-based decision-making using advanced data analytics capabilities in executing AS’s safety mission. Under this initiative, staff conducted market surveys and acquired software tools to demonstrate the use of dashboards for accident trend and NTSB performance outcome monitoring in areas related to: (1) fuel management accidents and (2) accidents involving operations conducted under 14 *CFR* Part 135.

The initiative also identified the need for “data cleaning” and an enhanced query tool for both internal and external users, which are currently under development as part of the M-ADMS contract expansion. In FY 2019, AS is moving forward with plans to more fully integrate the use of safety and business analytics into work products and processes. New data collection and analysis tasks will be explored to aid investigation and safety improvement decisions as well as overall process improvement efforts to enhance office efficiency and product quality.

In addition to aviation safety mission-related benefits, the initiative provides broader recognition of the value of and need for an agency-level data analytics program. As a result, the AS initiative was transitioned to an NTSB agency-wide data analytics program in FY 2018 to build the infrastructure and organizational focus needed to effectively use, present, and analyze data to enable informed decision-making in all NTSB offices. An agency-level Data Analytics Steering Committee was formed to provide guidance, executive oversight, and technical planning aspects of the program. The Data Analytics Steering Committee is supported by a Data Analytics Technical Advisors (DATA) group that provides technical recommendations to the steering committee and leads the completion of tasks identified by the committee.

Related outreach and training efforts to date include these:

- Technical staff participation in the General Aviation Joint Steering Committee’s (GAJSC) Data Working Group to infuse NTSB accident lessons learned into this public-private partnership’s efforts to prevent or mitigate problems associated with accident causes. A member of the DATA group participated in this working group’s efforts in FY 2018, and continued staff engagement is planned into FY 2019 and beyond.
- ADMS tutorial presentation and follow-on meetings with aviation industry safety professionals at such venues as the FAA-industry InfoShare meeting held in March 2018.
- Data science training of DATA group technical staff in areas related to data analytics, computer programming techniques, data curation and analysis methods and applications, and statistical data analysis (Data Analytics Boot Camp).
- Executive leadership training was also completed in FY 2018 for 10 senior leaders on the NTSB’s Data Analytics Steering Committee and key technical managers from the Offices of the CIO, RE, and AS. This training was aligned to the technical program elements on which the NTSB steering committee is now focused, and provided insight into the relevance of analytics to executive leaders; basic working knowledge of data science, organization strategy, design, and data/information governance; and integration of data analytics into existing lines of business within the NTSB. The training also provided the opportunity for NTSB senior leaders and managers to network with executives from other government agencies regarding the use of data analytics methods and tools within their organizations and across the US government.

In FY 2019 and beyond, the NTSB plans to continue 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 and analysis methods. For example, an outreach presentation followed by associated meetings with aviation insurance industry professionals was completed in April 2018, which provided inroads for accessing aviation-related data and risk assessment analysis models common in that segment of the industry. More of this type of outreach is currently being planned in FY 2019.

Summary

The NTSB has been focused on the areas discussed above for a long time, building knowledge and taking small, incremental steps in system development as resources permitted. We were prepared to accelerate our efforts and appreciate receiving the resources to do so. We are eager to continue incorporating what we are learning, the contacts we are making, and the tools we are developing and perfecting into our investigative process.

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 these 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 these 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 146,000 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 14,800 safety recommendations to more than 2,400 recipients in all transportation modes resulting from 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 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.

Our five-member Board is composed of appointees nominated by the President and confirmed by the Senate. A Chairman (one of the five members, also nominated by the President and confirmed by the Senate) serves as the chief executive officer of the NTSB. The President 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 as investigators located throughout the country who telework. The NTSB's training center is in Ashburn, Virginia.

Organization and Program Structure



RESOURCE REQUIREMENTS

Appropriations Language

Salaries and Expenses - 950310

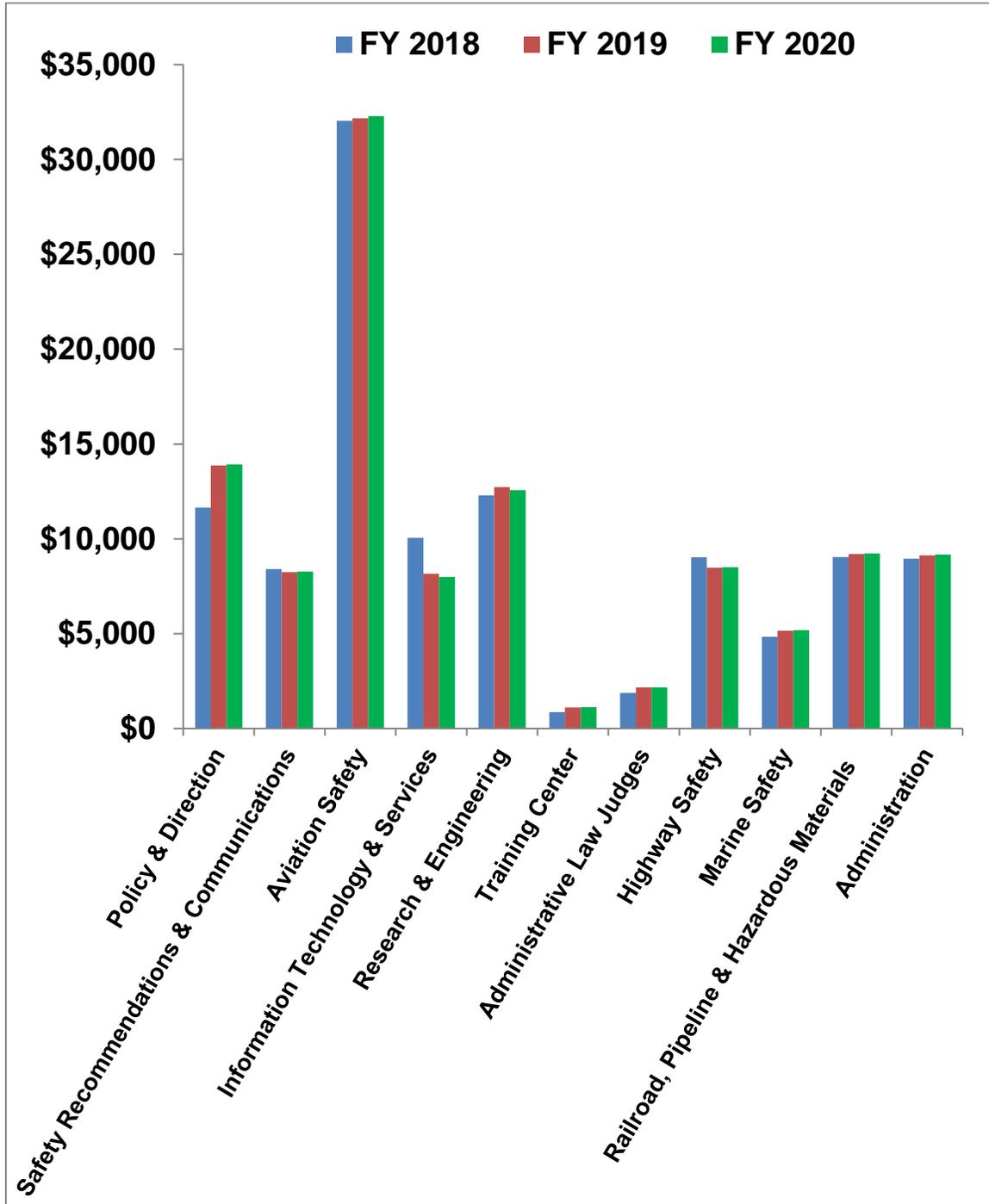
“For necessary expenses of the National Transportation Safety Board, including hire of passenger motor vehicles and aircraft; services as authorized by 5 [United States Code] U.S.C. 3109, but at rates for individuals not to exceed the per diem rate equivalent to the rate for a GS-15; uniforms or allowances therefor, as authorized by law (5 U.S.C. 5901-5902), \$110,400,000 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 2020.

NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Obligations by Program Activity (\$000s)



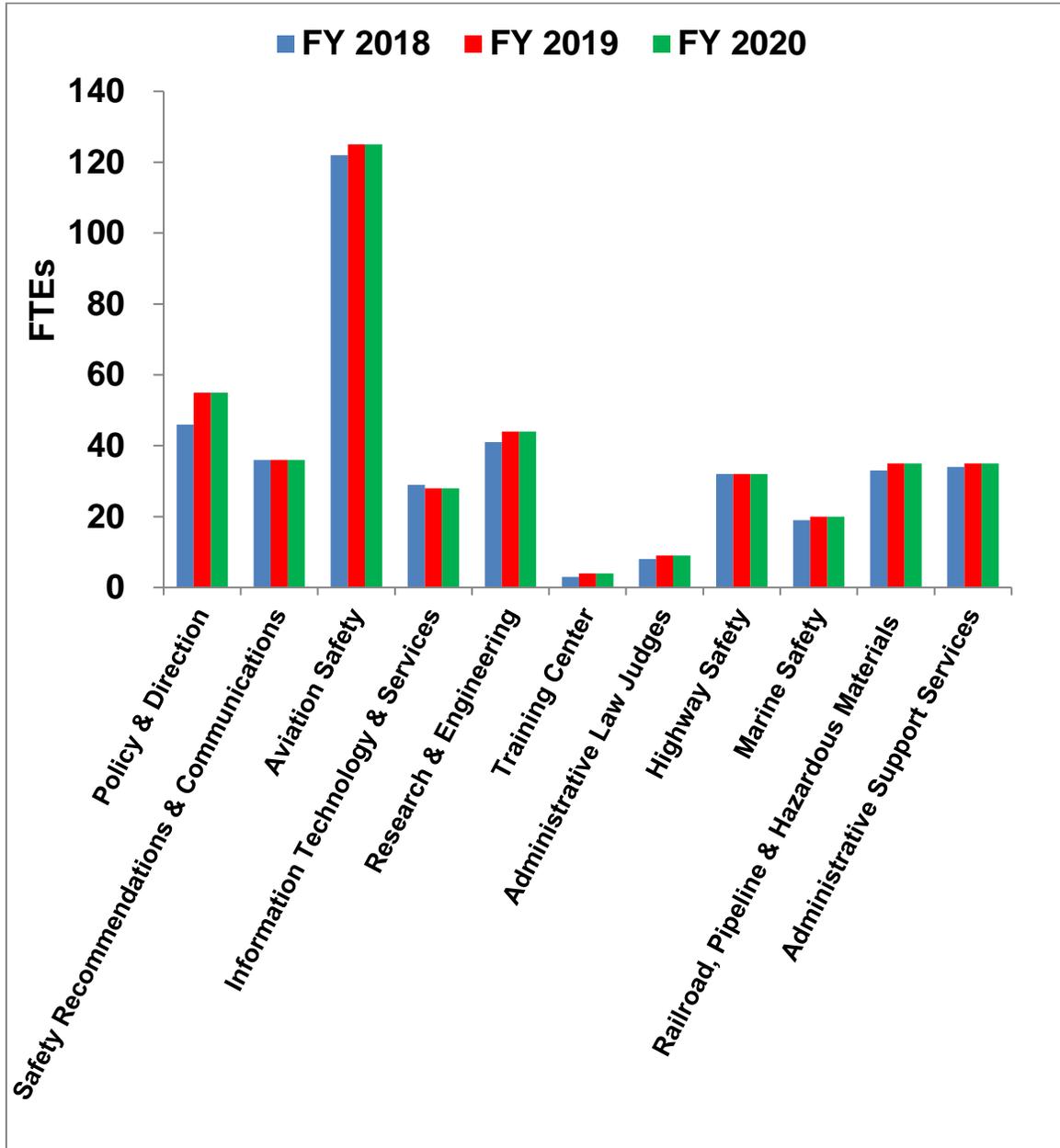
NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Obligations by Program Activity (\$000s)

Identification Code: 95-0310-0-1-407	FY 2018	FY 2019	FY 2020
Policy and Direction	11,641	13,871	13,924
Safety Recommendations and Communications	8,404	8,240	8,274
Aviation Safety	32,044	32,170	32,288
Information Technology and Services	10,050	8,161	7,987
Research and Engineering	12,290	12,718	12,560
Training Center	859	1,116	1,119
Administrative Law Judges	1,876	2,161	2,169
Highway Safety	9,027	8,473	8,503
Marine Safety	4,830	5,158	5,177
Railroad, Pipeline & Hazardous Materials Investigations	9,045	9,199	9,233
Administration	8,954	9,133	9,166
Total	109,020	110,400	110,400

NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Staffing by Program Activity



NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

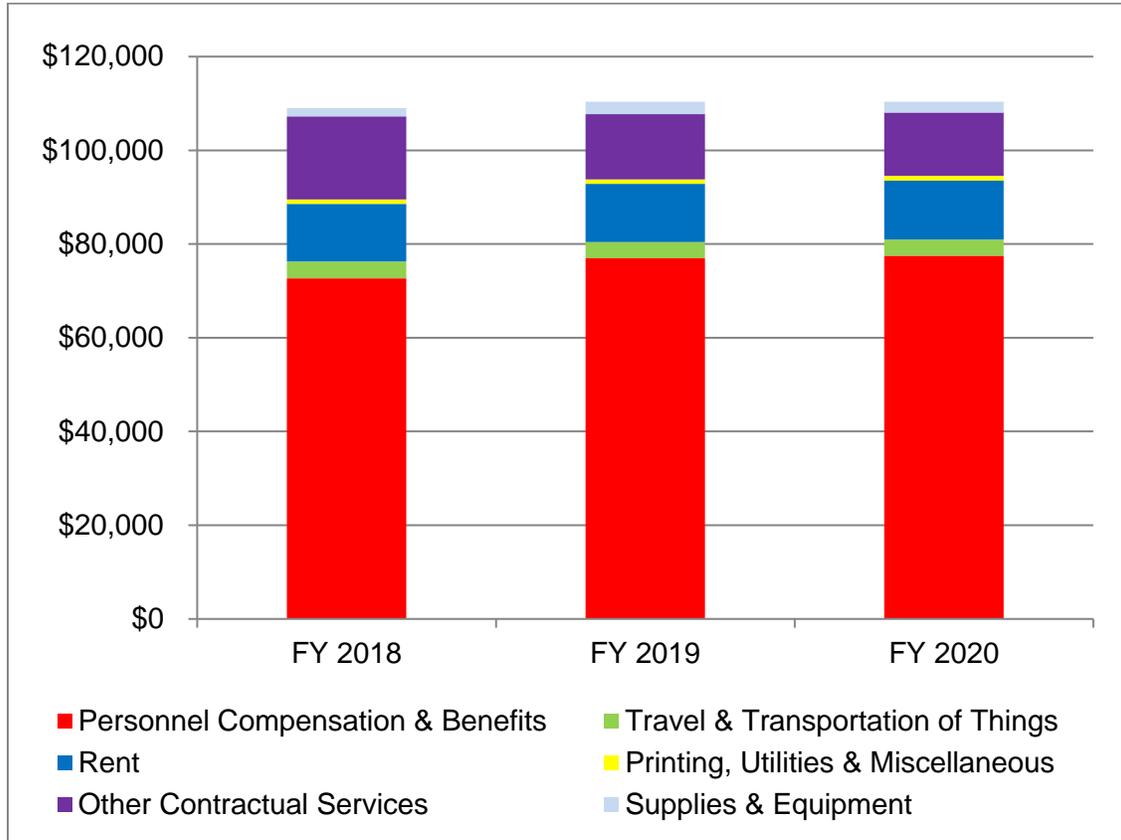
Staffing by Program Activity

Identification Code: 95-0310-0-1-407	FY 2018	FY 2019	FY 2020
Policy and Direction	<u>46</u>	<u>55</u>	<u>55</u>
Chairman, Vice Chairman, Board Members*	10	15	15
Office of the Managing Director	14	14	14
Office of the General Counsel	7	9	9
Office of the Chief Financial Officer	12	14	14
EEO, Diversity & Inclusion Office	3	3	3
Safety Recommendations and Communications	36	36	36
Aviation Safety	122	125	125
Information Technology and Services	29	28	28
Research and Engineering	41	44	44
Training Center	3	4	4
Administrative Law Judges	8	9	9
Highway Safety	32	32	32
Marine Safety	19	20	20
Railroad, Pipeline & Hazardous Materials Investigations	33	35	35
Administration	34	35	35
Total	403	423	423

* FY 2019 and FY 2020 assume full Board staffing.

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 2018	FY 2019	FY 2020
Personnel Compensation and Benefits:				
11.1	Permanent Positions	50,909	53,172	53,464
11.3	Positions Other Than Permanent	1,869	2,908	2,920
11.5	Other Personnel Compensation	2,361	2,487	2,500
	Total Personnel Compensation	55,139	58,567	58,884
12.1	Personnel Benefits	17,538	18,413	18,618
	Subtotal, Personnel Compensation and Benefits	72,677	76,980	77,502
Other Than Personnel Compensation and Benefits:				
21.0	Travel and Transportation of Persons	3,492	3,315	3,381
22.0	Transportation of Things	98	104	106
23.1	Rental Payments to GSA	9,579	9,659	9,712
23.2	Rental Payments to Others	2,747	2,803	2,859
23.3	Communications, Utilities, and Miscellaneous Charges	808	853	870
24.0	Printing and Reproduction	110	117	119
25.0	Other Contractual Services	17,731	13,877	13,504
26.0	Supplies and Materials	601	634	646
31.0	Equipment	1,177	2,058	1,701
99.9	Total Obligations	109,020	110,400	110,400
Personnel Summary:				
	Full Time Equivalent Employment (FTE)	403	423	423

NATIONAL TRANSPORTATION SAFETY BOARD SALARIES AND EXPENSES

Analysis of Changes - FY 2019 to FY 2020

\$ 392 Staffing Changes (Promotions)

The requested funding level provides for an FTE level of 423, unchanged from the annualized amount provided in the FY 2019 Continuing Resolution.

\$ 420 Non-Pay Inflation

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

(\$ 812) Operational Efficiencies

Reduction in operating expenses.

\$ 0 Total

Summary of Changes

\$ 110,400 FY 2019 Level (423 FTEs)

\$ 0 Total Increase/Decrease

\$ 110,400 FY 2020 Discretionary Level (423 FTEs)

POLICY AND DIRECTION

	(\$000s)	FTEs
FY 2019 Estimate	\$13,871	55
FY 2020 Request	\$13,924	55
Increase/Decrease	\$53	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of a 2.0 percent non-pay inflation factor. 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 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); drafts all rulemaking and interpretive guidance; 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, the acquisition of 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 related 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 Equal Employment Opportunity (EEO) complaints. These services are provided to managers, employees, and job applicants through a combination of full-time staff, collateral-duty employees, and volunteer managers of our special emphasis programs. 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 2019 Estimate	\$8,240	36
FY 2020 Request	\$8,274	36
Increase/Decrease	\$34	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of 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

This 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

This 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 review and approval by Board Members.
- 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

This 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, media relations products such 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 and supporting talking points, facilitating interviews, and conducting media training. This division also identifies 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.

- Responding to media inquiries, including facilitation of interviews with NTSB subject matter experts, development of responses to queries, and development of key messages.
- Providing strategic and tactical media-relations support for forums, meetings, roundtables, and other special investigative events.
- Providing guidance and training to NTSB investigators and communicators within the transportation industry in the conduct of media relations during NTSB investigations of transportation disasters.

Government and Industry Affairs Division

This 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 related 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 programs.

Transportation Disaster Assistance Division

This division is responsible for the following:

- Carrying out the NTSB's 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.

- Supporting accident investigations in other modes of transportation and in 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

This division is responsible for the following:

- Engaging the public and stakeholders 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 Ongoing Efforts

Safety Advocacy Division

In FY 2018, Safety Advocacy funded 70 advocacy and outreach activities conducted by division or modal office staff on issues related to the MWL and other critical

recommendations, and supported 19 presentations by Board Members and investigators with a reach of over 20,000 people. Staff also developed legislative testimony related to MWL areas and delivered presentations to state representatives on the issues of occupant protection, impairment, and distraction.

Last November, division staff met with stakeholders to discuss promotion efforts for the 2017-18 MWL. The division participated in several conferences, including those of Lifesavers (highway), the National Black Caucus of State Legislators, and the American Bus Association. Staff also collaborated with the National Safety Council to host a Road to Zero Coalition meeting at NTSB headquarters. The division coordinated meetings at the Air Charter Safety Foundation’s annual safety conference, supported widely attended general aviation (GA) events, and helped organize a roundtable discussion on Preventing Inflight Loss of Control in General Aviation through Training and Technology, which garnered the highest number of webcast views (893) of any NTSB public meeting since 2016.

The Safety Advocacy Division developed two products for the bus and motorcoach industry—a bus safety tip card addressing fatigue and a school bus safety video addressing occupant protection safety. Staff also produced two *Advocacy Spotlight* e-newsletters that shared NTSB advocacy information and MWL developments.

Staff more fully engaged with the agency’s LinkedIn page, using it to post biweekly safety messages from the Chairman and to promote advocacy events. The division also developed a podcast, “Behind the Scene @ NTSB,” which highlights agency activities and programs. Fourteen podcasts have been completed, and the number of followers has grown monthly.

Using its e-mail marketing distribution platform, staff sent 152 notifications related to events, reports, investigative findings, and MWL-related information to stakeholders, with an average “open” rate of 42 percent. The number of stakeholders receiving NTSB information notifications increased by nearly 50 percent from FY 2017 to FY 2018.

Safety Recommendations Division

In FY 2018, division staff reviewed and analyzed 291 responses from recommendation recipients, and developed draft recommendation classification responses to these letters for Board review and approval. The division also assisted the modal offices in developing and issuing 185 new safety recommendations.

The division developed 347 summary statistical reports or data summaries on specific recommendation topics to support NTSB Board Members, agency staff, and the public during the same period. Topics addressed in these reports included a summary of recommendations issued related to human fatigue, obstructive sleep apnea (OSA), runway incursions, and pilot-induced loss of control (LOC). Staff also provided input on

recommendation development during the report-planning phase of 29 NTSB accident investigations conducted by the modal offices.

Outreach activities of this division included eight presentations describing the safety recommendation process, including a presentation for aviation managers attending a training session at the NTSB Training Center and a presentation for accident investigation students at an NTSB-conducted training course. Staff participated in 15 meetings with government and industry organizations, including the Federal Highway Administration (FHWA), the FAA, NHTSA, the Federal Railroad Administration (FRA), the Federal Transit Administration (FTA), the Coast Guard, and the Association of Air Medical Services and the Air Medical Operators Association, to discuss and support the acceptance of previously issued recommendations.

Media Relations Division

In FY 2018, division staff efforts generated more than 285,000 print, online, and broadcast media mentions. Significant launches during the period include the Dupont, Washington, Amtrak crash; the New York City helicopter crash; the Miami pedestrian bridge collapse; the Philadelphia Southwest airline engine failure; the Crozet, Virginia, Amtrak crash; and the Dallas, Texas, natural gas explosion.

More than 426 links were created and used in more than 67 news releases, 25 media advisories, and 592 tweets to drive web traffic to NTSB online products. Those links received more than 164,700 clicks.

Data underscores the relevance of news release content: an exceptionally low unsubscribe rate (0.06 percent) and high open and click-to-open rates (29.0 percent and 13.0 percent, respectively). These data reveal that the division creates content that is useful to the media and is translating into earned media coverage, and that the division's approach to highly targeted media engagement is effective.

The division retooled its media relations training program, creating a 1-hour webinar to serve as refresher training for NTSB employees. The division returned to teaching the Managing Communications During an Aircraft Accident or Incident course, which eliminated a contract and solidified the relationships between Media Relations and the NTSB staff they support. Division staff provided 25 media relations training events, educating more than 1,280 NTSB staff and transportation-industry communicators.

Government and Industry Affairs Division

The Government and Industry Affairs Division initiated outreach to congressional, federal, state, and local officials who expressed an interest in improving transportation safety, arranging numerous briefings and responding to requests for information regarding NTSB investigations and safety issue areas.

In FY 2018, staff prepared Board Members and senior officials to testify at five congressional hearings to provide information regarding the investigation into the sinking

of *El Faro* and NTSB recommendations (two hearings), oversight of PTC implementation (two hearings), and the state of aviation safety. The division also supported Board Member and senior official testimonies and legislative advocacy efforts before state legislatures, including primary seat belt enforcement in Massachusetts and Virginia, rear seat belts in Connecticut, distracted driving in Virginia and Pennsylvania, and school bus safety in New Jersey. Staff also provided support for Board member confirmations.

The division supported eight accident launches on scene and the remaining major launches and GA regional investigations from headquarters. As each of these investigations continues, the 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 2018, TDA launched to five aviation accidents, three highway accidents, two rail accidents, one marine accident, and one pipeline accident. Staff provided support for an additional 296 domestic aviation accidents, 11 international aviation accidents, 11 rail accidents, 21 highway accidents, five marine accidents, and two pipeline accidents. TDA assisted approximately 1,500 family members and survivors associated with these accidents. On average, TDA staff managed 31 cases per week during the fiscal year.

TDA also participated in 53 outreach events, interacting with approximately 3,600 participants. Staff responded to inquiries from 11 international agencies; 39 US federal agencies or departments; 49 state or local agencies; 119 transportation organizations; and 79 professional organizations, educational institutions, or other aid organizations. Staff engaged in 19 outreach activities per week requiring either travel or remote interaction, on average.

In collaboration with the NTSB Training Center, TDA organized a semi-annual 2.5-day course, “Family Assistance,” to provide an overview of its operations for transportation disasters. The course was attended by 89 representatives from the transportation industry; from local, state, and federal agencies; and from other entities.

TDA coordinated two day-long meetings with the air carrier community to discuss industry best practices associated with family assistance planning and response and to share insights from recent responses. The meetings focused on the collaboration between airports and air carriers to establish a coordinated family assistance response following aviation accidents on or off airport property. A total of 232 participants, representing domestic and foreign air carriers, airports, federal partners, and non-governmental organizations, attended.

TDA staff developed and delivered a one-day training program for accident investigators focused on enhancing their communications with accident survivors and family members, and another, similar, program tailored for Board Members. Staff also developed a resource toolkit to supplement the two programs.

In addition, staff developed a series of transportation mode-specific brochures for accident survivors and family members to provide an overview of the NTSB investigative process and the products developed throughout an investigation.

Digital Services Division

In FY 2018, Digital Services staff provided support for nine major accident launches, 17 Board Meetings, and eight other NTSB-led safety-focused events. The division completed over 200 graphics and illustrations for use in reports and other materials, produced nearly 70 videos, and fulfilled more than 1,500 website update requests.

Division staff, in collaboration with SRC writers and Office of Marine Safety (MS) subject matter experts, created a first-of-its-kind *Illustrated Digest* based on the NTSB report on the sinking of *El Faro*. This publication condenses the 500-page accident report and thousands of pages of supplemental information into a 16-page summary that uses numerous graphics to tell the story of the accident voyage, the sequence of events leading to the sinking, and the subsequent voyages to find and recover the voyage data recorder (VDR) from 15,000 feet below the Atlantic Ocean.

Staff collaborated with MS to produce a companion video, as well. This video describes the event and our investigation of the sinking, and highlights the safety recommendations that we issued as a result of our findings. MS investigators use this video to share the investigation findings with the marine industry, as well as other audiences, to complement the *Illustrated Digest* and the Accident Report.

Staff also worked with Safety Advocacy to produce 15 episodes of the NTSB's first podcast series, "Behind the Scene @ NTSB." They also produced a new video series, "I Am NTSB." Both products highlight the mission of the agency and the work of staff and will be used for education and recruitment.

AVIATION SAFETY

	(\$000s)	FTEs
FY 2019 Estimate	\$32,170	125
FY 2020 Request	\$32,288	125
Increase/Decrease	\$118	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of a 2.0 percent non-pay inflation factor. 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; 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 accidents 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 related to air carrier operations.

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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, use of sUAS technology for accident scene documentation, commercial space launch/reentry accident investigation, and fully-autonomous air vehicle operations in the US National Airspace System.

As applicable for domestic accident and incident investigations, a specialist in operational factors, aviation engineering, human performance, survival factors, or other NTSB organizational element 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 or the UAS operator; training, experience, and operational performance of flight crews or UAS pilots; 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 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 operations and certification.

Writing and Editing Division

The Writing and Editing Division manages the development of, and writes, major aviation reports; staff also write, analyze, and edit accident briefs, safety recommendation reports, special investigation reports, safety alerts, responses to notices of proposed rulemaking,

and general correspondence related to aviation. In addition, the division manages the NTSB’s aviation accident database.

Regional Offices

Although 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 journeymen 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.

Administrative Support Division

The Administrative Support Division is responsible for processing budget, travel, payroll, personnel and timekeeping, procurement, contracting, and purchase card actions for the Office of Aviation Safety.

Accomplishments and Ongoing Efforts

This office’s accomplishments include issuance of many products related to transportation safety arising from completed and ongoing investigations. Products completed in FY 2018 are described below, together with information on other efforts and focus areas important to both the current and future mission of the agency.

Investigative Reports

Accident and incident reports, adopted by the Board, are issued for major accidents and certain significant incidents.

Taxiway Overflight Air Canada Flight 759 Airbus A320-211 San Francisco, California July 7, 2017

On July 7, 2017, at about 2356 Pacific daylight time (PDT), Air Canada flight 759, an Airbus A320-211, Canadian registration C-FKCK, was cleared to land on runway 28R at San Francisco International Airport, San Francisco, California, but instead lined up with parallel taxiway C. Four air carrier airplanes (a Boeing 787, an Airbus A340, another Boeing 787, and a Boeing 737) were on taxiway C awaiting clearance to take off from runway 28R. The incident airplane descended to an altitude of 100 ft above ground level and overflew the first airplane on the taxiway. The incident flight crew initiated a go-around, and the airplane reached a minimum altitude of about 60 ft and overflew the second airplane on the taxiway before starting to climb. None of the 5 flight crewmembers and 135 passengers aboard the incident airplane were injured, and the incident airplane was not damaged. The incident flight was operated by Air Canada under Title 14 *CFR* Part 129 as an international scheduled passenger flight from Toronto/Lester B. Pearson International Airport, Toronto, Canada. An instrument flight rules flight plan had been filed. Night visual meteorological conditions (VMC) prevailed at the time of the incident.

The NTSB determined that the probable cause of this incident was the flight crew's misidentification of taxiway C as the intended landing runway, which resulted from the crewmembers' lack of awareness of the parallel runway closure due to their ineffective review of notice to airmen (NOTAM) information before the flight and during the approach briefing. Contributing to the incident were (1) the flight crew's failure to tune the instrument landing system frequency for backup lateral guidance, expectation bias, fatigue due to circadian disruption and length of continued wakefulness, and breakdowns in crew resource management and (2) Air Canada's ineffective presentation of approach procedure and NOTAM information.

Safety issues identified and evaluated as part of the investigation and report included flight management system autotuning capability, effective presentation of flight operations information, systems to alert pilots when an airplane is not aligned with the runway, systems to detect potential taxiway landings and alert air traffic controllers, effective runway closure signaling, and Canadian regulations for reserve pilot duty times.

Safety recommendations were issued to the FAA and Transport Canada.

Recommendations: 7 new
Report Adopted: September 25, 2018

**Collision with Terrain Hageland Aviation Services, Inc. dba Ravn Connect Flight 3153 Cessna 208B
Togiak, Alaska
October 2, 2016**

On October 2, 2016, at about 1157, Alaska daylight time, Ravn Connect flight 3153, a turbine-powered Cessna 208B Grand Caravan airplane, N208SD, which had departed Quinhagak Airport, Quinhagak, Alaska, at 1133, en route to Togiak Airport (PATG), Togiak, Alaska, collided with steep, mountainous terrain about 10 nautical miles (nm) northwest of PATG. The two commercial pilots and the passenger were killed, and the airplane was destroyed. The scheduled commuter flight was operated under visual flight rules (VFR) by Hageland Aviation Services, Inc., Anchorage, Alaska, under the provisions of 14 *CFR* Part 135. The NTSB's investigation determined that instrument meteorological conditions (IMC) likely existed in the vicinity of the accident site at the time of the accident.

The NTSB determined that the probable cause of this accident was the flight crew's decision to continue the VFR flight into deteriorating visibility and their failure to perform an immediate escape maneuver after entry into IMC, which resulted in controlled flight into terrain (CFIT). Contributing to the accident were (1) Hageland's allowance of routine use of the terrain inhibit switch for inhibiting the terrain awareness and warning system alerts and inadequate guidance for uninhibiting the alerts, which reduced the margin of safety, particularly in deteriorating visibility; (2) Hageland's inadequate crew resource management (CRM) training; (3) the FAA's failure to ensure that Hageland's approved CRM training contained all the required elements of 14 *CFR* 135.330; and (4) Hageland's CFIT-avoidance ground training, which was not tailored to the company's operations and did not address current CFIT-avoidance technologies.

Safety issues identified and evaluated as part of the investigation and report included CRM and CFIT-avoidance training programs, terrain avoidance and warning systems, Medallion programs, safety management systems (SMS), flight data monitoring programs, infrastructure to support instrument flight rules operations, crash-resistant flight recorder systems, and pilot weather reports.

Safety recommendations were issued to the FAA, the Medallion Foundation, and Hageland Aviation.

Recommendations: 8 new, 8 reiterated
Report Adopted: April 17, 2018

**Uncontained Engine Failure and Subsequent Fire American Airlines Flight 383
Boeing 767-323
Chicago, Illinois
October 28, 2016**

On October 28, 2016, at about 1432 central daylight time (CDT), American Airlines flight 383, a Boeing 767-323, N345AN, had started its takeoff ground roll at Chicago O'Hare

International Airport, Chicago, Illinois, when an uncontained engine failure in the right engine led to a fire. The flight crew aborted the takeoff and stopped the airplane on the runway, and the flight attendants initiated an emergency evacuation. Of the two flight crewmembers, seven flight attendants, and 161 passengers on board, one passenger received a serious injury, and one flight attendant and 19 passengers received minor injuries during the evacuation. The fire substantially damaged the airplane, which had been operating under the provisions of 14 *CFR* Part 121. VMC prevailed at the time of the accident.

The NTSB determined that the probable cause of this accident was the failure of the high-pressure turbine (HPT) stage 2 disk, which severed the main engine fuel feed line and breached the right main wing fuel tank, releasing fuel that resulted in a fire on the right side of the airplane during the takeoff roll. The HPT stage 2 disk failed because of low-cycle fatigue cracks that had initiated from an internal subsurface manufacturing anomaly that was most likely not detectable during production inspections and subsequent in-service inspections using the procedures in place. Contributing to the serious passenger injury was (1) the delay in shutting down the left engine and (2) a flight attendant's deviation from company procedures, which resulted in passengers evacuating from the left overwing exit while the left engine was still operating. Contributing to the delay in shutting down the left engine was (1) the lack of a separate checklist procedure for Boeing 767 airplanes that specifically addressed engine fires on the ground and (2) the lack of communication between the flight and cabin crews after the airplane came to a stop.

Safety issues identified and evaluated as part of the investigation and report included production inspection processes and in-service inspection techniques for engine components, guidance about design precautions, engine fire checklist procedures, the need for research on the effects of evacuating with carry-on baggage, flight attendant training, and communication and coordination between flight and cabin crews during emergency situations, including evacuations.

Safety recommendations were issued to the FAA, Boeing, and American Airlines.

Recommendations: 9 new, 2 reiterated
Report Adopted: January 30, 2018

**Impact with Power Lines Heart of Texas Hot Air Balloon Rides Balóny Kubíček
BB85Z
Lockhart, Texas
July 20, 2016**

On July 30, 2016, at about 0742 CDT, a Balóny Kubíček BB85Z hot air balloon, N2469L, operated by Heart of Texas Hot Air Balloon Rides, that had left Fentress Airpark, Fentress, Texas about 0658 CDT, just after sunrise, struck power lines and crashed in a field near Lockhart, Texas. The pilot and 15 passengers died, and the balloon was destroyed by impact

forces and postcrash fire. The balloon was owned and operated by the pilot, and the flight was conducted under the provisions of 14 *CFR* Part 91 as a sightseeing passenger flight.

The NTSB determined that the probable cause of this accident was the pilot's pattern of poor decision-making that led to the initial launch, continued flight in fog and above clouds, and descent near or through clouds that decreased the pilot's ability to see and avoid obstacles. Contributing to the accident were (1) the pilot's impairing medical conditions and medications and (2) the FAA's policy not to require a medical certificate for commercial balloon pilots.

Safety issues identified and evaluated as part of the investigation and report included the lack of medical oversight for commercial balloon pilots and the lack of targeted FAA oversight of potentially risky commercial balloon operations.

Safety recommendations were issued recommendations to the FAA.

Recommendations: 2 new
Report Adopted: October 17, 2017

Investigative Briefs

Investigations resulting in accident or incident briefs are more limited in scope than those leading to major investigation 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 a total of 973 briefs in FY 2018, and has completed over 145,000 since the agency's creation. The brief below is one of the recent accident briefs adopted by the Board.

FedEx MD-10 main landing gear collapse and postimpact fire Ft Lauderdale, Florida October 28, 2016

On October 28, 2016, at about 1751 eastern daylight time (EDT), FedEx Express flight 910, a McDonnell Douglas MD-10-10F, N370FE, experienced a left main landing gear collapse after landing on runway 10L at Ft. Lauderdale/Hollywood International Airport, and the left wing subsequently caught fire. The airplane came to rest off the left side of the runway. The two flight crewmembers evacuated the airplane. The captain reported a minor cut and abrasions from the evacuation, and the first officer was not injured. The airplane sustained substantial damage. The cargo flight, which had originated at Memphis International Airport, Memphis, Tennessee, was operating on an instrument flight plan under the provisions of 14 *CFR* Part 121.

The NTSB determined that the probable cause of this accident was the failure of the left main landing gear due to fatigue cracking in the air filler valve hole on the aft side of the landing gear. The fatigue cracking occurred because of the presence of stray nickel plating

in the air filler valve hole. Contributing to the problem was the inadequate maintenance procedures to prevent nickel plating from entering the air filler valve hole during overhaul.

Recommendations: None
 Brief Adopted: May 15, 2018

Domestic Investigative Workload Summarized by State

The following table summarizes statistical information on domestic accident and incident investigations initiated from October 1, 2017, through September 30, 2018, by state or territory. Investigation types are defined after the table.

State	Major Investigation	Field Investigation	Limited Investigation	Data Collection Investigation	Incident Investigation	Total
ALABAMA	0	3	13	4	0	20
ALASKA	0	12	20	61	0	93
ARIZONA	1	7	22	35	0	65
ARKANSAS	0	3	7	11	0	21
CALIFORNIA	0	23	47	57	1	128
COLORADO	0	2	18	9	0	29
CONNECTICUT	0	1	2	3	0	6
FLORIDA	0	17	54	41	0	112
GEORGIA	0	3	10	11	2	26
HAWAII	0	1	6	1	1	9
IDAHO	0	3	10	14	1	28
ILLINOIS	0	2	15	17	1	35
INDIANA	0	6	9	3	0	18
IOWA	0	1	5	8	0	14
KANSAS	0	1	10	2	0	13
KENTUCKY	0	2	2	3	0	7
LOUISIANA	0	4	9	7	0	20
MAINE	0	1	3	2	0	6
MARSHALL ISLANDS	0	1	0	1	0	2
MARYLAND	0	1	7	8	0	16
MASSACHUSETTS	0	2	4	6	0	12
MICHIGAN	0	8	13	9	0	30
MINNESOTA	0	4	9	7	0	20
MISSISSIPPI	0	2	5	2	0	9
MISSOURI	0	4	10	7	1	22
MONTANA	0	1	3	12	0	16
NEBRASKA	0	3	4	4	0	11
NEVADA	0	5	11	10	0	26

State	Major Investigation	Field Investigation	Limited Investigation	Data Collection Investigation	Incident Investigation	Total
NEW HAMPSHIRE	0	0	1	4	0	5
NEW JERSEY	0	2	2	5	0	9
NEW MEXICO	0	5	10	12	0	27
NEW YORK	1	2	11	22	0	36
NORTH CAROLINA	0	3	15	13	0	31
NORTH DAKOTA	0	1	6	2	0	9
NORTHERN MARIANAS	0	0	1	1	0	2
OHIO	0	3	18	17	1	39
OKLAHOMA	0	5	6	5	0	16
OREGON	0	3	9	17	1	30
PENNSYLVANIA	1	2	8	14	1	26
RHODE ISLAND	0	0	0	2	0	2
SOUTH CAROLINA	0	2	7	6	0	15
SOUTH DAKOTA	0	0	5	5	0	10
TENNESSEE	0	4	8	3	1	16
TEXAS	0	14	48	43	1	106
US VIRGIN ISLANDS	0	1	0	0	0	1
UTAH	0	4	9	13	0	26
VERMONT	0	4	1	6	0	11
VIRGINIA	0	4	6	18	0	28
WASHINGTON	0	8	14	30	2	54
WEST VIRGINIA	0	0	2	0	0	2
WISCONSIN	0	4	9	11	0	24
WYOMING	0	2	7	4	0	13
Total	3	196	531	608	14	1,352

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.
- Significant operational deviation.
- Near midair collision.
- Aircraft malfunction.

When the NTSB conducts a full investigation of an incident, we determine probable cause. We focus on those incidents that represent events likely to present significant risk to the public. 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 agency’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 us to identify safety concerns and issue appropriate recommendations. We have issued numerous safety recommendations that have resulted in safety improvements worldwide directly due to our participation in these foreign investigations.

AS was notified of and assisted on 322 international investigations in FY 2018. Of these, investigators launched to or traveled in support of 22 investigations. Several accidents, including these, required significant US involvement:

- On September 28, 2018, Air Niugini flight 73, a Boeing 737, crashed into the sea on final approach to Chuuk International Airport, Chuuk, Micronesia. The airplane was substantially damaged and 1 of the 47 passengers and crew onboard was fatally injured. The accident is being investigated by the government of the Federated States of Micronesia. 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 July 31, 2018, Aeroméxico Connect flight 2431 crashed shortly after takeoff from General Guadalupe Victoria International Airport, Durango, Mexico. The airplane was destroyed and 49 of the 105 passengers and crew onboard were seriously injured. The accident is being investigated by the Mexico Dirección General de Aeronáutica Civil. 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.
- On May 18, 2018, Cubana de Aviación flight 972, a Boeing 737, crashed shortly after takeoff from Havana-José Martí International Airport, Havana, Cuba. The airplane was destroyed, and 112 of the 113 crew and passengers onboard were fatally injured. The accident is being investigated by the Cuba Instituto de Aeronáutica Civil. 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 and engines.
- On December 31, 2017, a chartered Cessna 208B airplane, operated by Nature Air, crashed shortly after takeoff from the Islita Airport, near Corozalito, Costa Rica. The airplane was destroyed, and the 2 crewmembers and 10 passengers were fatally injured. The accident investigation was initiated by the Costa Rica Consejo Técnico de Aviación Civil, Unidad de Investigación de

Accidentes e Incidentes Aéreos. 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 May 18, 2018, the Costa Rica Consejo Técnico de Aviación Civil, Unidad de Investigación de Accidentes e Incidentes Aéreos requested that the investigation be delegated to the NTSB, which we accepted on May 30, 2018.

- On September 30, 2017, Air France flight 66 experienced a catastrophic failure of the No. 4 engine, an Engine Alliance GP7200, and loss of the engine inlet and cowling. The Engine Alliance is a partnership of General Electric and Pratt & Whitney. None of the passengers and crew were injured, but the airplane received minor damage. The incident is being investigated by the French Bureau of Enquiry and Analysis for Civil Aviation Safety. NTSB investigators traveled to Greenland in April and May 2018 to assist with the search for the engine fan blades. 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 engine.

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:

- On August 3, 2016, a Boeing 777-300, operated by Emirates Airlines, crashed during landing to Dubai International Airport, Dubai, UAE. The airplane was destroyed but none of the 300 passengers and crew onboard were injured. One firefighter was fatally injured during firefighting operations. The UAE General Civil Aviation Authority 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 June 2018.
- On March 8, 2014, a Boeing 777-200ER, operated by Malaysia Airlines, crashed into the South Indian Ocean after taking off from Kuala Lumpur, Malaysia. The airplane has not been found, and the 227 passengers and 12 crew members are presumed to have been fatally injured. The Malaysia Ministry of Transport 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 April 2018.
- On September 15, 2017, American Airlines flight 2393 experienced a tailstrike while landing at Grantly Adams International Airport, Christchurch, Barbados. The airplane was substantially damaged, but none of the passengers or crewmembers were injured. The accident is being investigated by the Barbados Civil Aviation Department. The NTSB appointed a US-accredited representative in accordance with ICAO Annex 13 because the United States is

the state of registry. The United States provided comments on the draft report in March 2018.

Safety Recommendation Reports

During accident or incident investigations, safety issues are sometimes identified that warrant Board adoption of safety recommendations outside of a final report or brief. Safety recommendation reports, which may be issued at any time during an accident investigation, are used to make recommendations on such issues. 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.”

Guidance on the Issuance of Turbulence Products and Training for Low-Level Turbulence Identification and Forecasting for National Weather Service Forecasters

On April 28, 2017, at about 2348 CDT, a Pilatus PC-12 airplane impacted terrain near Rick Husband Amarillo International Airport (AMA) shortly after takeoff. The airline transport pilot and two flight crewmembers were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by Rico Aviation LLC, under the provisions of Title 14 *CFR* Part 135, as an air ambulance flight. The flight, which was operating on an instrument flight rules flight plan and was originating at the time of the accident, was en route to Clovis Municipal Airport, Clovis, New Mexico. The flight was cleared for takeoff about 2344, and the pilot reported to the AMA ATC tower at 6,000 feet above mean sea level about 2347. About 2348, the transponder signal was lost; shortly after, a fireball was observed south of the airport.

The NTSB issued recommendations to the National Weather Service (NWS) for guidance on the issuance of advisories for nonconvective turbulence hazards and for formal training on the analysis, interpretation, and forecasting of low-level turbulence.

Recommendations: 2 new
Report Adopted: August 2, 2018

Additional Harness Systems that Allow for Rapid Egress

On March 11, 2018, at about 1908 EDT, an Airbus Helicopters AS350B2 helicopter, N350LH, was substantially damaged when it impacted the East River during an autorotation after a loss of engine power near New York, New York; the helicopter subsequently rolled inverted. The pilot egressed from the helicopter and sustained minor injuries. Five passengers remained inside the helicopter and were fatally injured. The doors-off aerial photography flight, operated by Liberty Helicopters under the provisions of 14 *CFR* Part 91, had been scheduled for 30 minutes. VMC prevailed, and no flight plan

was filed for the flight, which originated from Helo Kearny Heliport, Kearny, New Jersey, about 1900.

The NTSB issued an urgent recommendation to the FAA to ensure that, if a harness system is used for an open-door passenger flight, it allows for rapid egress from the aircraft in the event of an emergency.

Recommendation: 1 new
Report Adopted: March 19, 2018

Use of Recording Devices during Experimental Flight Test Activity

On July 6, 2016, an experimental research and development Bell 525 helicopter, N525TA, broke up in flight and impacted terrain near Italy, Texas. The two test pilots received fatal injuries, and the helicopter was destroyed. The helicopter was being operated under the provisions of Title 14 *CFR* Part 91 as a developmental flight test.

The NTSB issued recommendations to the FAA and the Flight Test Safety committee regarding guidance and lessons learned regarding recording device use during flight tests.

Recommendations: 2 new
Report Adopted: January 9, 2018

Safety Alerts

Safety alerts are brief information sheets about a specific 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 2018, AS developed the following safety alerts for issuance by the Board:

- **Mechanics: Be Wary of Worn Fuel Selectors.** Between 2008 and 2018, the NTSB has cited the fuel selector in 104 accidents; 63 of those accidents involved incorrect use/operation of the fuel selector, and 28 cited degraded function of the fuel selector. These types of accidents typically result in fuel starvation and loss of engine power. Undetected wear of fuel selector components during required maintenance inspections could lead to fuel starvation because worn detents could make it difficult for a pilot to properly position the fuel selector to the desired tank because the selector handles may be difficult or even impossible to turn. (Adopted: September 2018)
- **Pilots: Ensure your Fuel Selector Works.** As described above in the “Mechanics: Be Wary of Worn Fuel Selectors” safety alert above, fuel selector accidents result in fuel starvation and loss of engine power. As fuel selectors

wear, the selector handles may be difficult or even impossible to turn; if a pilot applies too much force, the internal components can fracture and obstruct fuel flow. Further, worn detents could make it difficult for a pilot to properly position the fuel selector to the desired tank. (Adopted: September 2018)

- **Minding Weight, Maintaining Balance: Improper or unperformed calculations can be fatal.** Between 2008 and 2016, the probable causes of 136 GA accidents were related to pilots' improperly conducting preflight performance calculations for weight and balance or not conducting them at all. One-third of these accidents resulted in pilot and/or passenger deaths. If pilots do not perform preflight calculations to verify that their aircraft are within allowable weight and center of gravity (CG) limits, the aircraft could be operated in exceedance of its certificated takeoff gross weight or outside CG limits. Overloading aircraft or operating outside of the CG limits can severely degrade an aircraft's performance characteristics and ultimately lead to an aerodynamic stall and/or loss of aircraft control, typically during takeoff or landing. Not accounting for atmospheric conditions—such as wind, high temperature, and high-density altitude—on an aircraft's performance can exacerbate the effects of operating outside of weight and CG limits. Even if an aircraft is under or near its maximum gross takeoff limit, atmospheric conditions can degrade the aircraft's performance enough to prevent it from attaining or maintaining a climb. (Adopted: February 2018)

Safety Accomplishments

A safety accomplishment is defined as a positive measurable change within the transportation environment that is brought about through some direct action of an AS employee during an investigation. Such changes are considered safety accomplishments only if the action is taken voluntarily without the issuance of a formal safety recommendation by the NTSB.

In FY 2018, AS recorded 212 safety accomplishments. The accomplishments below are examples of the safety accomplishments that were implemented through direct action by our employees.

Special Airworthiness Information Bulletin Issued on Tailrotor Drive Shaft Couplings

On October 15, 2015, at about 1500 CDT, a Bell 206L-3, N206CJ, experienced a loss of tail rotor thrust and contacted trees during an emergency descent near Dickinson, Alabama. As a result of this accident and discussions among NTSB investigators, FAA personnel, Transport Canada personnel, and TSB of Canada personnel, on November 2, 2017, the FAA issued Special Airworthiness Information Bulletin (SAIB) SW-18-02, Loss of Hardware—Tailrotor Drive Shaft Couplings, that discusses the importance of proper

maintenance of the tail rotor drive shaft couplings and reminds mechanics to check the tare torque of nuts when re-installing hardware used to secure the tail rotor drive shafts.

Special Airworthiness Information Bulletin Issued on Engine Oil Drainage Systems

On January 26, 2017, at about 2145 central standard time (CST), a Eurocopter Deutschland GMBH MBB-BK 117 C-2 helicopter, N911MK, experienced an inflight engine fire and made an emergency landing at Joe Foss Field Airport, Sioux Falls, South Dakota. Then on September 8, 2017, about 1120 EDT, a Eurocopter Deutschland GMBH MBB BK117-C2 helicopter, N146DU, was destroyed after it crashed on a wind turbine farm in Hertford, North Carolina. As a result of NTSB investigators' discussions with the FAA, on November 17, 2017, the FAA issued SAIB SW-18-04, Engine Oil Drainage System, alerting operators of Airbus Helicopters Deutschland (Airbus Helicopters) Model MBB-BK 117 C-2 helicopters of possible blockage of the engine oil drainage system.

Changes to Engine Inspection Procedures and Guidance and the Inspection Room Environment

On February 13, 2018, at about 1200 Hawaiian standard time, United Airlines flight 1175, a Boeing 777-222 airplane, N773UA, experienced an in-flight separation of a fan blade in the Pratt & Whitney PW4077 No. 2 (right) engine during cruise flight to Daniel K. Inouye International Airport, Honolulu, Hawaii. The separation of the fan blade also resulted in the separation of the inlet duct and fan cowls from the engine. The investigation revealed that the fan blade had separated from a fatigue crack that originated at a location where a previous inspection had identified a crack indication that was accepted, allowing the blade to return to service. The NTSB investigator, the FAA, and parties to the investigation conducted a review of the inspection process and the inspection facilities, and interviewed the inspectors, which identified significant deficiencies that were adversely affecting the inspection. The manufacturer took immediate steps to correct the identified deficiencies, including improved inspector training, modified inspection procedures and guidance, and changes to the inspection room's environment and lighting.

Other Efforts and Focus Areas

NTSB General Aviation Safety Road Show: Strategies for Preventing In-Flight Loss of Control Accidents July 24, 2018

More GA pilots and passengers die from accidents involving LOC in flight than any other single factor. For this reason, preventing LOC in flight in GA has been included on the NTSB's MWL of transportation safety improvements from 2015 through 2018. A panel of industry and government GA safety experts discussed causes, strategies, and solutions to prevent LOC, and NTSB air safety investigators and medical officers presented accident

case studies at the Experimental Aircraft Association AirVenture 2018 in Oshkosh, Wisconsin.

**Roundtable: Preventing Inflight Loss of Control in General Aviation through Training and Technology
April 24, 2018**

Because more GA pilots and passengers die from accidents involving LOC in flight than any other single factor and greater pilot situational awareness—both in the cockpit and during flight training—can make a difference, the NTSB convened a roundtable of industry and government experts to discuss the current state of the problem and available technologies and training. The roundtable also explored challenges to implementation of current technologies to reduce these largely preventable accidents.

**Safety Seminar: Inspection Authorization Renewal
March 3, 2018**

The NTSB presented an opportunity for aircraft mechanics to renew their Inspection Authorization; the seminar was designed to increase the participant’s knowledge in all facets of the inspection process, as well as lessons learned from the outcome of NTSB investigations. Presenters included NTSB investigators and staff, FAA inspectors, and other industry experts. Attendees were exposed to presentation material that encouraged them to analyze and evaluate the information to become more informed mechanics and inspectors. Accident case studies involving maintenance issues were presented by active NTSB investigators and staff, as an opportunity to learn from these often tragic events. Presentations also included current technology and best practices and procedures for mechanics and inspectors.

**Safety Seminar: General Aviation Transition Training
December 2, 2017**

This seminar addressed the risks involved when pilots have not acquired adequate training for different aircraft they may be operating. Attendees heard presentations from NTSB investigators, as well as representatives from the Aircraft Owners and Pilots Association, the National Association of Flight Instructors, and Cirrus Aircraft, regarding their perspectives on best practices in the industry and the resources available to pilots and flight instructors.

Ongoing Significant Aviation Accident and Incident Investigations

Location	Date	Description	Fatalities
Philadelphia, PA	04/17/2018	B737 uncontained engine failure	1
New York, NY	03/11/2018	Helicopter impact with water and rollover	5
Peach Springs, AZ	02/10/2018	Air tour helicopter crash in Grand Canyon	5

Location	Date	Description	Fatalities
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

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

HIGHWAY SAFETY

	(\$000s)	FTEs
FY 2019 Estimate	\$8,473	32
FY 2020 Request	\$8,503	32
Increase/Decrease	\$30	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

HS investigates accidents that have significant safety implications nationwide, highlight national safety issues, involve major loss of life, or generate high interest because of their circumstances. Such accidents may include collapses of highway/pedestrian bridges 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 also investigates accidents that involve new safety issues or technologies (such as automated vehicles and alternatively fueled vehicles) and conducts special investigation reports 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: an IIC and five other 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, Texas, Washington, and Washington, DC.

HS staff is 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 Ongoing Efforts

This office's accomplishments include issuance of many products related to transportation safety arising from completed and ongoing investigations. Products completed in FY 2018 are described 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 Freight Train and Charter Motorcoach at High-Profile Highway–Railroad Grade Crossing Biloxi, Mississippi March 7, 2017

On March 7, 2017, at about 2:11 p.m. CST, a 2016 Van Hool motorcoach, operated by ECHO Transportation and occupied by a 60-year-old driver and 49 passengers, ranging in age from 50 to 88, was traveling northbound on Main Street in Biloxi, Mississippi, having departed that afternoon from a casino in Bay St. Louis, Mississippi, to travel to a casino in Biloxi. The motorcoach stopped in advance of a highway–railroad grade crossing on Main Street that had a high vertical profile.

The grade crossing was marked with (1) a crossbuck, (2) warning lights that would activate at a train's approach, (3) a gate arm that would lower at a train's approach, and (4) a low ground clearance grade crossing warning sign with a "LOW GROUND CLEARANCE" plaque below it on the signpost. The crossing warning system was not in active mode when the motorcoach approached, stopped, and then moved onto the railroad tracks. As the driver attempted to drive over the crossing, the frame of the motorcoach came into contact with the pavement, and the vehicle became stuck on the crossing. The driver moved the

motorcoach back and forth, attempting to dislodge it from the crossing, but was unsuccessful.

As the motorcoach became stuck on the crossing, an eastbound freight train operated by CSX Transportation (CSX) was approaching the crossing at a recorded speed of 27 miles per hour (mph) while continuously sounding its warning horn. The grade crossing warning system activated when the train was about 29 seconds away; first, the warning lights began to flash, and then the gate arm began to descend 3 seconds later. As soon as he became aware of the approaching train, the motorcoach driver opened the vehicle's loading door and told the passengers to evacuate. Due to their age and limited mobility, the passengers' evacuation was slow and the aisleway became congested; only six passengers had safely evacuated before the train struck the grounded motorcoach.

The train engineer told investigators that he had noticed the motorcoach on the tracks ahead, but he expected it to clear the crossing before the train reached it. Once the engineer realized that the motorcoach might not clear the tracks, he put the train into emergency about 502 feet west of the crossing. About 14 seconds later, by which time the train had decelerated to about 19 mph, it struck the left side of the motorcoach, pushing it 259 feet down the tracks before coming to a stop, with the motorcoach still in contact with the lead locomotive. Four motorcoach passengers died, the driver and 37 passengers sustained injuries, and 8 passengers were uninjured. The train crewmembers were uninjured.

The NTSB determined that the probable cause of the Biloxi, Mississippi, crash was the failure of CSX and the City of Biloxi to improve the safety of the Main Street grade crossing, a high-vertical-profile crossing on which motor vehicles were known to ground frequently; their inaction led to the grounding of the motorcoach that was subsequently struck by the CSX freight train. Contributing to the circumstances of the crash was the inadequate guidance from the FHWA on how to mitigate the risks posed by grade crossings with high vertical profiles.

Safety issues addressed included high-profile grade crossings and emergency egress and extrication.

As a result of this investigation, the NTSB made eleven new safety recommendations to the FHWA, FRA, Mississippi Department of Transportation, City of Biloxi, American Association of State Highway and Transportation Officials, American Railway Engineering and Maintenance-of-Way Association, Association of American Railroads, American Short Line and Regional Railroad Association, and Class I railroads. The NTSB reiterated and reclassified one recommendation to the Federal Motor Carrier Safety Administration (FMCSA).

Recommendations: 11 new, 1 reiterated
Report Adopted: August 7, 2018

**Selective Issues in School Bus Transportation Safety: Crashes in Baltimore, Maryland, and Chattanooga, Tennessee
November 1, 2016 & November 21, 2016
Special Investigation Report**

In November 2016, the NTSB began the investigation of two multifatality crashes involving school buses. Each crash was initiated when the driver lost control of the school bus. In the November 1 crash in Baltimore, Maryland, the driver suffered an epileptic seizure. In the November 21 crash in Chattanooga, Tennessee, the driver was speeding while using a cell phone, and ran off the road. In both cases, the school bus operators were private for-hire motor carriers performing contracted student transportation services. Although the specific safety issues differed, the crashes shared one common factor: poor driver oversight by both the school districts and the contracted motor carriers, which resulted in unsafe operation of the school buses.

The NTSB determined that the probable cause of the Baltimore, Maryland, school bus crash was (1) the loss of vehicle control due to incapacitation of the bus driver because of a seizure stemming from a long-standing seizure disorder; (2) the bus driver's continued operation of a school bus with a disqualifying medical condition and a fraudulently obtained commercial driver's license; and (3) the failure of AAAfordable Transportation and the Baltimore City Public Schools to provide adequate bus driver oversight, allowing the medically unfit driver to drive a commercial vehicle with a medical condition that they knew, or should have known, could lead to the unsafe operation of the school bus. Contributing to the severity of the crash was the lack of a collision avoidance system with automatic emergency braking on the school bus.

The NTSB determined that the probable cause of the Chattanooga, Tennessee, crash was (1) the school bus driver's excessive speed and cell phone use, which led to the loss of vehicle control; (2) Durham School Services' failure to provide adequate bus driver oversight, allowing an inexperienced driver to operate a commercial vehicle with escalating risky driving behaviors that it knew, or should have known, could lead to the unsafe operation of the school bus; and (3) the Hamilton County Department of Education's lack of follow-up to ensure that Durham had addressed a known driver safety issue. Contributing to the severity of the crash was the lack of passenger lap/shoulder belts on the school bus.

Safety issues addressed included oversight of student transportation service providers, management of unsafe school bus drivers, medically unfit school bus drivers, commercial driver license fraud, large school bus occupant protection, electronic stability control, automatic emergency braking, and event data recorders.

As a result of this special investigation report, the NTSB made one or more safety recommendations to each of the following: FMCSA; NHTSA; 42 states, the District of Columbia, and the territory of Puerto Rico; the Maryland Department of Education; the Maryland Motor Vehicle Administration; the National Association of State Directors of Pupil Transportation Services, National Association for Pupil Transportation, National School Transportation Association, American School Bus Council, and Maryland School Bus

Contractors Association; National Express LLC; school bus manufacturers Blue Bird Corporation, Collins Industries, Inc., IC Bus, Starcraft Bus, Thomas Built Buses, Trans Tech, and Van-Con, Inc.; electronic health record companies Epic, Cerner Corporation, eClinicalWorks, MEDITECH, and NextGen Healthcare; and Concentra, Inc. The report also reiterates four recommendations to NHTSA and reclassifies a recommendation to the Baltimore City Public Schools.

Recommendations: 16 new, 4 reiterated
Report Adopted: May 22, 2018

During the investigation but before the Board meeting, the NTSB also issued a safety recommendation report, *Shortcomings of Driver Qualification Processes for Baltimore City Public Schools and of the Disqualified Driver Database for All Maryland School Districts*. This report was based on deficiencies identified with the oversight of school bus driver operations and qualifications by the city of Baltimore and by the Maryland State Department of Education. 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.”

Recommendations: 3 new, including 1 urgent
Recommendations Adopted: March 29, 2017

**Commercial Vehicle Overturn Resulting in Cargo Tank Rupture, Propane Release, and Fire
Stroud, Alabama
March 11, 2016**

On March 11, 2016, at about 6:20 a.m., a 2011 Peterbilt truck-tractor in combination with a 1962 North Texas Tank Company, specification MC330, 10,500-gallon cargo tank semitrailer loaded with noncorrosive liquefied petroleum gas, operated by River City Propane, was traveling northbound on US Highway 431, a two-lane undivided highway, near Stroud, Alabama. As it entered a right curve near the intersection of County Route 256, it began to encroach on the southbound lane, which was occupied by a 2004 Pontiac sport utility vehicle (SUV). The driver of the Pontiac reported that he had observed the driver of the Peterbilt make a hard right turn. The cargo tank semitrailer then separated from its truck-tractor, traveled westward into a ditch, and struck a rock. The impact with the rock breached the front head of the cargo tank; as the cargo began to vent, the cargo tank’s entire head became separated, releasing the tank’s contents, which caught fire and burned. The cargo tank semitrailer continued to travel westward through about 300 yards of forested area before coming to rest. The truck-tractor came to rest on the eastern ditch/embankment area and was destroyed. The Peterbilt driver was severely injured in the crash and fire.

The NTSB determined that the probable cause of the Stroud, Alabama, crash was the combination vehicle driver’s overcorrection while traveling on a curve, after he had encroached into the opposing lane of traffic. Contributing to the crash was the driver’s

excessive speed. Contributing to the severity of the crash outcome was the rupture of the tank and subsequent release and ignition of propane.

Safety issues addressed included loading practices at Enterprise Propane Terminals and Storage (where the cargo tank was loaded), inspection and testing of MC330/MC331 cargo tanks, and certification and training of cargo tank inspectors.

As a result of the investigation, the NTSB made two safety recommendations to the FMCSA, three safety recommendations to the Pipeline and Hazardous Materials Safety Administration, and one safety recommendation to Enterprise Propane Terminals and Storage LLC.

Recommendations: 6 new
Report Adopted: January 23, 2018

**Agricultural Labor Bus and Truck-Tractor Collision at US-98–SR-363 Intersection
Near St. Marks, Florida
July 2, 2016**

On July 2, 2016, at about 5:16 a.m., a 1979 Blue Bird bus, operated by Billy R. Evans Harvesting, Inc., of Belle Glade, Florida, was traveling south on State Road 363, near St. Marks, Florida. The bus was occupied by a 56-year-old driver and 33 passengers, most of whom were migrant agricultural workers. As the bus driver approached the US Highway 98 (US-98) intersection, he did not stop at the stop sign or overhead flashing red traffic control beacons; he entered the intersection and was struck by a westbound 2005 Freightliner truck-tractor in combination with an enclosed semitrailer. The truck-tractor—occupied by a 55-year-old driver and a passenger—was operated by Verity Van Lines, Inc., of Seaford, New York. Overhead flashing yellow traffic control beacons controlled westbound traffic on US-98 at the intersection.

The front of the truck-tractor struck the left side of the bus slightly behind its front axle, resulting in the rapid counterclockwise rotation of the truck-tractor and the breach of its right-side-mounted diesel fuel tank, which ignited a fire. The front of the semitrailer then struck the left side of the bus near its rear wheel area as both vehicles proceeded toward the southwest corner of the intersection. Prior to coming to rest, the vehicles collided with fixed roadside objects, including a utility pole and its supporting cables. As a result of the crash, the truck driver and three bus passengers died. The bus driver, 28 bus passengers, and a passenger in the sleeper berth of the truck sustained injuries of varying degrees.

The NTSB determined that the probable cause of the St. Marks, Florida, crash was the bus driver's failure to stop at the intersection due to inattention, likely caused by the effects of fatigue; and his unfamiliarity with the rural roadway, which was dark, with limited lighting. Contributing to the crash were the failure of Billy R. Evans Harvesting, Inc., to exercise adequate safety oversight of the bus driver and the lack of effective oversight of the motor carrier by the FMCSA and the US Department of Labor. Contributing to the severity of the injuries were the rupture of the truck's right-side-mounted diesel fuel tank, leading

to a fast-spreading postcrash fire, and the failure of the truck driver to wear his lap/shoulder belt.

Safety issues addressed included agricultural worker transportation safety, intersection safety, heavy truck fuel tank integrity, and occupant protection.

As a result of this investigation, the NTSB made new safety recommendations to the US Department of Labor, the FMCSA, NHTSA, the Florida Department of Transportation, SAE, the American Association of State Highway and Transportation Officials (AASHTO), the National Association of Counties, the National Association of County Engineers, the National League of Cities, the National Association of Towns and Townships, the Institute of Transportation Engineers, the American Traffic Safety Services Association, the American Society of Highway Engineers, the American Society of Civil Engineers, the American Bus Association, and the United Motorcoach Association. The NTSB also reiterated one safety recommendation to the FMCSA and one to the state of Florida, and reiterated and reclassified one recommendation to the FMCSA.

Recommendations: 14 new, 3 reiterated
Report Adopted: November 28, 2017

**Motorcoach Collision with Combination Vehicle After Traffic Break on Interstate 10
Palm Springs, California
October 23, 2016**

On October 23, 2016, in dark conditions, at about 5:16 a.m. PDT, a motorcoach ran into the rear of a stopped combination vehicle near mile marker (mm) 32.5 in the westbound lanes of Interstate 10 (I-10), outside Palm Springs, California.

Nine minutes before the crash, the California Highway Patrol (CHP) initiated a traffic break (a method of temporary traffic control used to slow or stop traffic, most typically to allow for construction activities) for both eastbound and westbound traffic on I-10 in support of utility work that was being performed about 1.5 miles west of the crash location. At that time, a 2015 International Prostar truck-tractor in combination with a 2012 Utility semitrailer, operated by Tri-State Collision LLC, was traveling westbound on I-10. The combination vehicle stopped when it reached the traffic queue that had formed as a result of the break. After a traffic break that lasted about 7 minutes, the CHP released westbound traffic to start moving again. Despite the release, however, the combination vehicle remained stopped in the center-right lane of the four-lane westbound roadway and, according to witnesses, was stationary as westbound traffic resumed normal flow.

Shortly after the traffic break ended, a 1996 Motor Coach Industries International Inc. 47-passenger motorcoach, operated by USA Holiday, was traveling at highway speed on westbound I-10 in the lane in which the combination vehicle was stopped. The motorcoach, which was occupied by a 59-year-old driver and 42 passengers, struck the rear of the semitrailer, intruding about 13 feet into the semitrailer and pushing the combination vehicle

71 feet forward before coming to a stop. As a result of the crash, the bus driver and 12 passengers died, and the truck driver and 30 bus passengers were injured.

The NTSB determined that the probable cause of the crash was (1) the California Department of Transportation’s inadequate transportation management plan for the traffic break, which resulted in a hazardous traffic situation in which law enforcement did not detect the combination vehicle’s lack of movement after the traffic break ended and the bus driver did not receive any advance warning of potential traffic stoppage ahead, (2) the truck driver’s not moving his combination vehicle after the traffic break ended, most likely due to his falling asleep as a result of his undiagnosed moderate-to-severe OSA, and (3) the bus driver’s lack of action to avoid the crash due to his not perceiving the combination vehicle as stopped, as a result of his fatigue and the fact that he did not expect to encounter stopped traffic.

Safety issues addressed included traffic break policies, OSA in commercial drivers, oversight of commercial vehicle drivers and carriers, emergency egress, and collision avoidance systems.

As a result of this investigation, the NTSB made three new safety recommendations to the FHWA, two new safety recommendations to the FMCSA, one new safety recommendation to Tri-State Collision LLD, one new safety recommendation to the American Trucking Associations, the Owner-Operator Independent Drivers Association, the Commercial Vehicle Safety Alliance, and one new safety recommendation to the International Association of Chiefs of Police, and the National Sheriffs’ Association. We also reiterated safety recommendations to the FMCSA, the FHWA, Daimler Trucks North America LLC, Fuji Heavy Industries USA Inc., Hino Motors Manufacturing USA Inc., Coach Industries International Inc., Navistar Inc., PACCAR Inc., Van Hool NV, and Volvo Group North America LLC. In addition, we reiterated and reclassified one safety recommendation to the FMCSA.

Recommendations: 8 new, 7 reiterated
Report Adopted: October 31, 2017

**Motorcoach Run-Off-the-Road and Collision with Vertical Highway Signpost State Route 99
Livingston, CA
August 2, 2016**

On August 2, 2016, about 3:18 a.m. PDT, a 1998 Van Hool 49-passenger motorcoach operated by Autobuses Coordinados USA Inc. was traveling north on State Route 99, from Los Angeles to Modesto, California, when it departed the travel lanes to the right, crossed the paved shoulder, struck a W-beam guardrail, and collided with a 14-inch-diameter vertical highway signpost. The motorcoach was occupied by the driver and 24 passengers. The signpost entered the passenger compartment at the stepwell entry area. As the vehicle continued forward, the signpost tore the right (passenger side) sidewall, cargo bays, and

roof from the bus body for almost its entire length. Four passengers died, 19 received serious-to-minor injuries, and one was not injured. The bus driver was seriously injured.

The NTSB determined that the probable cause of the Livingston, California, crash was driver fatigue resulting from acute sleep loss and circadian factors. Contributing to the cause of the crash were the inadequate safety practices of Autobuses Coordinados and the FMCSA's lack of oversight of that company, which allowed it to continue operations despite known safety issues. Contributing to the severity of the crash were the guardrail, which was not designed to redirect the motorcoach and did not prevent it from colliding with the vertical highway signpost, and the extensive intrusion of the signpost into the passenger compartment.

Safety issues addressed included driver fatigue, poor safety management controls by Autobuses Coordinados, inadequate federal safety ratings for passenger motor carriers with a pattern of driver and vehicle violations, and highway barrier systems capable of safely redirecting heavy commercial passenger vehicles from point hazards.

As a result of this investigation, the NTSB made new safety recommendations to the FHWA and to AASHTO. The NTSB also reiterated a recommendation to the FMCSA, reiterated and reclassified recommendations to the FMCSA and to AASHTO, and reclassified recommendations to the FHWA and to AASHTO.

Recommendations: 2 new, 7 reiterated
Report Adopted: October 13, 2017

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. In support of the Pedestrian Safety Special Investigation Report discussed in the section below, HS completed 15 accident briefs that addressed specific pedestrian crashes. Three of these briefs are included here for review. In total, HS completed 17 briefs in FY 2018.

Fatal Pedestrian Collision with Car Washington, DC August 18, 2016

On August 18, 2016, about 2:20 a.m., a 2000 Mercedes-Benz CLK 320 coupe was traveling south on 9th Street NW in Washington, DC. As the 31-year-old driver approached the intersection of 9th and P streets, the traffic signal for southbound vehicular traffic was green. A 44-year-old male, walking with a female companion, attempted to cross 9th Street from the southeast corner of the intersection. Neither pedestrian was in the crosswalk. The driver reported that she saw the pedestrians in the roadway and attempted to steer left to avoid them. The car struck the male pedestrian at the right-side bumper area, causing him to ride up onto the hood and propelling him into the windshield on the passenger side. The

pedestrian rolled off the right side of the car and came to rest in the roadway. He was transported to MedStar Washington Hospital Center, where he died of his injuries. The female pedestrian was not injured.

The NTSB determined that the probable cause of the crash was the pedestrian's decision to cross the street outside the crosswalk and against the traffic signal. Contributing to his poor decision-making was alcohol impairment. Further contributing to the crash was the driver's impairment from alcohol, which most likely diminished her ability to detect and avoid the pedestrian.

Recommendations: None
Brief Adopted: September 24, 2018

**Fatal Pedestrian Collision with Sport Utility Vehicle
Falls Church, Virginia
May 18, 2016**

About 3:40 p.m. on May 18, 2016, a 2012 Jeep Wrangler SUV was making a left turn from the left-turn lane on southbound Glen Carlyn Drive onto eastbound Leesburg Pike (State Route 7) in Falls Church, Virginia. The SUV had a green left-turn arrow and was the first vehicle in a queue. As the 51-year-old male driver turned, a 71-year-old male pedestrian tried to cross Leesburg Pike from south to north, in front of the turning vehicle. According to a witness, the pedestrian was outside the crosswalk, the traffic signal facing him was red, and the pedestrian control indicated not to walk. The driver steered right, attempting to go behind the pedestrian, but the left front corner of the vehicle struck him.

The NTSB determined that the probable cause of the crash was a combination of the pedestrian's attempt to cross a busy multilane arterial roadway outside the crosswalk, while the pedestrian control signal indicated not to walk, and the driver's failure, while executing a left turn, to enter the leftmost lane of the roadway being entered.

Recommendations: None
Brief Adopted: July 13, 2018

**Fatal Pedestrian Collision with Car
Riverdale Park, Maryland
April 24, 2016**

About 9:16 p.m. on April 24, 2016, a 1998 Toyota Corolla four-door sedan was traveling north on Kenilworth Avenue (State Route 201) in Riverdale Park, Prince George's County, Maryland. As the 50-year-old female driver approached the intersection of Kenilworth Avenue and Tuckerman Street, the traffic signal for northbound vehicles was green. The driver observed a male pedestrian walking east in the middle of the intersection, trying to cross Kenilworth Avenue. The driver applied the brakes and attempted to steer left, away

from the pedestrian, but the car struck him in the left northbound through lane of the intersection.

The NTSB determined that the probable cause of the crash was the pedestrian's decision to cross a multilane arterial roadway in the middle of the intersection. Contributing to his poor decision-making was impairment from alcohol. Also contributing to the crash was the intersection design, which failed to consider pedestrian traffic.

Recommendations: None
Brief Adopted: July 2, 2018

**Fire Damage to Bridge and Subsequent Collapse
Atlanta, Georgia
March 30, 2017**

On March 30, 2017, about 6:05 p.m., construction materials stored under an Interstate 85 (I-85) overpass in Atlanta, Georgia, were set on fire. The fire propagated throughout the storage area. Just over 1 hour later, at 7:14 p.m., span 30 NB—a 92-foot-long elevated span of I-85—collapsed. No fatalities or injuries were reported from the fire or the subsequent bridge collapse. One person was arrested and later charged with criminal damage to property. The Georgia Department of Transportation (GDOT) had been using the area as storage for 76 reels of high-density polyethylene conduit and nine racks of fiberglass conduit. The materials were left over from an earlier project on State Route 400 and were surrounded by a chain-link fence.

The NTSB determined that the probable cause of the fire and subsequent collapse of the span 30 NB bridge structure on Interstate 85 north, in Atlanta, Georgia, was excessive heat from the ignition of 76 reels of high-density polyethylene conduit and nine racks of fiberglass conduit stored beneath the overpass. Contributing to the bridge collapse was the decision of the GDOT to store construction materials beneath the bridge and its failure to assess the increased fire risk due to the presence of these combustible materials.

Recommendations: None
Brief Adopted: March 13, 2018

**Rear-End Crash Involving Truck-Tractor Semitrailer and Sport Utility Vehicle
Goodland, Kansas
June 29, 2016**

At about 2:15 a.m. mountain daylight time on June 29, 2016, a 2004 Toyota Sequoia 7-passenger SUV, occupied by a 22-year-old male driver and 10 passengers, was traveling eastbound in the right lane of US Interstate 70 (I-70) approaching milepost 30.1. The SUV was taking the passengers from Houston, Texas, to Los Angeles, California (one passenger

was to be dropped off in Denver, Colorado). The SUV was traveling at a slower speed than the truck, which overtook the SUV and rear-ended it.

The NTSB determined that the probable cause of the Goodland, Kansas, crash was the truck driver's failure to perceive and take effective action to avoid rear-ending the SUV, due to his fatigue and lack of expectancy to encounter the slow-moving SUV on the highway ahead of him. Contributing to the crash was the SUV driver's decision to continue traveling on the highway at a reduced speed without using his vehicle's flashing hazard lights to make the slow-traveling SUV more conspicuous to other drivers. Contributing to the severity of the SUV passengers' injuries were the SUV's overloaded condition, which resulted in an insufficient number of rear passenger seat belts, and the lack of a collision avoidance system on the truck.

Recommendations: None

Brief Adopted: March 8, 2018

Special Investigations

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

Pedestrian Safety

Special Investigation Report

In May 2016, the NTSB hosted a forum intended to begin a public conversation about pedestrian safety. After the forum, the NTSB began investigating a series of 15 fatal crashes in which vehicles on public highways killed pedestrians. In 2016, during the project design phase, the set of 15 investigative cases represented the average number of pedestrian fatalities every day. By the time the project was complete, the average had increased to 16 a day.

This special investigation report discusses the public forum and previous NTSB investigations related to pedestrian safety, including the 15 fatal pedestrian crashes, and makes recommendations to improve pedestrian safety. Special investigation reports combine the work of a similar set of cases to address a safety issue. This report and the related public forum represent the NTSB's first full consideration of pedestrian safety since the 1970s.

The report uses an organizing framework of vehicle-based changes, infrastructure improvements, and data needs for improving pedestrian safety. Given that the poor visibility of people walking in and around moving vehicles is a serious problem, the report considers improvements to vehicle lighting systems that are being developed but are not yet in place. The report also considers other vehicle safety systems that can improve pedestrian safety and recognizes the needs of local transportation planning work to improve pedestrian safety. Several recommendations target data needed to better guide the

implementation of countermeasures and to gauge the effectiveness of programmatic efforts. The report focuses on issues common to all pedestrians without separating out subgroups of risk or countermeasures specific to some types of events and not others. The report makes recommendations to NHTSA, the FHWA, and the Centers for Disease Control and Prevention (CDC).

As a result of this special investigation report, the NTSB made eight new safety recommendations to NHTSA, two new safety recommendations to FMCSA, and one new safety recommendation to the CDC. The report also closed and superseded one recommendation to the US DOT.

Recommendations: 11 new, 1 reclassified
Report Adopted: September 25, 2018

Safety Alerts

Safety alerts are brief information sheets about a specific safety issue, based on the findings of investigations. They are used to help disseminate safety information to the public. In FY 2018, HS developed the following safety alert for issuance by the Board:

Protecting Bridges From Fire Damage and Collapse

In March 2017, the NTSB investigated an incident in which construction materials stored under a bridge on Interstate 85 in Atlanta, Georgia, were set on fire, resulting in the collapse of the bridge. Although catastrophic fires fueled by materials stored underneath bridges are relatively rare events, the loss of this structure demonstrated what can happen if bridge owners are not vigilant about monitoring and controlling such materials. No fatalities or injuries were reported from the fire and subsequent bridge collapse; however, the replacement cost for the bridge spans was \$15 million, and the project required more than 40 days to complete. In addition, the loss of roadway usage for this segment of I-85 significantly disrupted businesses and motorists and increased traffic congestion. The safety alert provided bridge owners with information on protecting and securing bridges from catastrophic events, such as fire damage.

Adopted Date: March 13, 2018

Other Efforts and Focus Areas

Automated Vehicle Technologies

Driverless cars are coming, and their potential for improving highway safety is promising. Most important, driverless cars could substantially reduce the number of lives lost on our streets and highways—currently a tragic 38,000 every year. Driverless cars could also increase the amount of traffic that our roads can safely carry because the precision of vehicle separation can be reduced to improve infrastructure capacity. HS is focusing on developing staff to understand and address the complexity of automated vehicles. In addition, we are working to enhance staff’s technical capabilities to analyze system data

collected from these vehicles. Further, staff is meeting with many conventional and nonconventional automated vehicle manufacturers to explain NTSB safety investigations, the processes we use, and the party system.

Alternatively Fueled Vehicles

Electric vehicles, hydrogen fueled vehicles, and hybrid vehicles are all using our roadways. These vehicles pose challenges to emergency responders when a crash occurs and leads to a fire, and a greater understanding of these advanced systems is critical to improving transportation safety. The NTSB is currently focusing our efforts on investigating multiple electric vehicles crashes that resulted in postcrash fires, and we are continuing to explore recommendations that will improve the outcome for these events.

Ongoing Significant Highway Accident Investigations

Location	Date	Description	Fatalities
Thoreau, NM	08/30/2018	An eastbound truck tractor crossed the center median of Interstate 40 and collided with a motorcoach on the westbound side of the highway.	5
Boise, ID	06/16/2018	Multi-vehicle crash in a highway work-zone.	4
West Hollywood, FL	06/15/2018	A battery module used to power an electric passenger car went into thermal runaway, resulting in a battery fire.	0
Fort Lauderdale, FL	05/08/2018	An electric powered passenger car crashed into a wall resulting in a postcrash fire.	2
Dumfries, VA	04/12/2018	While changing lanes, a passenger vehicle struck a motorcycle.	2
Mountain View, CA	03/23/2018	Following a crash into a previously damaged crash attenuator, an electric vehicle caught fire.	1
Tempe, AZ	03/18/2018	Uber Technologies, Inc. test vehicle, based on a modified 2017 Volvo XC90 and operating with a self-driving system in computer control mode, struck a pedestrian.	1
Miami, FL	03/15/2018	An elevated pedestrian walkway collapsed onto several vehicles, resulting in fatalities and injuries to vehicle occupants.	6
Loxley, AL	03/13/2018	A motorcoach transporting a group of high school band members departed from the highway and fell into a ravine.	1
Elmhurst, IL	03/01/2018	Six vehicles at the end of a traffic queue were struck from behind by a combination vehicle.	1
East Penn, PA	02/21/2018	A section of electrical conduit broke away from the ceiling of the Lehigh Tunnel, striking a combination vehicle and fatally injuring the driver.	1
Crozet, VA	01/31/2018	A chartered Amtrak train struck a refuse truck at a protected highway-railroad grade crossing.	2
Culver City, CA	01/22/2018	A vehicle operating in an automated mode crashed into the back of a stopped fire truck that was parked in a high-occupancy vehicle lane to render assistance to a previous crash.	0

Location	Date	Description	Fatalities
Oakland, IA	12/12/2017	A school bus departed the roadway and backed into a culvert. A postcrash fire ensued and the only occupants on the vehicle, the driver and one student passenger, were fatally injured.	2
Helena, MT	11/27/2017	A school bus crossing through a stop sign–controlled intersection was struck by a pickup truck towing a trailer. Following the impact, the school bus rolled 90 degrees and came to rest on its right side.	0
Las Vegas, NV	11/08/2017	A fully autonomous, self-driving shuttle bus was involved in a crash with a truck tractor in combination with a van semi-trailer.	0
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
Concan, TX	03/29/2017	A pickup truck crossed into the opposing traffic lane and collided with a medium size bus.	13
Laredo, TX	05/14/2016	A motorcoach, traveling through a curve in wet weather, yawed and rolled over.	9

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 2019 Estimate	\$5,158	20
FY 2020 Request	\$5,177	20
Increase/Decrease	\$19	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

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 Coast Guard conducts preliminary investigations of all marine accidents and notifies the NTSB when 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 that result in safety recommendations are adopted by the Board.

MS is also responsible for the overall management of the NTSB's international marine safety program, under which the office investigates 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 29 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 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, about 12 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, ship design standards, and the technical standards and requirements for VDRs.

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 (Director, Deputy Director, Program Management Officer, and Administrative Officer), the Marine Investigations Division, and the Product Development Division.

Marine Investigations Division

The Marine Investigations Division manages the multidisciplinary go-teams that launch to accident sites, collect information, and analyze collected information to determine probable cause. The division is managed by a Division Chief and Deputy Division Chief. Currently, major accident investigations are conducted by one of two teams with five or six investigators on each team. 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 Division

The Product Development Division administers the investigative quality management program. The division consists of a chief and technical writer-editors who are responsible for drafting and editing major marine accident reports, marine accident briefs, safety recommendation reports, special investigation reports, the *Safer Seas Digest* publication,

responses to notices of proposed rulemaking, and general correspondence. Staff also reviews the contents of the accident dockets provided by investigative specialists.

Accomplishments and Ongoing Efforts

This office's accomplishments include issuance of many products related to transportation safety arising from completed and ongoing investigations. Products completed in FY 2018 are described 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.

Fire Aboard Roll-on/Roll-off Passenger Vessel *Caribbean Fantasy* Atlantic Ocean, 2 Miles Northwest of San Juan, Puerto Rico August 17, 2016

About 7:25 a.m. on August 17, 2016, a fire broke out in the main engine room of the roll-on/roll-off (Ro/Ro) passenger vessel *Caribbean Fantasy* when fuel spraying from a leaking flange came in contact with a hot surface on the port main propulsion engine. The fire could not be contained, so the master ordered the ship to be abandoned. US Coast Guard and other first responder vessels and aircraft, along with Good Samaritan vessels, helped transport all 511 passengers and crew to the port of San Juan, Puerto Rico. Several injuries, none life-threatening, occurred during firefighting and abandonment efforts. The burning vessel drifted in the wind and grounded on the sandy bottom outside the port. Three days later, the vessel was towed into the harbor, where shore-based firefighters extinguished the last of the fire. The accident resulted in an estimated \$20 million in damage to the *Caribbean Fantasy*, which was eventually scrapped in lieu of repairs.

The NTSB determined that the probable cause of the fire aboard the Ro/Ro passenger vessel *Caribbean Fantasy* was Baja Ferries' poor safety culture and ineffective implementation of their SMS on board the vessel, where poor maintenance practices led to an uncontained fuel spray from a blank flange at the end of the port main engine fuel supply line onto the hot exhaust manifold of the engine. Contributing to the rapid spread of the fire were fuel and lube oil quick-closing valves that were intentionally blocked open, fixed firefighting systems that were ineffective, and a structural fire boundary that failed. Contributing to the fire and the prolonged abandonment effort was the failure of the Panama Maritime Authority and the recognized organization, RINA Services, to ensure that Baja Ferries' SMS was functional.

The report identifies the followings safety issues: machinery maintenance practices, fuel and lube oil quick-closing valves, fire protection, crew training and familiarization with emergency systems and procedures, implementation of company's SMS, and oversight by flag state and flag state's recognized organization.

As a result of this investigation, the NTSB made a total of ten new recommendations, one or more to the following: the US Coast Guard, Baja Ferries S.A. de C.V., RINA Services S.p.A, the International Association of Classification Societies (IACS), and the Panama Maritime Authority.

Recommendations: 10 new
Report Adopted: June 5, 2018

**Sinking of US Cargo Vessel SS *El Faro*
Atlantic Ocean, Northeast of Acklins and Crooked Island, Bahamas
October 1, 2015**

On October 1, 2015, the US-flagged SS *El Faro*, a 40-year-old cargo ship owned by TOTE Maritime Puerto Rico and operated by TOTE Services, Inc., was on a regular route from Jacksonville, Florida, to San Juan, Puerto Rico, when it foundered and sank in the Atlantic Ocean about 40 nm northeast of Acklins and Crooked Island, Bahamas. The ship had sailed directly into the path of Hurricane Joaquin carrying a crew of 33, including 5 Polish contract repair workers. All those aboard perished in the sinking. Damages were estimated at \$36 million. Before the loss of *El Faro*, the last comparable US maritime disaster was the sinking of the US bulk carrier *Marine Electric* off the coast of Virginia in February 1983, in which all but three of the 34 persons aboard lost their lives.

As part of its accident investigation, the NTSB led a joint effort with the Coast Guard, the US Navy, Woods Hole Oceanographic Institution, and the National Science Foundation to locate the ship's wreckage and retrieve its VDR. The VDR was pulled from 15,250 feet below the ocean surface in August 2016 during the third undersea mission and yielded more than 26 hours of parametric data and audio files.

The NTSB determined that the probable cause of the sinking of *El Faro* and the subsequent loss of life was the captain's insufficient action to avoid Hurricane Joaquin, his failure to use the most current weather information, and his late decision to muster the crew. Contributing to the sinking was ineffective bridge resource management on board *El Faro*, which included the captain's failure to adequately consider officers' suggestions. Also contributing to the sinking was the inadequacy of both TOTE's oversight and its SMS. Further contributing factors to the loss of *El Faro* were flooding in a cargo hold from an undetected open watertight scuttle and damaged seawater piping; loss of propulsion due to low lube oil pressure to the main engine resulting from a sustained list; and subsequent downflooding through unsecured ventilation closures to the cargo holds. Also contributing to the loss of the vessel was the lack of an approved damage control plan that would have assisted the crew in recognizing the severity of the vessel's condition and in responding to the emergency. Contributing to the loss of life was the lack of appropriate survival craft for the conditions.

The NTSB's accident investigation identified the following safety issues: the captain's actions, use of noncurrent weather information, late decision to muster the crew, ineffective bridge resource management, inadequate company oversight, company's SMS, flooding in

cargo holds, loss of propulsion, downflooding through ventilation closures, need for damage control plan, and lack of appropriate survival craft.

The NTSB issued 81 findings and 53 safety recommendations at the adoption of the report. One or more recommendations were issued to each of the following: the Coast Guard, the Federal Communications Commission, the National Oceanic and Atmospheric Administration (NOAA), the IACS, the American Bureau of Shipping, Furuno Electric Company Ltd., and TOTE Services Inc.

Recommendations: 53 new
Report Adopted: December 12, 2017

The NTSB also issued a Marine safety recommendation report, *Tropical Cyclone Information for Mariners*, with 10 advance safety recommendations urging NOAA, the NWS (a component of NOAA), and the Coast Guard to act on the report's recommendations. The recommendations, which addressed the development of tropical cyclone information and its availability to mariners, were derived primarily from information gathered during the NTSB's investigation into the sinking of cargo vessel *El Faro*.

Recommendations: 10 new
Recommendations Adopted: June 20, 2017

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. This report details 22 of the 29 briefs completed in FY 2018.

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

Towing by Coast Guard Response Boat *CG 29113* of *Vanguard* Sailboat, Resulting in Loss of Propulsion and Allision with Highway 11 Bridge Lake Pontchartrain, Louisiana May 3, 2017

On May 3, 2017, about 6:32 p.m., the Coast Guard response boat *CG 29113* allided with the Highway 11 Bridge while responding to a non-distress search-and-rescue case involving the adrift sailboat *Vanguard* in Lake Pontchartrain, Louisiana. The accident caused a minor injury to one of the four Coast Guard crewmembers and damage estimated at \$337,000 to the *CG 29113*. The sailboat, valued at \$20,000, eventually sank.

The NTSB determined that the probable cause of the accident was the challenging circumstances that occurred during a stern-to-stern tow in deteriorating weather conditions, which fouled the *CG 29113*'s propellers and caused a loss of propulsion. Contributing to

the accident was the dilapidated state of the sailboat, which complicated the attempt to tow the vessel.

Recommendations: None
Brief Adopted: May 22, 2018

**Collision of Tugboat *Cerro Santiago* with US Coast Guard Cutter *Tampa*
Miraflores Lake, Panama Canal, Panama
April 18, 2017**

At 12:29 a.m. local time on April 18, 2017, while transiting northbound through the Panama Canal, the Panama-flagged tugboat *Cerro Santiago* collided with the Coast Guard cutter *Tampa* in Miraflores Lake, Panama. Although the tugboat was not damaged, the cutter sustained \$170,018 in damage to the stern and 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 was the failure of the master of the *Cerro Santiago* to maintain a vigilant watch because of fatigue.

Recommendations: None
Brief Adopted: November 20, 2017

Accident Briefs Adopted by the Board

**Capsizing and Sinking of Fishing Vessel *Destination*
Bering Sea, 2.6 miles northwest of St. George Island, Alaska
February 11, 2017**

At about 6:10 a.m. local time on February 11, 2017, while transiting from Dutch Harbor to St. Paul Island, Alaska, to deliver bait and to fish for crab, the fishing vessel (FV) *Destination* capsized 2.6 miles northwest of St. George Island, Alaska, and sank several minutes later. No mayday call was received. However, a signal from the vessel's emergency position-indicating radio beacon alerted the US Coast Guard to the sinking. During search and rescue efforts, debris and an oil sheen were sighted, but none of the six crewmembers aboard were found and are therefore presumed to be dead. The value of the vessel was estimated at \$2.5 million.

The brief identifies the following safety issue: the need to address the risks of ice from freezing spray on vessel stability. To draw attention to the issue, OMS issued a safety alert titled "Ice Accumulation" targeting captains and owners of FVs who are likely to encounter freezing spray conditions during operations.

The NTSB determined that the probable cause of the capsizing and sinking of the FV *Destination* was the captain's decision to proceed during heavy freezing spray conditions

without ensuring the vessel had a margin of stability to withstand an accumulation of ice or without taking sufficient mitigating action to avoid or limit the effects of icing.

Recommendations: None
Brief Adopted: June 20, 2018

Accident Briefs Adopted by Delegated Authority

**Flooding and Sinking of Towing Vessel *Savage Ingenuity*
Gulf Intracoastal Waterway near mm 245, Sulphur, Louisiana
September 5, 2017**

At about 12:35 a.m. local time on September 5, 2017, the crew of the towing vessel *Savage Ingenuity* was maneuvering two empty tank barges in the Gulf Intracoastal Waterway near mm 245 in Sulphur, Louisiana, with the assistance of another vessel. While the tow's starboard side was almost perpendicular to the current, the vessel heeled to starboard and flooded through an open engine room door. The towboat sank partially, its bow being held above the water by the head line connected to the barges. All five crewmembers escaped to the barges without reported injury. Approximately 11,800 gallons of diesel oil were released into the waterway, most of which was not recovered. Damage to the *Savage Ingenuity* was estimated at \$1,350,000.

The NTSB determined that the probable cause of the flooding and sinking of the towing vessel *Savage Ingenuity* was the absence of company procedures requiring the closure of weather deck doors whenever the vessel was under way, which resulted in rapid downflooding into the engine room when the vessel heeled while perpendicular to a strong current with the head of its tow pushed into a river bank.

Recommendations: None
Brief Adopted: August 31, 2018

**Capsizing and Sinking of Fishing Vessel *Langley Douglas*
60 miles east of Cape Charles, Virginia
September 11, 2017**

On the morning of September 11, 2017, the commercial fishing vessel (CFV) *Langley Douglas* developed a port list, capsized, and subsequently sank 60 miles east of Cape Charles, Virginia. A US Coast Guard helicopter rescued the five people on board. No injuries or pollution were reported. The *Langley Douglas* was valued at \$1.95 million.

The NTSB determined that the probable cause of the capsizing and sinking of CFV *Langley Douglas* was the captain's decision to unload a large catch that had overflowed the pen and spilled out on deck, which—in conjunction with the water trapped on deck by

blocked freeing ports and the shifting of liquids in partially filled tanks—caused the vessel to roll to port and downflood.

Recommendations: None
Brief Adopted: August 30, 2018

**Allision of *James H Hunter* Tow with Dock and Fire Boat
Cumberland River, mm 191.1; Nashville, Tennessee
June 6, 2017**

At about 10:50 p.m. on June 6, 2017, the towing vessel *James H Hunter* was pushing three gravel and sand barges upstream in the Cumberland River through the city of Nashville, Tennessee, when two barges broke from the tow; hit the bank; and then allided with a floating dock underneath a pedestrian bridge, a fire boat moored at the dock, and a bridge pier. The fire boat broke free of its moorings as the barges pushed the dock downriver. There were no injuries or reports of pollution. The fire boat sustained damage in the form of dents and scrapes to its hull, and the dock sustained damage estimated to be about \$300,000. Damage to the barges was reported to be superficial.

The NTSB determined that the probable cause of the allision of the *James H Hunter* tow with the dock and fire boat was the practice of using single barge couplings in high-water conditions, which resulted in the parting of a steering coupling after rudder input to counteract the strong current.

Recommendations: None
Brief Adopted: July 12, 2018

**Fire aboard Sailing Vessel *Best Revenge 5*
Falmouth Inner Harbor, Falmouth, Massachusetts
July 11, 2017**

At about 1:30 a.m. on July 11, 2017, the uninspected sailing vessel *Best Revenge 5* caught fire while docked at a marina pier in Falmouth Inner Harbor in Falmouth, Massachusetts. The vessel's two crewmembers escaped the burning vessel and attempted to fight the fire but could not contain it, and local firefighters later extinguished it. One crewmember sustained second- and third-degree burns to the arms, hands, and feet. An oil sheen was observed in the immediate vicinity of the vessel after the fire but was contained by a floating boom. Damage to the *Best Revenge 5* (which was declared a constructive total loss), to a vessel docked next to it, and to the pier totaled an estimated \$1,508,000.

The NTSB determined that the probable cause of the fire aboard the uninspected sailing vessel *Best Revenge 5* and on its pier was an electrical fault in an accommodation space on the vessel.

Recommendations: None
Brief Adopted: June 28, 2018

**Grounding and Sinking of Fishing Vessel *Southern Bell*
Gulf of Mexico, east of Sabine Pass Jetty Channel, Texas
October 13, 2017**

On October 13, 2017, at 7:05 a.m. local time, the uninspected FV *Southern Bell* grounded outside of the east jetty for the entrance to the Sabine Pass Channel, an outlet for the Sabine and Neches Rivers into the Gulf of Mexico. The vessel heeled over on its port side and began flooding through open doors to the engine room and accommodation space before sinking. The captain and two crewmembers entered the water and were rescued by a Good Samaritan vessel nearby without suffering any injuries. A light oil sheen and debris were later observed. The vessel, valued at an estimated \$519,000, was determined to be unsalvageable.

The NTSB determined that the probable cause of the grounding and subsequent sinking of the *Southern Bell* was the captain's decision to leave the wheelhouse unattended while still making way as the vessel approached the entrance channel to Sabine Pass.

Recommendations: None
Brief Adopted: June 4, 2018

**Contact of Crane Barge *Troy McKinney* with Overhead Power Lines
Harvey Canal, Harvey, Louisiana
June 7, 2017**

On the evening of June 7, 2017, the unmanned crane barge *Troy McKinney* broke free from its mooring and struck overhead power lines crossing the Harvey Canal in Harvey, Louisiana. No pollution or injuries were reported. Damage to the crane barge was negligible, but damage to the power lines totaled about \$440,000. Approximately 100 gallons of diesel fuel were released during salvage operations but were later recovered. Damage to the vessel was estimated at \$1.5 million.

The NTSB determined that the probable cause of the accident was the insufficient mooring arrangement, which did not prevent the barge from excessive movement or breaking away.

Recommendations: None
Brief Adopted: May 2, 2018

**Fire aboard Vehicle Carrier *Alliance St. Louis*
Gulf of Mexico, about 190 miles south of New Orleans, Louisiana
January 16, 2017**

On January 16, 2017, at 2:52 a.m., the vehicle carrier *Alliance St. Louis* was under way from Port Arthur, Texas, to Jacksonville, Florida, when a pipe plug on the fuel pump for the main engine's no. 6 cylinder came loose, resulting in fuel spray onto the engine's hot exhaust gas pipe manifold. The atomized fuel quickly ignited. The fire was contained to the main engine room and extinguished by the carbine dioxide (CO₂) fixed

fire-suppression system. No injuries were reported, but property damage exceeded \$3,750,000.

The NTSB determined that the probable cause of the fire was improper tightening of a pipe plug on the top cover of the no. 6 cylinder fuel pump housing, which resulted in a high-pressure release of marine gas oil. Contributing to the fire was the improper attachment of a fuel spray shield to the top cover, which allowed fuel to spray directly onto the cylinder's hot exhaust pipe and ignite.

Recommendations: None
Brief Adopted: March 29, 2018

**Fire on board Vehicle Carrier *Honor*
English Channel, about 55 miles southwest of the Isle of Wight, United Kingdom
February 24, 2017**

At about 3:00 a.m. local time on February 24, 2017, the US-flagged Ro/Ro vehicle carrier *Honor* was in route from Southampton, England, to Baltimore, Maryland, when a fire broke out in the upper vehicle deck. The fire was extinguished by the crew using the vessel's CO₂ fixed firefighting system. One injury was attributed to the firefighting efforts. The accident resulted in extensive damage, amounting to more than \$700,000, to the *Honor*'s hold and its cargo of about 5,000 vehicles. No pollution resulted from the accident.

The NTSB determined that the probable cause of the fire was a fault in the starter motor solenoid in one of the personally owned vehicles being transported in the vessel's cargo space.

Recommendations: None
Brief Adopted: March 6, 2018

**Allision of Tanker *Aframax River* with Mooring Dolphins, and Subsequent Fire in
Waterway
Deer Park, Texas
September 6, 2016**

On September 6, 2016, about 12:05 a.m. local time, the tanker *Aframax River* allided with two mooring dolphins in the Houston Ship Channel near Deer Park, Texas. The allision punctured the ship's hull plating, and about 88,000 gallons of low-sulfur marine gas oil spilled into the water. The oil ignited and burned for about 45 minutes. The two onboard pilots sustained minor burns, and property damage exceeded \$1.5 million.

The NTSB determined that the probable cause of the accident was a momentary abnormality of the tanker's main engine governor actuator system in responding to command inputs from the bridge.

Recommendations: None
Brief Adopted: February 22, 2018

**Flooding and Sinking of Fishing Vessel *Ambition*
Bering Sea, 19 nm north-northeast of False Pass, Alaska
July 23, 2016**

At about 4:00 p.m. on July 23, 2016, the CFV *Ambition* started taking on water in its lazarette while transiting in the Bering Sea near the northern entrance to False Pass off the Alaska Peninsula. The vessel began sinking by the stern, and efforts by the crew to determine the source of the flooding were unsuccessful. After the captain transmitted a distress call over VHF radio at 6:32 p.m., the five crewmembers donned immersion suits and abandoned the vessel into the water and onto an awaiting Good Samaritan vessel. The crew suffered no injuries. The *Ambition* continued to slowly sink and was last seen at 10:09 p.m. Most of the fuel oil on board was later recovered by salvors, but a light oil sheen was observed in the area in the days immediately following the sinking. Two attempts to raise the wreck were unsuccessful, and the vessel, which had an estimated value of \$700,000, was declared a total loss.

The NTSB determined that the probable cause of the sinking of the CFV *Ambition* was the flooding of the lazarette from a breach in the steel hull.

Recommendations: None
Brief Adopted: January 30, 2018

**Grounding of Fishing Vessel *St. Dominick*
Pumicestone Bay on the northwest side of the long west extension of Unalaska
Island, Alaska
March 6, 2017**

On March 6, 2017, at about 12:09 a.m., the uninspected CFV *St. Dominick* grounded in Pumicestone Bay, Alaska. The engine room flooded within 10-20 minutes of the grounding, and the four crewmembers abandoned the vessel a short time later. None of them were injured, and no pollution was reported. The vessel, valued at \$1.1 million, was deemed a constructive total loss.

The NTSB determined that the probable cause of the grounding of the *St. Dominick* was the captain's failure to monitor the vessel's track because he was fatigued from an accumulated sleep deficit. Contributing to the accident was the nature of the derby-style fishing that the *St. Dominick* was engaged in and the captain's failure to properly set the bridge watch alarm.

Recommendations: None
Brief Adopted: January 18, 2018

**Grounding of Bulk Carrier *Nenita*
Columbia River, Three Tree Point, in the Welch Island Reach near Skamokawa,
Washington
November 19, 2016**

On November 19, 2016, the fully-laden bulk carrier *Nenita*, registered in the Marshall Islands, was outbound on the Columbia River when the vessel suffered an engine failure impacting its ability to maneuver. The vessel subsequently ran aground at Three Tree Point on the Washington State side of the river, damaging its bulbous bow and hull. After the grounding, the *Nenita* was towed to Longview, Washington, for temporary repairs. Two weeks later, the vessel resumed the voyage to its original destination. There were no injuries or reported pollution from the accident.

The NTSB determined that the probable cause of the grounding was the failure of a main engine cylinder cooling jacket that initiated an automatic reduction in engine speed, resulting in the eventual loss of steerageway. Contributing to the accident was the lack of information relayed from shipboard personnel to the pilot about status of the main engine, which prevented him from taking effective corrective action following the engine casualty.

Recommendations: None
Brief Adopted: January 4, 2018

**Sinking of Motor Vessel *Exito*
Alaska Bering Sea, 4 miles north of Cape Kalekta, Unalaska Island
December 6, 2016**

On December 6, 2016, at about 9:40 p.m. local time, the uninspected motor vessel (MV) *Exito* sank while transiting from Dutch Harbor to Akutan, Alaska. During the transit, the vessel had been struck by a wave and began listing to starboard. Unable to determine the source of the list as it progressively increased, the captain ordered the *Exito*'s second crewmember and three contractors who were also on board to don immersion suits and abandon the vessel. The crew and one contractor evacuated to a liferaft, but two contractors were unable to escape the *Exito* before it sank. The survivors were recovered shortly after by a Good Samaritan vessel. US Coast Guard aircraft, a Coast Guard cutter, and other vessels searched for the missing contractors, but they were never found. About 2,000 gallons of diesel fuel, twelve 55-gallon drums of anti-freeze, and an industrial X-ray machine were released into the sea when the vessel sank. The *Exito*, valued at about \$310,000, was lost.

The NTSB determined that the probable cause of the sinking of the MV *Exito* was progressive flooding from an undetermined location. Contributing to the loss of life was the carriage of personnel on board, other than crewmembers, who were inadequately prepared and equipped for an emergency.

Recommendations: None
Brief Adopted: December 15, 2017

Sinking of Fishing Vessel *Lady Gertrude*
Atlantic Ocean about 40 nm east-southeast of Point Pleasant, New Jersey
August 15, 2016

On August 15, 2016, at about 1:50 a.m., the 119-gross-ton FV *Lady Gertrude* began flooding through its propulsion shaft stern tube while preparing to dredge for scallops. The captain contacted the Coast Guard, the three crewmembers abandoned ship, and they were rescued by a Good Samaritan vessel before search-and-rescue assets arrived; no one was injured. The vessel sank at 4:53 a.m. Following the sinking, a light oil sheen was observed. The *Lady Gertrude* was valued at \$400,000.

The NTSB determined that the probable cause of the sinking of the *Lady Gertrude* was the fracture of the propeller shaft forward of the stern tube stuffing box, resulting in uncontrollable flooding of the vessel's fish hold and progressive flooding through non-watertight bulkheads of the engine room and lazarette.

Recommendations: None
Brief Adopted: November 27, 2017

Grounding of Articulated Tug and Barge *Nathan E Stewart/DBL 55*
Edge Reef, off Athlone Island in Seaforth Channel, northwest of Bella Bella, British Columbia, Canada
October 13, 2016

On October 13, 2016, at 1:08 a.m., the articulated tug barge *Nathan E Stewart/DBL 55* ran aground on Edge Reef off Athlone Island in the Seaforth Channel near Bella Bella, British Columbia, Canada. At the time of the accident, the *Nathan E Stewart* was in route to the Port of Vancouver with the empty *DBL 55*. None of the crewmembers were injured, but approximately 29,000 gallons of fuel and lube oil were released into the environment. Damage to the vessel and barge was estimated at \$12 million.

The NTSB determined that the probable cause of the grounding was the second mate's falling asleep while on watch. Contributing to the grounding was the ineffective implementation of the company's SMS procedures for watchstanding.

Recommendations: None
Brief Adopted: November 21, 2017

Engine Explosion and Fire aboard Towing Vessel *The Admiral*
Ingleside, Texas, La Quinta Channel, mm 544, Gulf Intracoastal Waterway
July 14, 2016

On July 14, 2016, the uninspected towing vessel (UTV) *The Admiral* was moored alongside barges in the La Quinta Channel, Gulf Intracoastal Waterway, near Ingleside, Texas. About 1635, the vessel's starboard main engine over sped and then exploded, causing a fire in the engine room. Two crewmembers who were in the engine room at the time of the explosion

were severely burned; one subsequently died. Damage to the vessel was estimated at \$300,000. No pollution was reported.

The NTSB determined that the probable cause of the engine explosion and resulting fire aboard the towing vessel *The Admiral* was a misfiring cylinder that ignited lubricating oil in the sump of the engine.

Recommendations: None
Brief Adopted: November 14, 2017

**Allision of Cruise Ship *Celebrity Infinity* with Dock
Ketchikan, Alaska
June 3, 2016**

At about 2:00 p.m. on June 3, 2016, the Malta-flag cruise ship *Celebrity Infinity* allided with berth 3 in Ketchikan, Alaska. No one was injured, and no pollution occurred. The vessel sustained a 9-inch-diameter hole on the forward port side, about 12 feet above the waterline, and the berth suffered extensive damage to the catwalks and pilings. The cost of repairs was about \$1.15 million.

The NTSB determined that the probable cause of the allision was the master's failure to plan, monitor, and execute a safe docking evolution.

Recommendations: None
Brief Adopted: November 14, 2017

**Fire aboard Passenger Vessel *Tahoe Queen*
Zephyr Cove on Lake Tahoe, Nevada
August 16, 2016**

At about 7:30 a.m. on August 16, 2016, a fire broke out on the upper deck of the passenger vessel *Tahoe Queen* as it was docked alongside its home pier on Lake Tahoe undergoing extensive maintenance and repairs. The fire destroyed the wheelhouse and most of the upper deck. Two crewmembers suffered minor injuries; both were treated and released the same day. There were no reports of pollution. The vessel, valued at \$4.8 million, was declared a constructive total loss. The NTSB determined that the probable cause of the fire aboard passenger vessel *Tahoe Queen* was the operating company's poor oversight of its contractors' adherence to hot-work safety policies.

Recommendations: None
Brief Adopted: November 6, 2017

**Flooding and Sinking of Small Passenger Vessel *Maximus*
Turtle Bay, Mexico
May 12, 2016**

On the evening of May 12, 2016, the *Maximus*, a 42-gross-ton small passenger vessel, began taking on water while under way near Turtle Bay, Mexico. The four crewmembers could not stop the flooding and abandoned ship into a life raft, from which a Good Samaritan vessel rescued them. No injuries or pollution were reported. The *Maximus* was valued at \$575,000.

The NTSB determined that the probable cause of the flooding and sinking of small passenger vessel *Maximus* was a hull breach near the waterline from an unknown cause. Contributing to the accident was the ineffectiveness of the installed high-level bilge alarm system to alert the crew to water accumulating in the hull.

Recommendations: None
Brief Adopted: October 3, 2017

***Participation in Coast Guard, Marine Board of Investigation
Public Hearing***

**Explosion and Fire Aboard *Bouchard No. 255* Tank Barge
Gulf of Mexico near Port Aransas, Texas
U.S. Coast Guard, Marine Board of Investigation Public Hearing
July 16 – 27, 2018**

The NTSB Marine Safety IIC participated in equal status with the Coast Guard in this joint Coast Guard-led hearing into the circumstances of the October 20, 2017 explosion while heaving anchor on the *B-255*, which resulted in two fatalities.

Safety Alerts

Safety alerts are brief information sheets about a specific safety issue, based on the findings of investigations. They are used to help disseminate safety information to the public. In FY 2018, MS developed the following safety alert for issuance by the Board:

Ice Accumulation: Addressing the risks of ice from freezing spray on vessel stability

Icing can dangerously degrade a vessel's stability. The NTSB investigated an accident in which the FV *Destination* likely capsized at night in very rough seas and gale force winds because of topside ice accumulation while transiting the Bering Sea. The vessel and all hands were lost without a mayday call. The vessel sailed into freezing spray despite the forecast warnings from the NWS.

This safety alert discussed the icing problem and what mariners can do to reduce the risk of icing. It provided guidance, suggested precautions, and provided links to information on managing freezing spray and resultant icing.

Adopted Date: June 20, 2018

Support to Foreign Accident Investigations

Under the IMO Casualty Investigation Code, MS participated with the US Coast Guard as a substantially interested state in the following ongoing investigation of a serious marine casualty involving a foreign-flagged vessel in international waters:

Location	Date	Description	Fatalities
Exuma Island, Bahamas	06/30/2018	Passenger Vessel (PV) 4Cs, Bahamas flag 37-ft tour boat, fire, explosion & sinking	1 (US citizen)

Other Efforts and Focus Areas

Sinking of the US Cargo Vessel *El Faro* Illustrated Digest Publication May 24, 2018

This 16-page illustrated digest summarizes the critical events and decisions that led to the October 1, 2015, sinking of *El Faro* and the loss of all 33 crewmembers. The digest also synthesizes the more than 60 recommendations issued throughout the NTSB's investigation of the sinking. The infographics and summary provide an easy-to-read document that imparts potentially lifesaving information to marine industry stakeholders, gathered from the thousands of pages that comprised the NTSB's final report and associated investigative documents.

***El Faro* Investigation Lessons Learned Workshop with the US Coast Guard February 8, 2018**

This workshop was proposed by the Commandant of the Coast Guard and the Chairman of the NTSB to mark the completion of the *El Faro* investigation, document lessons learned, meet colleagues, and outline updates for a new Coast Guard/NTSB Memorandum of Understanding (MOU). The current MOU dates to 2008. The workshop included discussions of the investigation, VDR issues, and legal matters concerning both the NTSB and the Coast Guard. MS managers and the *El Faro* investigative team attended, as did members of the Coast Guard Office of Investigations and Marine Safety Center.

El Faro Investigation

Marine Safety Advocacy and Outreach

Following the NTSB’s adoption of the El Faro Marine Accident Report in December 2017, MS has received numerous requests from federal, state, local, educational, and private marine stakeholders for a presentation on the casualty. In FY 2018, MS staff and NTSB Board Members gave nine briefings or presentations on the investigation, which included congressional testimony and presentations to groups such as the Maine Maritime Alumni and the Greater New Orleans Barge Fleet Association (GNOBFA). MS management also briefed the Texas Maritime Academy and Great Lakes Maritime Academy on the El Faro investigation and resulting recommendations.

Conferences and Other Outreach

MS employees attended several conferences in FY 2018, including the American Waterway Operators Spring Convention and the Annual Cruise Line International Association Conference. MS staff also presented at the Annual GNOBFA Conference, Ship Owners Cooperation Program Conferences, and the North American e-Navigation Underway Conference. The MS Director, sometimes with the Chairman, Board members, or the Managing Director, was also involved in a number of presentations and meetings with industry and government stakeholders.

International Outreach

During the year, MS staff have worked closely with foreign nation counterparts. In October 2017, the MS Director traveled to Ottawa, Canada, to meet with Transportation Safety Board of Canada leadership. In February 2018, the MS Director met with the Executive Director of the Finnish Safety Investigation Authority. MS staff attended meetings of the IMO Sub-Committee on Navigation, Communications and Search and Rescue and the IMO Sub-Committee on Ship Systems and Equipment, both held in London, England. The MS Director also attended the IMO Sub-Committee on Implementation of IMO Instruments on September 23-29, 2018 in London. A presentation on the *El Faro* investigation was provided to the European MAIIF in Iceland in May 2018. Finally, the NTSB hosted the annual meeting for the MAIIF of the Americas, which was planned and organized by MS managers and held at the NTSB’s Training Center in June 2018.

Ongoing Significant Marine Accident Investigations

Location	Date	Description*	Fatalities
Off Sabine Pass, TX	09/18/2018	FV <i>Capt M & M</i> - sinking	0
Stamford Harbor, CT	09/17/2018	ITV <i>Seeley</i> & SV <i>Sea Jay</i> - collision	0
West Helena, AR	09/12/2018	TV <i>Jacob Kyle Rusthoven</i> - fire	0
45 NM South of Padre Island, TX	08/31/2018	FV <i>Master D</i> - fire	0

Location	Date	Description*	Fatalities
Manhattan Cruise Terminal Pier 90, New York, NY	08/28/2018	PV <i>Carnival Horizon</i> - allision (striking) and Manhattan Cruise Terminal Pier 90	0
Newburyport, MA	08/24/2018	FV <i>Hit List</i> - fire	0
Cape Cod, MA	08/23/2018	FV <i>Rose Marie</i> - fire	0
Trinidad & Tobago	08/23/2018	Offshore Supply Vessel (OSV) <i>Sanibel Island</i> - damage in drydock	0
Brownsville, TX	08/09/2018	<i>Atlantic Giant II</i> - crane boom collapse	0
Port O'Connor, TX	07/28/2018	CFV <i>Lady Toni & Got M'On</i> - collision & <i>Got M'On</i> sinking	0
Port Moller, AK	07/28/2018	FV <i>Logger</i> - engine room fire	0
Dillingham, AK	07/25/2018	FV <i>Pacific Knight</i> - capsize	1
Branson, MO	07/19/2018	Amphibious PV <i>Stretch Duck 07</i> - sinking	17
Houston, TX	06/13/2018	Bulk carrier MV <i>Yochow</i> - collision with tank barge <i>OSG 243</i>	0
Houston, TX	05/23/2018	MV <i>Chipolbrok Moon</i> - cargo hold fire/cargo damage	0
Pago Pago, American Samoa	05/21/2018	CFV <i>Cape Cod</i> - engine room fire	0
30 nm SE Bridgehampton, NY	05/12/2018	MV <i>Tofteviken</i> & FV <i>Polaris</i> - collision	0
New Orleans, LA	05/07/2018	UTV <i>Steve Richoux</i> - barge allision w/pier	0
Matagorda Bay, TX	04/17/2018	Dredge <i>Jonathan King Boyd</i> - struck gas pipeline and caught fire	0
New Orleans, LA	04/06/2018	Bulk carrier MV <i>Shamdong Fu En</i> - allision w/Erdon Dock	0
Mackinaw City, MI	04/01/2018	MV <i>Clyde S Van Enkevort</i> - allision w/underwater transmissions lines	0
Dry Tortugas, FL	03/18/2018	CFV <i>Ole Betts Sea</i> - fire and sinking	0
New Orleans, LA	03/12/2018	UTV <i>Natalie Jean</i> - sinking	2
Blytheville, AR	03/06/2018	UTV <i>MS Nancy Jean</i> - foundering	0
MM 519 LMR, Mississippi River, AR	02/21/2018	UTV <i>Leland Speaks</i> - engine room fire	0
73 nm NW of Cold Bay, AK	01/26/2018	CFV <i>Progress</i> - damage from broaching wave into pilothouse	0
Alcorn, MS	01/24/2018	UTV <i>George King</i> - engine room fire	0
Port Richey, FL	01/14/2018	Small Passenger Vessel <i>Island Lady</i> - engine room fire	0
Pittsburg, PA	01/13/2018	Barge breakaway and allision w/ USACE vessels (public non-public, NTSB lead)	0
Twelve Mile Island, PA	12/13/2017	UTV <i>JW Herron</i> - fire	0
Amchitka Island, AK	12/12/2017	OSV <i>HOS Red Dawn</i> - engine/generator explosion/fire	0
McKellar Lake, near Memphis, TN	12/08/2017	UTV <i>Rickey Robinson</i> - foundering	0

Location	Date	Description*	Fatalities
Boston, MA	12/07/2017	Container vessel MV <i>Helsinki Bridge</i> - breakaway from Conley Container Terminal	0
9 NM East of Nantucket, MA	12/04/2017	CFV <i>Misty Blue</i> - foundering	2
5 NM offshore jetties of South Padre Island, TX	10/30/2017	CFV <i>Benn & Casey</i> - foundering	0
St. Paul, MN	10/26/2017	UTV <i>Cooperative Venture</i> - allision w/ railroad bridge	0
Port Aransas, TX	10/20/2017	Tank Barge <i>Bouchard B-255</i> - explosion	2
East of Straits of Singapore (territorial waters)	08/21/2017	United States Ship (USS) <i>John S McCain</i> collision w/ MV <i>Alnic MC</i> (Public non-public, NTSB lead)	10
New Orleans, LA	08/19/2017	Bulker MV <i>Mia-S</i> - allided w/ Nashville Ave. Wharf A on Left Descending Bank	0
56 NM SW of Yokosuka, Japan (territorial waters)	06/17/2017	USS <i>Fitzgerald</i> collision with <i>ACX Crystal</i> (Public non-public, NTSB lead)	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.

RAILROAD, PIPELINE AND HAZARDOUS MATERIALS INVESTIGATIONS

	(\$000s)	FTEs
FY 2019 Estimate	\$9,199	35
FY 2020 Request	\$9,233	35
Increase/Decrease	\$34	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of a 2.0 percent non-pay inflation factor. No other program changes are planned.

Program Description

RPH comprises four divisions: Railroad, Pipeline and Hazardous Materials, System Safety, and Report Development. The office 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 the probable cause, and issues safety 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 and businesses.

The division does 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 identify 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 the study. In other cases, the special

studies may focus on analyses of regulations, railroad safety programs or procedures, or 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.

System Safety Division

The System Safety Division reviews regulatory and industry best practices for system safety management in the regulated transportation mode, as well as for the role of individual, workgroup, and organizational factors affecting accident scenarios. The division also maintains effective oversight of emerging regulations, methods, and data related to system safety in the railroad, pipeline, and hazardous materials arenas.

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 back 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 all written products generated by the office, including railroad, pipeline, and hazardous materials reports and briefs, safety alerts, safety recommendations, responses to notices of proposed rulemaking, papers, congressional testimony, and speeches on matters pertaining to railroad, pipeline, and hazardous materials safety.

Accomplishments and Ongoing Efforts - Railroad

This office's accomplishments include issuance of many products related to transportation safety arising from completed and ongoing investigations. Products completed in FY 2018 are described 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

BNSF Railway Roadway Worker Fatalities Edgemont, South Dakota January 17, 2017

On January 17, 2017, about 10:09 a.m. mountain standard time, BNSF Railway westbound train E DOLEBM0 01E, traveling at 35 mph, struck and killed two roadway workers, including the watchman/lookout. The accident occurred at milepost 477, on the Black Hills subdivision, in Edgemont, South Dakota. The three-member roadway work group had been cleaning snow and ice from the track switch on the main track to prepare for the movement of a train that was to have its air brake system tested in a stationary test on the main track. The crew of the striking train sounded the train horn and bell, and both members of the train crew applied emergency braking; however, there was no response from the roadway work group, and the train was unable to stop before reaching the work location.

The NTSB determined that the probable cause of the accident was the improper use of train approach warning by the BNSF Railway roadway work group to provide on-track safety. Contributing to the accident was incorrect information provided in the job briefing, including a miscalculated sight-distance assessment. Also contributing to the accident was the failure of BNSF Railway to provide the watchman/lookout with the necessary equipment to alert the work group of oncoming trains and equipment. Further contributing to the accident was the FRA's inconsistent enforcement of federal regulations requiring that railroads equip watchman/lookouts.

The investigation of this accident identified worker protection as a safety issue.

The NTSB made new safety recommendations to the FRA and BNSF.

Recommendations: 7 new
Report Adopted: August 27, 2018

Amtrak Train Collision with Maintenance-of-Way Equipment Chester, Pennsylvania April 3, 2016

On April 3, 2016, about 7:50 a.m. EDT, southbound Amtrak train 89 struck a backhoe with a worker inside at milepost 15.7 near Chester, Pennsylvania. The train was authorized to

operate on main track 3 at the maximum authorized speed of 110 mph. Beginning on the morning of April 1, Amtrak had scheduled track-bed restoration—ballast vacuuming—at milepost 15.7 on track 2 on the Philadelphia to Washington Line. Track 2 had to be taken out of service between control points Baldwin (milepost 11.7) and Hook (milepost 16.8) for the 55-hour duration of the project. As train 89 approached milepost 15.7, the locomotive engineer saw equipment and workers on and near track 3 and initiated an emergency brake application. The train speed was 106 mph before the emergency brake application, and 99 mph when it struck the backhoe. Two roadway workers were killed, and 39 other people were injured. Amtrak estimated property damages to be \$2.5 million.

The NTSB determined that the probable cause of the accident was the unprotected fouled track that had been used to route a passenger train at maximum authorized speed; the absence of supplemental shunting devices, which Amtrak required but the foreman could not apply because he had none; and the inadequate transfer of job site responsibilities between foremen during the shift change that resulted in failure to clear the track, to transfer foul time, and to conduct a job briefing. Allowing these unsafe actions to occur were the inconsistent views of safety and safety management throughout Amtrak’s corporate structure that led to the company’s deficient system safety program that resulted in part from Amtrak’s inadequate collaboration with its unions and from its failure to prioritize safety. Also contributing to the accident was the FRA’s failure to require redundant signal protection, such as shunting, for maintenance-of-way (MOW) work crews who depend on the train dispatcher to provide signal protection, prior to the accident.

The investigation of this accident identified several safety issues, including release of foul time; single point failures; track occupancy rules; adjacent track authorization rules; job brief for field dispatcher; communication with dispatcher; Amtrak oversight; safety culture; and employee guidance on drug/alcohol policy.

As a result of this investigation, the NTSB made new safety recommendations to the FRA, Amtrak, the Brotherhood of Maintenance of Way Employees Division, the American Railway and Airway Supervisors Association, the Brotherhood of Locomotive Engineers and Trainmen, and to the Brotherhood of Railroad Signalmen. The NTSB also reiterated one safety recommendation to the FRA.

Recommendations: 14 new, 1 reiterated
Report Adopted: November 14, 2017

Information on additional Safety Recommendations pertaining to this accident can be found in the safety recommendation report “*Using Technology to Protect Maintenance-of-Way Employees*,” which is included in the safety recommendation report section.

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. This report details 10 of the 12 accident briefs completed in FY 2018.

**Southeastern Pennsylvania Transportation Authority Trolley Collision
Philadelphia, Pennsylvania
January 4, 2017**

On January 4, 2017, at 12:47 p.m. eastern standard time (EST), Southeastern Pennsylvania Transportation Authority (SEPTA) trolley 9101 (struck trolley), traveling northwest on trolley route 10 with an estimated 47 passengers on board, stopped near the intersection of Lancaster Avenue and 38th Street, in Philadelphia, Pennsylvania, to offload passengers. SEPTA trolley 9085 (striking trolley), with six passengers on board, was also traveling northwest on trolley route 10, and struck stopped SEPTA trolley 9101 in the rear at an estimated impact speed of 10 mph. First responders transported 40 passengers and both operators to local hospitals for treatment of minor injuries. The total estimated equipment damage to both trolleys was \$60,000.

The NTSB determined that the probable cause of this accident was the failure of the operator of the striking trolley to slow and stop his trolley before colliding with the stopped trolley because of his impairment from fatigue and the sedating effects of the repeated doses of over-the-counter antihistamine diphenhydramine. Contributing to the operator's fatigue was his illness, which negatively affected his medical fitness for duty.

The investigation of this accident identified several safety issues, including medical requirements, drug and alcohol policy, operator certificates, and regulator oversight.

The NTSB made new safety recommendations to the American Public Transportation Association and to the FTA.

Recommendations: 2 new
Brief Adopted: September 11, 2018

**Southeastern Pennsylvania Transportation Authority Light Rail Collisions
Upper Darby, Pennsylvania
February 21, 2017**

On February 21, 2017, at 8:03 a.m. EST, SEPTA light-rail passenger train 57, traveling westbound on the Market-Frankford Line, entered the number 2 loop track at the 69th Street Transportation Center located in Upper Darby, Pennsylvania, and struck stopped SEPTA light-rail passenger train 67 on the number 2 loop track. The collision and associated derailment also caused train 67 to strike SEPTA light-rail train 51, which was operating in the opposite direction on the adjacent number 1 loop track. Train 57 was traveling about 14 mph at the time of the collision. Four people were injured (two passengers and two car operators) and transported by emergency responders to local medical facilities for treatment. The total estimated equipment damage to all involved light-rail equipment was \$1.6 million.

The NTSB determined that the probable cause of this accident was the temporary loss of awareness and lack of proper speed control by the train 57 operator as the train entered the 69th Street station loop track.

The investigation of this accident identified several safety issues, including the use of onboard cameras and event recorders.

The NTSB made one new safety recommendation to the FTA and two new safety recommendations to SEPTA.

Recommendations: 3 new
Brief Adopted: August 27, 2018

**Southwestern Railroad Collision
Roswell, New Mexico
April 28, 2015**

On April 28, 2015, at 6:23 a.m. mountain daylight time (shortly after dawn), a westbound Southwestern Railroad (Southwestern) freight train with nine locomotives and 79 cars collided with Southwestern's Roswell Local standing freight train. The striking train traveled through a switch that was in the reverse position at the east end of Chisum siding, just south of Roswell, New Mexico. The two crewmembers on the lead locomotive of the striking train jumped before impact. The engineer died, and the conductor was seriously injured. Nine locomotives derailed from the striking train. Two locomotives and three empty hopper cars derailed from the standing train. Southwestern, which owned both trains, estimated the damage at \$2.01 million.

The NTSB determined that the probable cause of the accident was that the conductor of the Roswell Local train failed to return the switch for main track movement because he was fatigued. Contributing to the accident was that the striking train crew did not perceive the misaligned switch in non-signaled territory in time to avoid the collision.

The investigation of this accident identified a safety issue with the hand-operated switch in non-signaled territory.

As a result of this investigation, the NTSB made one new safety recommendation to the FRA. In addition, the Board reiterated three safety recommendations to the FRA.

Recommendations: 1 new, 3 reiterated
Brief Adopted: April 19, 2018

**Railroad Switching Services Employee Fatality
Pine Bluff, Arkansas
April 3, 2015**

On April 3, 2015, at 9:23 p.m. CDT, a Railroad Switching Services crew—a locomotive operator and a ground person—was moving 34 railroad cars onto yard track 4 at the Evergreen Packaging plant in Pine Bluff, Arkansas. After moving the train about three car-lengths without receiving radio commands from the ground person, the operator

stopped the train, disembarked, and found the ground person under the ninth car. The ground person died at the scene.

The NTSB determined that the probable cause of the accident was the switching crew's failure to establish the required safety protections before the ground person stepped between the railcars. Contributing to the accident was the minimal plant railroad safety oversight exercised by the FRA.

The investigation of this accident identified several safety issues, including the oversight of insular properties, compliance, substance abuse policies, and medical requirements.

As a result of this investigation, the NTSB made one safety recommendation to the Occupational Safety and Health Administration (OSHA) and one safety recommendation to the FRA.

Recommendations: 2 new
Brief Adopted: March 1, 2018

**Long Island Rail Road Passenger Train Strikes Platform in Atlantic Terminal
Brooklyn, New York
January 4, 2017**

On January 4, 2017, about 8:18 a.m. EST, Long Island Rail Road (LIRR) passenger train 2817, consisting of six cars, collided with the platform at the end of track 6 in the Atlantic Terminal in Brooklyn, New York. The lead end of the lead car came to rest on top of the concrete platform at the end of the track, injuring 108 people. Damage was estimated at \$5.3 million. The accident occurred inside the terminal and was not affected by the weather.

The NTSB determined the probable cause of the accident was that the engineer of LIRR train 2817 had fallen asleep because of his chronic fatigue. Contributing to his chronic fatigue was the engineer's severe undiagnosed OSA, and LIRR's failure to initiate OSA screening for safety-sensitive personnel and to refer at-risk safety-sensitive personnel for definitive OSA testing and treatment. Further contributing to the accident was the FRA's failure to require railroads to medically screen employees in safety-sensitive positions for OSA and other sleep disorders. Also contributing to the accident was the lack of either a device or a safety system that could have intervened to stop the train before the collision.

The investigation of this accident identified several safety issues, including bumping posts, employee fatigue policy, and PTC.

Recommendations: None
Brief Adopted: February 6, 2018

Information on Safety Recommendations pertaining to this accident can be found in the "End-of-Track Collisions at Terminal Stations" special investigation report section.

**New Jersey Transit Train Strikes Wall in Hoboken Terminal
Hoboken, New Jersey
September 29, 2016**

On September 29, 2016, about 8:38 a.m. EDT, New Jersey Transit (NJT) train 1614 failed to stop, overrode a bumping post at the end of track 5, and struck a wall of the Hoboken Terminal in Hoboken, New Jersey. Train 1614 consisted of one controlling passenger car (cab car), three passenger cars, and one locomotive at the rear of the train. The train was traveling about 21 mph at the time of the accident.

About 250 passengers and 3 crewmembers (engineer, passenger car conductor, and assistant conductor) were on the train. One person on the passenger platform was struck by falling debris and died, and 110 passengers and crewmembers were injured. Total damage to the train, track, and facility was estimated at \$6 million.

The NTSB determined that the probable cause of the accident was the failure of NJT train 1614's engineer to stop the train after entering Hoboken Terminal due to the engineer's fatigue from his undiagnosed severe OSA. Contributing to the accident was NJT's failure to follow its internal OSA screening guidance and to refer at-risk safety-sensitive personnel for definitive OSA testing and treatment. Also contributing to the accident was the FRA's failure to require railroads to medically screen employees in safety-sensitive positions for OSA and other sleep disorders, and the lack of either a device or safety system that could have intervened to stop the train before the collision.

The investigation of this accident identified several safety issues, including OSA (employee medical requirements), bumping posts, and PTC systems.

Recommendations: None
Brief Adopted: February 6, 2018

Information on Safety Recommendations pertaining to this accident can be found in the "End-of-Track Collisions at Terminal Stations" special investigation report section.

**BNSF Railway Crude Oil Unit Train Derailment
Heimdal, North Dakota
May 6, 2015**

On May 6, 2015, at 7:21 a.m., a BNSF Railway (BNSF) crude oil unit train derailed six cars (81 through 86) near Heimdal, North Dakota. The train, consisting of 3 locomotives, 2 buffer cars, and 107 loaded tank cars carrying crude oil, was operating at 45 mph when the cars derailed. The train separated after a broken wheel on the 81st car struck the leading edge of the highway rail grade crossing at milepost 149.01. A mark on the track structure at milepost 153.87 indicated that the broken wheel could not maintain its normal position on the rail at that point, and the derailment sequence began. The momentum of the train pulled the 81st car and the following five cars off the track. Five of the derailed tank cars breached and released about 96,400 gallons of crude oil, which fueled a fire about 1 mile

east of Heimdal. About 30 people were evacuated from Heimdal and the surrounding area due to the smoke plume that extended north. BNSF estimated damage at \$5 million.

The NTSB determined that the probable cause of this derailment was failure of a wheel on the 81st tank car because of a vertical split rim.

The investigation of this accident identified several safety issues, including wheel impact, remedial actions for suspected defective wheel conditions, employee fatigue policies, and kilopound levels.

As a result of this investigation, the NTSB made two new safety recommendations to the FRA. In addition, the Board made a new safety recommendation to the FRA and the Association of American Railroads.

Recommendations: 3 new
Brief Adopted: December 29, 2017

**Union Pacific Railroad Employee Fatality
Kansas City, Kansas
September 29, 2015**

On September 29, 2015, about 11:15 a.m. CDT, Union Pacific Railroad (UP) remote-control train YAR-24R-29 struck and fatally injured a foreman conducting switching operations at the east end of Armourdale Yard in Kansas City, Kansas. The foreman was found in the gage of track 5 under the lead railcar. A second switching crew foreman working in the yard was operating the striking train. There was no property damage.

The NTSB determined that the probable cause of the accident was the east crew foreman's being in the gage of the track for unknown reasons while a train-switching movement was being performed by another crew. Contributing to the accident was the inadequate radio communication and work coordination between the crews working in the yard.

The investigation of this accident identified several safety issues, including rule non-compliance and employee distraction.

As a result of this investigation, the NTSB issued one new safety recommendation to UP.

Recommendations: 1 new
Brief Adopted: December 29, 2017

**Amtrak Train Derailment on BNSF Railway Tracks
Cimarron, Kansas
March 13, 2016**

On March 13, 2016, at 9:30 a.m. CDT, an unattended two-axle agricultural truck loaded with cattle feed rolled away from the Cimarron Crossing Feeders feedlot, in Cimarron, Kansas. The truck rolled down a hill and across a highway, and collided with the BNSF

railroad tracks. The collision caused a lateral shift in the tracks at milepost 372.09. At 12:02 a.m. the next day, an eastbound Amtrak passenger train derailed while crossing the misaligned tracks.

The Los Angeles-to-Chicago train, which had two locomotives and 10 cars, was operating on the La Junta Subdivision. The last four cars derailed on their sides, and two other cars derailed upright. Of the 130 passengers and 14 Amtrak employees on board, 28 were injured. Amtrak and the BNSF estimated the damages to be more than \$1.4 million.

The NTSB determined that the probable cause of the derailment was the agriculture truck driver's failure to properly secure his unattended truck, which rolled downhill and struck the BNSF railroad tracks, causing them to misalign. Contributing to the accident was the failure of the truck's driver and the driver's supervisor to report the incident to the local authorities.

The investigation of this accident identified several safety issues, including third party damage, and track alignment.

Recommendations: None
Brief Adopted: November 16, 2017

**South Florida Regional Transportation Authority Highway-Rail Grade Crossing
Collision
West Palm Beach, Florida
July 6, 2016**

On July 6, 2016, about 9:59 a.m. EDT, northbound Amtrak Silver Meteor train P09806 (train), operating on the South Florida Regional Transportation Authority (SFRTA) track, struck a 2004 Mercury Sable automobile at the 25th Street highway-rail grade crossing in West Palm Beach, Florida. At the time of the collision, a VTMI signal employee was working in the crossing warning system bungalow. The event recorder in the bungalow recorded a 1-second warning before the collision. The automobile driver was seriously injured.

The train was en route from Miami, Florida, to New York, New York. The train did not derail and no crewmembers or passengers were injured. Damage to the train was estimated at \$16,300; the automobile was a total loss.

The NTSB determined that the probable cause of the accident was the failure of the VTMI signal inspector to provide for the safety of train movements and highway users prior to disabling the highway-rail grade crossing warning system at the 25th Street highway-rail grade crossing while performing tests. Contributing to the accident was the failure of the SFRTA and VTMI management to ensure that proper procedures were followed during testing to provide for the safety of the train movements and the highway users.

The investigation of this accident identified several safety issues, including signal training for employees on grade crossings, test procedures, and efficiency testing.

As a result of this investigation, the NTSB made one new safety recommendation to the SFRTA and VTMI.

Recommendations: 1 new
Brief Adopted: November 1, 2017

Railroad Investigative Hearings

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

Managing Safety on Passenger Railroads Investigative Hearing July 10 - 11, 2018

The NTSB held a two-day investigative hearing on recent Amtrak accidents on July 10 and 11, 2018.

The investigative hearing, held in Washington, D.C., explored issues involved in the December 18, 2017, Amtrak derailment in DuPont, Washington, and the February 4, 2018, Amtrak collision with a CSX freight train near Cayce, South Carolina.

Parties to the hearing included the FRA; the International Association of Sheet Metal, Air, Rail and Transportation Workers; the Brotherhood of Locomotives Engineers and Trainmen; the Brotherhood of Railroad Signalmen; CSX; Sound Transit; Amtrak; the Washington State Department of Transportation; and the Washington State Utilities and Transportation Commission.

Railroad Safety Recommendation Reports

During accident or incident investigations, safety issues are sometimes identified that warrant Board adoption of safety recommendations before a final report or brief. Safety recommendation reports are used to make recommendations on such issues; these 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 issued is designated “Urgent.”

Using Technology to Protect Maintenance-of-Way Employees Chester, Pennsylvania April 3, 2016

On April 3, 2016, about 7:50 a.m. EDT, southbound Amtrak train 89 struck a backhoe at milepost 15.7 near Chester, Pennsylvania. Two roadway workers were killed and 39 other people were injured. The NTSB determined that the probable cause of the accident was

the unprotected fouled track; the absence of supplemental shunting devices; and the inadequate transfer of job site responsibilities. Additional details on this accident and the probable causes can be found in the “*Amtrak Train Collision with Maintenance-of-Way Equipment*” report, which is included in the Railroad Accident Reports section above.

The NTSB’s safety recommendation report on the Chester, Pennsylvania, accident detailed numerous safety deficiencies that existed at the Amtrak work site immediately prior to the accident. This investigation found that Amtrak’s safeguards to protect MOW employees failed at several levels, including these: the MOW night foreman released his track authority improperly, the MOW day foreman did not conduct a safety briefing, none of the work crews used supplemental shunting devices to provide redundant protection to the MOW employees, and other issues. These failures highlight problems that can result from relying solely on procedural safeguards to protect MOW employees who foul tracks.

As a result of this investigation, the NTSB made two new safety recommendations to the FRA: (1) to issue a guidance document railroads can use to assess their on-track safety program to ensure it encompasses the role of signal and train control equipment, including redundant protection, such as supplemental shunting devices to protect roadway workers and their equipment and (2) to study available technologies that automatically alert maintenance-of-way workers fouling tracks of approaching trains, then require that such technology be implemented as a redundant protective measure.

Recommendations: 2 new
Report Adopted: September 28, 2018

Train Operation During Signal Suspension Cayce, South Carolina February 4, 2018

The NTSB investigated a head-on collision that occurred on February 4, 2018, about 2:27 a.m. EST, on the CSX Columbia Subdivision in Philade, South Carolina. Southbound Amtrak train 91, operating on a track warrant, diverted from the main track through a reversed hand-thrown switch into a siding and collided head-on with stationary CSX local freight train F777 03.

The engineer and conductor of the Amtrak train died, and at least 92 passengers and crewmembers on the Amtrak train had to be transported to medical facilities. The engineer of the stopped CSX train had exited the lead locomotive before the Amtrak train entered the siding, had run to safety, and was not injured. The conductor of the CSX lead locomotive saw the Amtrak train approaching in the siding, ran to the back of the locomotive, and was thrown from the locomotive, sustaining minor injuries.

The normal method of train operation on the subdivision was a traffic control system with wayside signals. Signal indications authorized movement in either direction. On the day before the accident, CSX signal personnel had suspended the traffic control signal system to install updated traffic control system components for implementing PTC on the subdivision. During this time, scheduled to last through February 4, 2018, the signals would

not operate and dispatchers would use track warrants to move trains through absolute blocks in the work territory. Although the installation was only partially complete, the signal personnel stopped work at the accident location at 7:00 p.m., and the signal suspension remained in place.

The investigation of this accident identified a safety issue with signal suspension.

As a result of this ongoing investigation, the NTSB issued an urgent recommendation to the FRA to issue an emergency order providing instructions for railroads to follow when signal suspensions are in effect and a switch has been reported relined for a main track.

Recommendations: 1 new, Urgent
Report Adopted: February 13, 2018

**Train Approach Warning and Predetermined Place of Safety
Queens Village, New York
June 10, 2017**

The NTSB investigated a June 10, 2017, accident in which an LIRR train struck and killed a roadway worker who was occupying the railroad tracks inside an interlocking in Queens Village, New York. During this investigation, NTSB investigators became aware of an improper practice by the LIRR roadway workers working in or near the tracks. The LIRR was not ensuring that roadway workers were complying with its operating rules and procedures and with FRA roadway worker protection regulations.

The investigation of this accident identified a safety issue with operating rules and procedures compliance.

Accordingly, the NTSB issued two new, urgent safety recommendations to the Metropolitan Transportation Authority (MTA), of which the LIRR is a subsidiary. The recommendations were to audit the LIRR's use of train approach warning as a method of worker protection for compliance with LIRR rules and federal regulations, and correct any deficiencies.

Recommendations: 2 new, Urgent
Report Adopted: February 13, 2018

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.

End-of-Track Collisions at Terminal Stations Special Investigation Report

The NTSB launched investigative teams to two very similar accidents within 13 weeks of one another. In both accidents, the engineers had failed to stop their trains before reaching the end of a terminating track at a station. The September 29, 2016, accident on the NJT commuter railroad at Hoboken, New Jersey, killed one person, injured 110, and resulted in major damage to the passenger station. The January 4, 2017, accident on the LIRR (a subsidiary of MTA) at the Atlantic Terminal in Brooklyn, New York, injured 108 people.

As the investigations progressed, it became apparent that these accidents demonstrated similar safety issues. The NTSB also realized that these safety issues were not unique to these two properties, but exist throughout the US at many intercity passenger and commuter passenger train terminals.

As a result of this special investigation, the NTSB made two new safety recommendations to the FRA to require intercity passenger and commuter railroads to implement technology to stop a train before reaching the end of tracks, and two new safety recommendations to NJT and the MTA to (1) review and revise the hazard management portion of its system safety program plans to document previous incidents and use them when identifying and assessing operational hazards, and (2) ensure that operator impairment due to medical conditions, including OSA, is part of the hazard management portion of its system safety program plan. In addition, the NTSB reiterated two safety recommendations to the FRA to (1) require railroads to medically screen employees in safety-sensitive positions for sleep apnea and other sleep disorders, and (2) develop and enforce medical standards that railroad employees in safety-sensitive positions diagnosed with sleep disorders must meet to be considered fit for duty.

Recommendations: 4 new, 2 reiterated
Report Adopted: February 6, 2018

Ongoing Significant Railroad Accident Investigations

Location	Date	Description	Fatalities
Philadelphia, PA	09/23/2018	SEPTA passenger fatality	1
Dallas, TX	08/13/2018	Dallas, Garland & Northeastern Railroad Inc employee fatality	1
Kingman, AZ	06/05/2018	Herzog Railroad Services employee fatality	1
Atlanta, GA	06/03/2018	Metropolitan Atlanta Rapid Transit Authority employee fatality	1
Alexandria, VA	05/19/2018	CSX freight train derailed	0
Bowie, MD	04/24/2018	Amtrak employee fatality	1
Lynbrook, NY	04/05/2018	LIRR passenger fatality	1
Wartrace, TN	03/12/2018	CSX employee fatality while working the ballast regulator	1

Location	Date	Description	Fatalities
Cayce, SC	02/04/2018	Amtrak train entered CSX siding due to misaligned switch and collided with standing freight train	2
DuPont, WA	12/18/2017	Amtrak 501 derailed from a bridge	3
Arlington, TX	09/22/2017	UP employee fatality	1
Upper Darby, PA	08/22/2017	2 SEPTA trains collided	0
Hyndman, PA	08/02/2017	31 tank cars derailed: one propane tank car cracked, breached, fire; residents evacuated	0
Washington, DC	06/27/2017	CSX employee fatalities	2
Queens Village, NY	06/10/2017	Train struck track worker	1
Rye, NY	05/18/2017	Commuter train derailed	0
Graettinger, IA	03/10/2017	Ethanol train derailed on trestle into water	0
Brooklyn, NY	11/03/2016	Train struck two track workers	1
Panhandle, TX	06/28/2016	Two freight trains collided; derailment/fire	3

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 Ongoing Efforts - Pipeline

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 adopted by the Board. The office completed one pipeline brief this fiscal year.

TransCanada Corporation (Keystone Pipeline) Rupture Amherst, South Dakota November 16, 2017

On November 16, 2017, at 4:34 a.m. mountain daylight time, a TransCanada Corporation, Keystone Pipeline (Keystone) ruptured near Amherst, South Dakota, between the Ludden, North Dakota, and Ferney, South Dakota, pump stations. Keystone's Operational Control Center, in Calgary, Alberta, Canada, was monitoring Keystone's Supervisory Control and Data Acquisition system that detected the leak and shut down the pipeline. Keystone's field staff traveled to the indicated leak location, confirmed that the pipeline had ruptured, and initiated their spill response plan. The approximate spill area comprised about 5,000 barrels of crude oil.

The NTSB determined that the probable cause of the failure of the Keystone Pipeline was a fatigue crack, likely originating from mechanical damage to the pipe exterior by a

metal-tracked vehicle during pipeline installation, that grew and extended during service to a critical size, resulting in the rupture of the pipeline.

Recommendations: None
Brief Adopted: July 5, 2018

Ongoing Significant Pipeline Accident Investigations

Location	Date	Description	Fatalities
Merrimack Valley, MA	09/13/2018	Over pressure natural gas distribution system	1
Dallas, TX	02/23/2018	Single-family residence explosion (2 previous houses had fire/explosions)	1
Minneapolis, MN	08/02/2017	Minnehaha Academy exploded	2
Millersville, PA	07/02/2017	Single family home exploded	1
Helena, AL	10/31/2016	Track hoe struck gas pipeline	1
Tekamah, NE	10/17/2016	Pipeline release 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 Investigations

Location	Date	Description	Fatalities
Doon, IA	06/22/2018	BNSF crude oil train derailment	0
Diamond Bar, CA	02/11/2018	Tube trailer carrying composite cylinders loaded with hydrogen caught fire; evacuation	0
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, ON, 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 2019 Estimate	\$12,718	44
FY 2020 Request	\$12,560	44
Increase/Decrease	(\$158)	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of a 2.0 percent non-pay inflation factor. A slight decrease in funding of special projects is anticipated; no other program changes are planned.

Program Description

RE is an investigative office providing scientific and technical expertise for NTSB accident investigations in all modes of transportation. The office, which includes four divisions and one program area, also conducts safety research, 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 expertise 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 assist 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 expertise, as well as technical advice and resources for experimental testing and research in the physical sciences.

Vehicle Recorder Division

The Vehicle Recorder Division extracts, formats, and analyzes data from aircraft FDRs and cockpit voice recorders (CVR), and 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 expertise 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 expertise; three-dimensional laser scanning and accident reconstruction; photogrammetry and video analysis; and animation and graphics development 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, OSA, and use of prescription and over-the-counter medications as well as illicit substances.

Accomplishments and Ongoing Efforts

Safety Research Division

In a typical year, Safety Research Division analysts complete more than 250 requests for data analysis, geospatial maps, and statistical information from NTSB offices, Board Members, Congress, and the public. In addition to supporting accident investigations, the division compiles and publishes annual transportation safety statistics, conducts transportation safety research studies, and develops safety recommendations and reports. Below are some examples of these efforts.

**Pedestrian Safety
Special Investigation Report**

Over the 10-year period from 2007 through 2016, the number of pedestrian fatalities increased by 27 percent at a time when overall highway fatalities have decreased in the United States. This report analyzed vehicle-based changes, infrastructure improvements, and data needs for improving pedestrian safety. Staff provided the safety trend data and data analysis for this report, created an online data visualization tool for the agency to inform the public about important safety issue areas identified in the report, and supported the development of eleven safety recommendations.

Report Adopted: September 25, 2018

**Taxiway Overflight, Air Canada Flight 759, Airbus A320-211
San Francisco, California
July 7, 2017**

Air Canada flight 759, an Airbus A-320, was cleared to land on runway 28R, but instead lined up on parallel taxiway C, which had four air carrier airplanes on it awaiting takeoff clearance. The flight descended below 100 feet above the ground and initiated a go-around after overflying the first airplane on the taxiway. Staff provided aviation safety data mining and statistical analysis products for the investigation.

Report Adopted: September 25, 2018

**Select Risk Factors Associated with Causes of Motorcycle Crashes
Safety Report**

Motorcycle riders and their passengers have the highest risk of fatal injury among all motor vehicle users in the United States. Staff conducted an in-depth analysis of motorcycle crash risk factors using data from the FHWA's 2016 *Motorcycle Crash Causation Study*. The final report identified four motorcycle safety issue areas: (1) crash warning and prevention, (2) braking and stability, (3) alcohol and other drug use, and (4) licensing procedures. Staff's efforts resulted in ten safety recommendations on motorcycle crash prevention.

Report Adopted: September 11, 2018

**Collision with Terrain Hageland Aviation Services, Inc. dba Ravn Connect Flight
3153 Cessna 208B
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 three occupants died. Staff provided data analysis and research on Part 135 accidents in the United States, and CFIT accidents in Alaska;

developed geospatial maps; and served as a member of the Board of Inquiry for the investigative hearing.

Report Adopted: April 17, 2018

**Sinking of US Cargo Vessel SS *El Faro*
Atlantic Ocean, Northeast of Acklins and Crooked Island, Bahamas
October 1, 2015**

The US-flagged cargo ship *El Faro* sank during Hurricane Joaquin. Staff conducted advanced text mining and analysis of vessel communications and provided geographic information and mapping products for the investigation.

Report Adopted: December 12, 2017

**Agricultural Labor Bus and Truck-Tractor Collision at US-98-SR-363 Intersection
Near 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 of US Highway 98 and state road SR-363. Staff provided geographic information and mapping products for the investigation.

Report Adopted: November 28, 2017

**2016 Preliminary Aviation Accident Statistics
2015 US Civil Aviation Accident Summary
Annual Reports**

Staff compiled, organized, and summarized the agency's *2015 Summary of US Civil Aviation Accidents*, which was released online December 20, 2017, as well as 2016 and 2017 preliminary aviation accident data and statistics released November 21, 2017, and November 1, 2018, respectively. Staff also wrote many structured query language scripts and other machine code to improve the automation of the data extraction, cleaning, and compiling tasks associated with these annual reports.

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 the following:

**Installation of PermaLock Mechanical Tapping Tee Assemblies
Safety Recommendation Report**

A natural gas-drive explosion destroyed a house in Millersville, Pennsylvania on July 31, 2017. Four nearby houses in the area were damaged and condemned. Four utility workers were working in the area; three were injured, and one was killed. Staff conducted materials failure analyses of plastic tapping tees used in the gas distribution system. Deficiencies in the tapping tee design led to the development of several recommendations to the regulator and the manufacturer of the tapping tees.

Report Adopted: June 18, 2018

**Fire Aboard Roll-on/Roll-off Passenger Vessel *Caribbean Fantasy*
Atlantic Ocean, 2 Miles Northwest of San Juan, Puerto Rico
August 17, 2016**

The *Caribbean Fantasy*, a Panamanian flagged Ro/Ro 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 investigation of the cause and origin of the fire, an evaluation of the fire protection/suppression system, and a failure analysis of the gasketing system that initiated the fire.

Report Adopted: June 5, 2018

**Southwest Airlines Engine Incident
Philadelphia, Pennsylvania
April 17, 2018**

Southwest Airlines flight 1380, a Boeing 737-700, N772SW, experienced a failure of the left CFM International CFM-56-7B engine and loss of engine inlet and cowling during climb about flight level 320 (32,000 feet). Fragments from the engine inlet and cowling struck the wing and fuselage, resulting in a rapid depressurization after the loss of one passenger window. Staff conducted a metallurgical failure analysis of the failed engine fan blades and developed crack growth rate data to enable remediation.

**Collapse of Pedestrian Bridge Under Construction
Miami, Florida
March 21, 2018**

A partially constructed pedestrian bridge crossing SW 8th Street, an eight-lane roadway in Miami, Florida, experienced a structural failure, and the 174-foot-long bridge fell about 18.5 feet onto SW 8th Street. Eight vehicles that were stopped below the bridge were fully or partially crushed. As a result of the bridge collapse, one bridge worker and five vehicle occupants died; four bridge workers and four other people were injured. Staff conducted an on-scene investigation of the structure and materials. Staff also oversaw all materials testing of the concrete, reinforcing bars, pretension bars, and other componentry.

**United Airlines Uncontained Engine Incident
Honolulu, Hawaii
February 13, 2018**

United Airlines flight 1175, a Boeing 777, N773UA, experienced an in-flight separation of a fan blade and subsequent loss of the inlet and fan cowls of the right engine, a Pratt & Whitney PW4077, during descent into Daniel K. Inoyue International Airport, Honolulu, Hawaii. Staff provided a metallurgical failure analysis of the failed fan blade.

**High-Pressure Hydrogen Gas Cylinder Fire During Transportation
Diamond Bar, California
February 11, 2018**

An Air Products and Chemicals Inc. module of 25 horizontally mounted high-pressure gas cylinders loaded with 240 kilograms of compressed hydrogen caught fire while being transported. About 500 people within a 10-block business district were evacuated. Staff conducted metallurgical evaluations of pressure release devices.

**Amtrak Passenger Train 501 Derailment
DuPont, Washington
December 18, 2017**

Amtrak passenger train 501 was traveling at 78 mph when it derailed from a highway overpass near DuPont, Washington, while on its first regular passenger service trip on a single main track in the Lakewood subdivision. Three passengers died, and 70 other people were injured as a result of the derailment. Staff provided metallurgical engineering expertise during wreckage examinations, participated in an investigative hearing, and conducted mechanical tests on the truck retaining straps.

**Explosion and Fire Aboard *Bouchard No. 255* Tank Barge
Gulf of Mexico near Port Aransas, Texas
October 20, 2017**

The tug *Buster Bouchard* was anchored offshore of Port Aransas, Texas, with the tank barge *Bouchard No. 255*. The barge was loaded with 133,000 barrels of crude oil. As the crew was preparing to raise the anchor for an inbound transit, an explosion occurred, and a fire ensued on the deck of the barge. Staff conducted an origin and cause investigation of the explosion. Staff also conducted a metallurgical evaluation of portions of a bulkhead.

Technological Upgrades

This year, the Materials Laboratory Division updated its 3D laser scanning system and infrared spectrometer.

Vehicle Recorder Division

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

Selective Issues in School Bus Transportation Safety: Crashes in Baltimore, Maryland, and Chattanooga, Tennessee Special Investigation Report

This special investigation report examined selective issues in school bus transportation safety discovered during the NTSB’s investigation of the November 1, 2016, crash involving a Baltimore City school bus and a Maryland Transit Administration bus and the November 21, 2016, crash of a Hamilton County school bus in Chattanooga, Tennessee. The two crashes injured 37 people and killed 12, including six Woodmore Elementary School students aboard the Hamilton County school bus. Division staff launched on-scene, recovered and downloaded multiple recording devices, and documented the findings in factual reports. Staff’s efforts led to the issuance of a new safety recommendation to a school bus manufacturer to develop and implement engine recording features for the event data recorder in the engine control module for newly manufactured school buses.

Report Adopted: May 22, 2018

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. Division staff launched to the accident and worked to document extensive flight test data, as the CVR was not recording at the time of the accident. These efforts led to the issuance of new recommendations to the Flight Test Safety Committee and Bell Helicopter Textron regarding the benefits of recording devices for parametric data, cockpit audio, and cockpit images during experimental flight test activities.

Report Adopted: January 16, 2018

Sinking of US Cargo Vessel SS *El Faro* Atlantic Ocean, Northeast of Acklins and Crooked Island, Bahamas October 1, 2015

The US-flagged cargo ship *El Faro* sank during Hurricane Joaquin. Division staff led the effort to complete the transcript of the VDR audio, the longest transcript in the NTSB’s history, and documented extensive data from the VDR and other sources. The transcript provided a detailed time history of events on the voyage and enabled the agency to produce an extensive final report with numerous safety recommendations. As a result of staff’s

efforts, two new recommendations were issued to the Coast Guard to improve VDR quality and reliability.

Report Adopted: December 12, 2017

**Crash Involving Pedestrian, Uber Technologies, Inc., Test Vehicle
Tempe, Arizona
March 18, 2018**

An Uber Technologies Inc., test vehicle, a modified 2017 Volvo XC90, occupied by one vehicle operator and operating with a self-driving system in computer control mode, struck a pedestrian. The pedestrian suffered fatal injuries; the vehicle operator was not injured. Staff launched on-scene, recovered information from multiple video and data recording systems, and are working to validate and document the recordings.

**Sightseeing Helicopter Loss of Engine Power and Descent into the East River
New York, New York
March 11, 2018**

An Airbus Helicopters AS350B2 was substantially damaged when it impacted the East River and subsequently rolled inverted after the pilot reported a loss of engine power. The pilot egressed from the helicopter and sustained minor injuries, but the five passengers did not egress and died. Staff are working to recover critical information from multiple video recording devices and personal electronic devices.

Technological Upgrades

This year, the Vehicle Recorder Division is developing a new protected recording viewer application to provide secure remote access to certain recordings and transcripts. The new application will improve the accessibility of this critical information for non-headquarters-based investigators and will help to increase investigative efficiency.

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:

**Taxiway Overflight, Air Canada Flight 759, Airbus A320-211
San Francisco, California
July 7, 2017**

Air Canada flight 759, an Airbus A-320, was cleared to land on runway 28R, but instead lined up on parallel taxiway C, which contained four air carrier airplanes awaiting takeoff clearance. The flight descended below 100 feet above the ground and initiated a go-around

after overflying the first airplane on the taxiway. Staff are evaluating the vehicle performance and developing graphics to aid in explaining the layout of the airport lighting.

Report Adopted: September 25, 2018

**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.

Report Adopted: January 16, 2018

**Sinking of US Cargo Vessel SS *El Faro*
Atlantic Ocean, Northeast of Acklins and Crooked Island, 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 developed an animation to communicate the sequence of events leading to the sinking.

Report Adopted: December 12, 2017

**Agricultural Labor Bus and Truck-Tractor Collision at US-98–SR-363 Intersection
Near 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 analyzed surveillance video to calculate the speeds of the vehicles and performed vehicle simulations to explain the sequence of events in the crash.

Report Adopted: November 28, 2017

**Sightseeing Helicopter Loss of Engine Power and Descent into the East River
New York, New York
March 11, 2018**

An Airbus Helicopters AS350B2 was substantially damaged when it impacted the East River and subsequently rolled inverted after the pilot reported a loss of engine power. The pilot egressed from the helicopter and sustained minor injuries, but the five passengers did not egress and died. Staff are evaluating the aircraft performance and rate of descent into the river through recorded radar data along with onboard and witness videos.

**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 are evaluating the vehicle performance and developing an animation depicting the sequence of events during the accident flight.

International Outreach

This year, the Vehicle Performance Division hosted the first of planned annual meetings to share best practices with performance engineers at accident investigation agencies in other countries. The first meeting had participants from France, Canada, and the United States, and the success of the meeting has led to an expansion of the group to include the United Kingdom and Australia, and possibly others. The first meeting focused on the validation and reduction of parametric data, analysis of video, and the use of simulation to reconstruct the sequence of events in accidents. The sharing of tools, techniques, and available software to address common problems will ensure that the Vehicle Performance Division remains at the forefront of the state of the art in accident investigation.

Medical Investigative Consultation Service

Medical staff participate in numerous NTSB accident investigations in all transportation modes each year, evaluating and addressing medical issues through 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 for these cases. Here are some examples of these efforts:

**Selective Issues in School Bus Transportation Safety: Crashes in Baltimore, Maryland, and Chattanooga, Tennessee
Special Investigation Report**

In November 2016, the NTSB began the investigation of two multifatality crashes in which a school bus driver lost control of the bus. On November 1, 2016, in Baltimore, Maryland, a school bus carrying the driver and an adult bus aide struck a sedan and then a transit bus, killing the school bus driver, the transit bus driver, and four transit bus passengers, and injuring 11. Medical staff evaluated the drivers; the probable cause was determined to be the school bus driver's incapacitation by a seizure associated with a longstanding seizure disorder he had worked to hide from authorities. Medical staff participated in the development of seven new safety recommendations to prevent a similar accident from occurring.

On November 21, 2016, in Chattanooga, Tennessee, a school bus carrying grade school students home from school departed from the roadway, overturned, and struck a tree. Six

students died; 32 people were injured. Medical staff participated in the evaluation of the injured and the determination of the potential effectiveness of lap/shoulder harnesses in school buses, which led to the development of a new safety recommendation.

Report Adopted: May 22, 2018

End-of-Track Collisions at Terminal Stations Special Investigation Report

The NTSB launched investigative teams to two very similar accidents within 13 weeks of one another. In both accidents, the engineers failed to stop their trains before reaching the end of a terminating track at a station. The September 29, 2016, accident on the NJT commuter railroad at Hoboken, New Jersey, killed one person, injured 100, and resulted in major damage to the passenger station. Medical staff evaluated the operator and worked closely with the investigative team, enabling investigators to determine that the probable cause of the Hoboken, New Jersey, accident was the failure of NJT train 1614's engineer to stop the train after entering Hoboken Terminal because of the engineer's fatigue resulting from his undiagnosed, severe OSA. Contributing to the accident was NJT's failure to follow its internal OSA screening guidance and refer at-risk safety-sensitive personnel for definitive OSA testing and treatment. Further contributing to the accident was the FRA's failure to require railroads to medically screen employees in safety-sensitive positions for OSA and other sleep disorders. Also contributing to the accident was the lack of either a device or a safety system that could have intervened to stop the train before the collision.

The January 4, 2017, accident on the LIRR (a subsidiary of MTA) at the Atlantic Terminal in Brooklyn, New York, injured 108 people. Medical staff evaluated the operator and worked closely with the investigative team, enabling investigators to determine that the probable cause of the Brooklyn, New York, accident was that the engineer of LIRR train 2817 fell asleep due to his chronic fatigue. Contributing to his chronic fatigue was the engineer's undiagnosed, severe OSA and LIRR's failure to initiate OSA screening for safety-sensitive personnel and to refer at-risk safety-sensitive personnel for definitive OSA testing and treatment. Further contributing to the accident was the FRA's failure to require railroads to medically screen employees in safety-sensitive positions for OSA and other sleep disorders. Also contributing to the accident was the lack of either a device or a safety system that could have intervened to stop the train before the collision.

Medical staff participated in the development of six safety recommendations to prevent this type of accident from recurring.

Report Adopted: February 6, 2018

Motorcoach Collision With Combination Vehicle After Traffic Break on Interstate 10 Palm Springs, California October 23, 2016

A motorcoach ran into the rear of a stopped tractor trailer in the westbound lanes of Interstate 10 (I-10) outside Palm Springs, California, resulting in the deaths of 12 people

and injuries to 31 others. Medical staff investigated medical conditions in the two commercial drivers. The tractor trailer driver was found to likely have undiagnosed, untreated, moderate-to-severe OSA that had led him to fall asleep during a traffic break and fail to move his truck when the traffic break ended. The motorcoach driver had undiagnosed, uncontrolled diabetes that could have been detected during his most recent medical certification exam. Medical staff also participated in the evaluation of the injuries to assess the effects of prolonged extrication because the only door to the bus was rendered inoperable during the crash. Medical staff participated in the development of two new safety recommendations and the reiteration of two more.

Report Adopted: October 31, 2017

**Amtrak Passenger Train 501 Derailment
DuPont, Washington
December 18, 2017**

Amtrak passenger train 501 was traveling at 78 mph when it derailed from a highway overpass near DuPont, Washington, while on its first regular passenger service trip on a single main track in the Lakewood subdivision. Three passengers died, and 70 other people were injured as a result of the derailment. Medical staff is involved in investigating the medical conditions and medication use by the traincrew as well as assessing the severity of injuries among the crew, passengers, and motor vehicle passengers.

**Pickup Truck Centerline Crossover Collision With Medium-Size Bus
Concan, Texas
March 29, 2017**

A 2007 Dodge Ram 3500 pickup truck driven by a 20-year-old was traveling north on US Highway 83 (US-83), near Concan, Texas. About the same time, a 2004 Ford E350 with a Turtle Top Vanterra medium-size bus body was approaching from the opposite direction in the southbound lane of US-83. The bus, operated by the First Baptist Church of New Braunfels, Texas, was driven by a 66-year-old and carried 13 passengers. The truck departed the northbound travel lane and crossed into the southbound lane, colliding with the front left corner of the bus and killing the bus driver and 12 passengers. The driver of the truck and one bus passenger sustained serious injuries. Medical staff evaluated the pickup truck driver's impairment from prescription medication and marijuana as well as assisting in the assessment of injuries resulting from passenger lap-only seat belts.

TRAINING CENTER

	(\$000s)	FTEs
FY 2019 Estimate	\$1,116	4
FY 2020 Request	\$1,119	4
Increase/Decrease	\$3	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of 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 Ongoing Efforts

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, supervisory and leadership development, 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. We also add new course offerings and initiatives in response to senior leadership strategic priorities for the workforce. These courses are generally open only to NTSB investigative and support staff.

FY 2018 is the NTSB's sixth and final year using the Talent Management System, which has aided in scheduling, approving, and evaluating all staff training. The successor system will continue to track and maintain a permanent record of all staff education and training activities and provide a valuable tool for developing and tracking staff competencies and skills. It will also serve as an online training venue as well as a course evaluation tool. As the system's vendor moves to a new platform in FY 2019, we are working to ensure that all of NTSB's learning management system requirements are met, and additional capabilities will be added as they become available.

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 and 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 15 safety seminars on various topics that have received high marks from the aviation community. In December 2017, the Training Center held a Safety Seminar on Transition Training, and in March 2018, the Training Center held the second annual Inspection Authorization Renewal Safety Seminar.

Future safety seminars will continue to concentrate on areas of GA operations that have the highest fatality rates and on emerging and 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 offered courses include courses on Project Management, Problem Solving, and Covey's 7 Habits of Highly Effective Managers, in addition to an Executive Leadership Retreat. Retirement planning training was offered online to better address the needs of our regional and teleworking personnel, as well as investigative staff whose on-call status demands greater scheduling flexibility. The workforce development curriculum is designed to address important cross-functional technical, administrative, 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 Accident Report Writing tailored to the NTSB's needs.
- ***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, as well as investigation in other modes of transportation. 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 US Coast Guard. In FY 2018, we held

four classes for the US Coast Guard. We continue to deliver a custom, 2-week Aircraft Accident Investigation course (now in its 10th year) for the US Army National Guard and are in discussions with the US Air Force Reserve to develop training for reservists.

- ***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 2018 we added a hands-on module for UAS, and an engine data analysis course for Air Safety Investigators.
- ***Continuing to increase awareness of the NTSB, its mission, and the importance of our independent investigative process by offering TWA 800 briefings to other federal agencies and groups involved with transportation safety.***
- ***Promoting interest in STEM careers that improve transportation safety.***

FY 2018 Activities

Courses With Open Enrollment	Students
Courses at Training Center:	
Aircraft Accident Investigations Orientation for Aviation Professionals (2 offerings)	57
Cognitive Interviewing (2 offerings)	59
Family Assistance (2 offerings)	89
Aircraft Accident Investigations (2 offerings)	98
Investigating Human Fatigue Factors	27
Inspection Authorization Renewal Safety Seminar	88
Transition Training Safety Seminar	8
Helicopter Accident Investigations	30
Accident Investigation Orientation for Rail Professionals	42
NTSB Highway Crash Investigation	46
Subtotal Courses at Training Center	544
Offsite Courses:	
Managing Communications During a Major Transportation Accident – Office of Emergency Services, City of Sacramento	56
Managing Communications During a Major Pipeline Accident – Interstate National Gas Association of America	42
Subtotal Off Site Courses	98
Courses with Restricted Enrollment:	
Advanced Aircraft Mishap Analysis and Reporting – US Coast Guard (2 offerings)	116
Aircraft Accident Investigation – US Army National Guard	46
Advanced Marine Mishap Analysis and Reporting – US Coast Guard (2 offerings)	103
Subtotal Restricted Enrollment Courses at Training Center	265
Total Participants Trained in Courses With Open Enrollment (October 1, 2017 – September 30, 2018)	907

Courses Conducted for NTSB Employees	Students
Civil Treatment Employee Training Webinars	19
Civil Treatment for Leaders	13
Comprehensive Project Management: Principles for Project Managers	20
Conflict Competency: Lunch and Learn Workshop	12
Contracting Officers Representative (COR) Level II	16
Covey's 7 Habits for Managers	11
Crane Operator Safety	8
EEO for Supervisors and Managers	34
Enterprise Risk Management	82
Estate Planning	25
Ethics (2 offerings)	400
Forklift Operator	8
G-1000	3
Hazwoper 24 Hour	5
Hazwoper Refresher 8-hour course	7
Leadership Development Series: Please Respect My Generation	30
Managing Cumulative Stress	35
Microsoft Visio 2016 (2 offerings)	45
Mid-Career Retirement Planning (2 offerings)	42
New IQ Master Game Changer	16
New IQ Solution (2 offerings)	94
NTSB 101	12
NTSB Advocacy Training	25
Office of the Chief Information Officer (OCIO) Team Building Workshop I	32
OCIO Team Building Workshop II	21
OSHA 2225 Respiratory Protection and Fit Test (14 offerings)	122
Problem Solving	6
Questioning Skills	5
Root Cause Analysis	15
The Road to Number 1: Engagement and Accountability	27
Leadership and Management for Non-Manager and Aspiring Supervisors (Small Agency Council (SAC))	1
The Business of Writing-December (SAC)	2
Effective Briefings and Presentation Skills (SAC)	2
Building and Leading Effective Teams (SAC)	2
Leadership and Management for Non-Manager and Aspiring Supervisors (SAC)	2
Mid-Career Planning – Federal Employees Retirement System (FERS) Part 1	47
Mid-Career Planning – FERS Part 2	33
Retirement Benefits – FERS Part 1	34
Retirement Benefits – FERS Part 2	32

Courses Conducted for NTSB Employees	Students
Retirement Benefits – Civil Service Retirement System (CSRS) Part 1	9
Retirement Benefits – CSRS Part 2	8
Social Security & Medicare	42
Federal Insurances	35
Financial Planning - Part 1	30
Financial Planning - Part 2	28
Financial Planning - Part 3	26
Income Tax Planning	14
Total Participants Trained in Courses Conducted for NTSB Employees (October 1, 2017 – September 30, 2018)	1,537

ADMINISTRATIVE LAW JUDGES

	(\$000s)	FTEs
FY 2019 Estimate	\$2,161	9
FY 2020 Request	\$2,169	9
Increase/Decrease	\$8	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of 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 judge located in the Denver Regional Office. 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 (the 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 Ongoing Efforts

The Office of Administrative Law Judges completed these actions in FY 2018:

- Met its goal of conducting hearings and rendering decisions in emergency cases within 30 days of the receipt of an appeal
- Made rulings, within the 5-day statutory time frame, on 16 petitions challenging the FAA Determination that an Emergency Exists in Air Safety.
- Issued a total of 70 decisions and held 28 hearings.
- Processed 285 new appeals and closed a total of 250 cases.

INFORMATION TECHNOLOGY AND SERVICES

	(\$000s)	FTEs
FY 2019 Estimate	\$8,161	28
FY 2020 Request	\$7,987	28
Increase/Decrease	(\$174)	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of a 2.0 percent non-pay inflation factor. A slight decrease in funding of special projects is anticipated; 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; for providing training for the docket management system and guidance on redaction policies and techniques; and for 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 information technology (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 Ongoing Efforts

The core of CIO activities in FY 2018 revolve around two major initiatives: digital transformation and meeting the goals identified in the Presidential Executive Order on Strengthening the Cybersecurity of Federal Networks and Critical Infrastructure. These two initiatives focus on the need to efficiently and effectively deliver services and products on a more secure and reliable technical platform while reevaluating agency processes, procedures, technologies, and use of data in meeting mission objectives in delivery of services and products to the public. Foundational to meeting these initiatives, the CIO will need to upgrade its long outdated technical platform, while moving to cloud as appropriate, and enhance the agency's cybersecurity environment and program. Efforts in FY 2018 include an upgrade to improve the resiliency and performance of the agency's wide area network. Efforts will continue in the coming years to replace the technical infrastructure, implement a foundational cloud platform, and enhance the cybersecurity environment and program. Separately, but in line with meeting the May 11, 2017 Executive order, is compliance with the mandates of the enhanced governmentwide FISMA addressing all aspects of cybersecurity and risk management.

Computer Services Division

The CSD successfully resolved more than 3,200 service desk requests for the NTSB's distributed locations (headquarters, regional offices, and teleworkers) in FY 2018. 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. The CSD also made substantial progress in its efforts to implement logical access via personal identity verification (PIV) card and has fully deployed PIV-only authentication to all agency users. Perhaps most significantly, the CSD has worked substantially to upgrade and improve the resiliency and performance of the agency's wide area network by connecting three data centers throughout the country. These data centers are to be used for networking the agency's workforce which is currently dispersed throughout the United States. The CSD also began a robust pilot project involving the implementation of a zero-trust methodology for remote access. This pilot deployment allows users to gain remote access to agency resources without obtaining an internal agency Internet Protocol address.

To remove dependencies on location and to reduce single points of failure, the division has taken significant efforts to move the agency's e-mail entirely to the cloud. The CSD had previously operated a portion of the e-mail system in the cloud, but a large part remained dependent on systems located in its headquarters location. Currently, only a small piece of the e-mail system is dependent upon localized systems. Additionally, during this fiscal year, the CSD worked to bring all the agency's Domain Name System and Simple Mail Transfer Protocol traffic under the protection of the Department of Homeland Security's (DHS) Einstein 3 Accelerated program.

Systems Support Division

The SSD provides mission-critical support by advancing the office's initiatives of digital transformation, staff cross-functional training, and cyber security. As members of the Service Desk, Network Operations Center/Security Operations Center, and SharePoint development teams, SSD staff directly affect the day-to-day IT operations and maintenance of the agency, as well as implementing system enhancements and improvements. For example, on the operations and maintenance front, the SSD stood up a new Service Desk group that is exclusively dedicated to the management and oversight of incidents and service requests. SSD closed 423 tickets related to Incident and Service Requests, covering all areas of IT troubleshooting to include applications, databases, and Portal requests. The Service Desk also launched a pilot for a new Call Center in FY 2018.

The NTSB's Product Management Application system has updated agency software multiple times, significantly improving efficiency in producing NTSB investigative reports, safety recommendations, and congressional reports. Other applications that have benefited from continued enhancements include the Project Status Board, Supply Inventory, Case Appeal Filing System, the National Archives and Records tracking tool, and the SharePoint-based International Advocacy Travel Form. Additionally, in keeping

with the cloud-first initiative, the SSD has begun laying the groundwork for migrating the Intranet portal and collaboration tools to the cloud and continues to explore ways of using software as service offerings, such as our current, remotely hosted FOIAXpress site.

Records Management Division

The RMD posted 1,644 accident dockets in FY 2018. During the same period, the division received 521 FOIA requests, processed 549 FOIA requests, and reevaluated FOIA practices to mitigate and reduce the FOIA backlog. The RMD also began working with the Chief Privacy Officer to create a Controlled Unclassified Information Program to review all Privacy Impact Assessments and System of Records Notices for the agency.

Enterprise Architecture Division

The EAD continues to work on various efforts to standardize business processes, to analyze NTSB's data to more effectively comprehend and identify trends and patterns, and to enable all agency data users to make better decisions based on that data.

The M-ADMS will enable all modal offices to standardize the accident investigation data collection process, resulting in more structured data. The EAD is leading the development effort for the system and has delivered the HS modal office's portion of the system. HS is starting to test and validate investigation-related information using the system. The EAD has also delivered the first draft of the product requirements for the RPH modal office and is currently working on product requirements for RE modal office.

The EAD is leading the effort on development of an enterprise self-service query tool and initial proof-of-concept enterprise data dashboard. The first iteration of the self-serving query tool has been delivered to the AS investigators.

Finally, the EAD continued to provide guidance, design oversight, and technical advice in all NTSB software development efforts, IT consulting services to various divisions, and COR services to various IT initiatives.

IT Security Program

In FY 2018, the CISO continued to advise the CIO regarding the NTSB's FISMA compliance requirements and advocated the expanded use of such external cybersecurity enhancement services as DHS's Continuous Diagnostics and Mitigation program, Einstein 3A threat monitoring, and weekly Cyber Hygiene Assessment reports. The IT Security program coordinated with our external cybersecurity oversight agencies at the OMB and DHS, providing responses to several ongoing reporting directives including Binding Operation Directive (BOD) 18-01–Enhance Email and Web Security, BOD 17-01 Removal of Kaspersky-branded Products, Cybersecurity Incident Reports, and the FY 2018 Annual FISMA report. In addition, the IT Security Program successfully completed annual cybersecurity and privacy awareness training for 100 percent of our staff and contractors to comply with OMB guidelines. NTSB also implemented a Phishing Awareness Training

program and conducted a Spear-Phishing campaign targeting 100 percent of our staff and contractors. We also successfully implemented a majority of the NIST Framework for Improving Critical Infrastructure Cybersecurity recommendations as illustrated through the DHS Cyberscope FY 2018 Quarter 4 CIO metrics. For the eighth consecutive year, the Inspector General’s audit found that the agency’s IT security program complied with FISMA requirements.

ADMINISTRATION

	(\$000s)	FTEs
FY 2019 Estimate	\$9,133	35
FY 2020 Request	\$9,166	35
Increase/Decrease	\$33	0

Overview of the Request

The funding level for this program activity assumes no pay raise, but includes the pro-rated impact of 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, including 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 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 Division

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 Division

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 Division

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 Division

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 (OSHP) to reduce the potential for human and economic losses associated with incidents and accidents.

Accomplishments and Ongoing Efforts

Administrative Operations and Security Division

The Administrative Operations and Security Division maintains an agreement with the GSA to meet the requirements of Homeland Security Presidential Directive 12 (HSPD-12) for PIV credentials for all employees and contractors. This agreement continues the implementation of the physical access control system (PACS) upgrades for NTSB headquarters, the regional offices, and the Training Center to comply with the new HSPD-12 program requirements. A new contract is in place to upgrade the PACS at each location. The expected completion date is March 31, 2019.

In FY 2018, the division conducted its annual accountable asset inventory and validation in accordance with agency policy and reported to GSA, the agency's property disposition in accordance with the GSA Federal Management Regulation. The division also participated in the annual Continuity of Operations Plan (COOP), National Level Exercise (NLE) in accordance with Federal Emergency Management Agency regulations. In addition to the COOP NLE, the division has a contract in place for COOP support services to review, update, and refine the agency's COOP plan.

Acquisition and Lease Management Division

In FY 2018, the Acquisition and Lease Management Division executed approximately 300 contract actions to support the mission of the agency. The division continued to provide support and training to investigators to highlight the acquisition process as well as roles and responsibilities for purchase cardholders. Imparting this knowledge ensures that investigators are better prepared to request and receive the mission critical goods and services necessary to complete accident investigations.

In FY 2018, the Acquisition and Lease Management Division played an important role in the NTSB's investigation of a collapse of a pedestrian bridge in Miami, Florida, by rapidly awarding a contract to dismantle, remove, and transport five pieces of damaged bridge

material to a local Florida Department of Transportation facility for follow-up testing and examination.

Additionally, the division issued an agreement for automated vehicle technologies support services utilizing emerging technology funding. The primary task is to provide training and support to NTSB investigators through instruction, demonstration and consultation to reduce the gaps in our knowledge and enable us to conduct timely, effective and thorough investigations involving automated vehicle systems and alternative energy systems.

Human Resources Division

The HR Division coordinates the agency participation in the Office of Personnel Management (OPM) Federal Employee Viewpoint Survey. In 2018, our participation rate of 73.4 percent exceeded the government-wide average rate of 40.6 percent and the small agency average rate of 67 percent. The 282 survey respondents provided a valuable perspective on their NTSB work place experience. The office-level reports will provide opportunities to further analyze the data and discuss strengths, challenges, and improvement goals. The Employee Engagement Index of 74 percent matched the 2017 score; the New Inclusion Quotient (67 percent) and Global Satisfaction (79 percent) indices both increased by 1 percent. Management moved forward with initiatives to improve the workplace, including improving communication, encouraging collaboration and teamwork, focusing training and development on enhancing employee competencies, and showcasing and recognizing staff members' achievements.

In FY 2018, HR collaborated with program offices throughout the agency to recruit and hire 25 new employees for mission-critical and support positions and to provide 18 current employees internal career promotions. Additionally, we provided employment opportunities to 16 students through the Federal Pathways Program and 7 volunteer opportunities through established agreements with the Chickasaw Nation and the On Ramps to Careers Program (DC Summer Youth). The summer program provides youth a recruitment and employment experience with briefings and activities about the NTSB's mission and goals.

During FY 2018, we re-evaluated position management criteria, better identifying staffing priorities in accordance with the administration's requirements. We considered the impact of emerging transportation technologies in relation to the current skill level of the agency staff and identified recruitment and training options for closing skills gaps.

We are improving the transparency and accountability of hiring timeline reporting with our staffing software, USA Staffing, to capture data throughout the hiring process. The information will result in better work management and the identification of efficiencies that will assist us in reducing the time to hire. In FY 2018, our use of software to send and receive forms for new employees and to transfer information directly onto new hires'

electronic Official Personnel Folders increased the efficiency, effectiveness, and quality of our operations.

In FY 2018, HR provided workshops and training opportunities for supervisors to improve their use of the performance management system to communicate with employees about work expectations, to provide feedback, and to deal with less-than-satisfactory performance. The workshops reinforced the use of the newly-implemented automated performance management system, USA Performance, as an effective tool to support communications between supervisors and employees. HR also issued a revised policy and provided training to supervisors on their responsibilities for developing employees from entry-level positions to the full-performance level.

NTSB's performance management system for senior level employees is subject to a 2-year review and recertification. On September 7, 2018, OPM approved full certification of our performance appraisal system, thus allowing the agency to facilitate the recruitment and retention of highly technical professionals by offering more competitive compensation.

Safety Division

In FY 2018, the Safety Division continued to lead efforts to improve the agency's OSHP. The division completed the OSHP audit and will provide its findings in the 2018 Annual Report to OSHA. The division coordinated and led efforts for participation in OSHA's second annual Safe + Sound Week designed to enhance the agency's safety culture through management leadership, worker participation, and a systematic approach to risk management. An Occupational Safety and Health Survey was issued to obtain feedback and determine the needs of employees. Based on the analysis of the survey results, the Safety Division took steps to educate employees on existing programs such as personal protective equipment, respiratory protection, and hazard recognition, as well as to procure items to assist investigators during accident investigations. Finally, the WOW (Words on Wellness) newsletter was introduced to promote a healthy workplace and increase employee knowledge on the importance of wellness and work-life balance.

The Safety Division will continue to lead efforts to improve the agency's OSHP through internal audits, increased safety training, annual facility inspections, other educational opportunities, and a focus on fatigue risk management.

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, minimize injuries, and save lives in the future. Listed below are the 10 issue areas contained in the 2019-2020 NTSB Most Wanted List of Transportation Safety Improvements.

ELIMINATE DISTRACTIONS

Distraction is a growing and life-threatening problem in all modes of transportation. All drivers, pilots, and operators need to eliminate distractions and stay focused on safely operating their vehicle, aircraft, vessel, or train. Pedestrians are equally susceptible to distraction and need to remain aware of their surroundings. We believe distraction should be addressed through education, legislation, and enforcement.

END ALCOHOL AND OTHER DRUG IMPAIRMENT

Impairment is a contributing factor in far too many transportation accidents across all modes, with alcohol impairment as a leading cause of highway crashes. We want to continue to see states adopt per se BAC limits of 0.05 percent or below, as well as broaden their use of other effective countermeasures, like ignition interlock devices and high-visibility enforcement. Impairment in transportation is not limited to just alcohol; it also includes impairment by other drugs—legal or illicit. We want a national drug testing standard for passenger vehicles and stronger screening and toxicology testing in commercial transportation.

ENSURE THE SAFE SHIPMENT OF HAZARDOUS MATERIALS

More than 2 million miles of pipeline deliver 24 percent of the natural gas and 39 percent of the total oil consumed in the United States, yet only 16 percent of U.S. rail tank cars carrying flammable liquids meet the improved safety specifications for DOT-117/DOT-117R cars. As infrastructure ages, the risk to the public from pipeline ruptures also grows, and older, more dangerous tank cars continue to carry flammable liquids. We are calling on the railroad industry to meet existing federal deadlines for replacing or retrofitting rail tank cars, and on the pipeline industry to conduct adequate risk assessments. Failure to meet safety standards by—or ahead of—deadlines places communities near railroads or above pipelines at an unacceptable risk.

FULLY IMPLEMENT POSITIVE TRAIN CONTROL

Positive train control (PTC) can stop a train before a crash happens. Although Congress mandated that PTC be installed and operating by December 31, 2018, only 25 percent of passenger route miles and just 60 percent of passenger locomotives have met that criteria.

A two-year extension has been granted to rail lines that are not fully compliant. PTC must be fully implemented before the extended deadline to ensure the safety of railroad passengers and the people who live and work near railroads.

IMPLEMENT A COMPREHENSIVE STRATEGY TO REDUCE SPEEDING-RELATED CRASHES

Speeding increases the likelihood of being involved in a crash and intensifies the severity of injuries sustained in a crash. Speeding-related crashes kill more than 10,000 people and cost society more than \$52 billion annually. Proven countermeasures—including automated enforcement technology, vehicle technology, infrastructure design, and education campaigns—must be used more broadly to reduce speeding-related crashes.

IMPROVE THE SAFETY OF PART 135 AIRCRAFT FLIGHT OPERATIONS

Air tour, air medical service, air taxi, charter, and on-demand flights are not required to meet the same safety requirements as commercial airlines, leaving them susceptible to disaster. Part 135 operators must implement safety management systems that include a flight data monitoring program, and they should mandate controlled-flight-into-terrain-avoidance training that addresses current terrain-avoidance warning system technologies.

INCREASE IMPLEMENTATION OF COLLISION AVOIDANCE SYSTEMS IN ALL NEW HIGHWAY VEHICLES

Motor vehicle crashes are a leading cause of death and injury in the U.S., and many of them could be prevented with collision avoidance systems that are already available. Vehicle manufacturers should make this technology standard equipment on all vehicles. And consumers, informed about the technology's capabilities and limitations, should buy vehicles equipped with it.

REDUCE FATIGUE-RELATED ACCIDENTS

Fatigue is a pervasive problem in transportation that degrades a person's ability to stay awake, alert, and attentive to the demands of safely controlling a vehicle, vessel, aircraft, or train. We are calling for a comprehensive approach to combatting fatigue in transportation, focusing on research, education, and training; technology; sleep disorder treatment; hours-of-service regulations; and on-and off-duty scheduling policies and practices.

REQUIRE MEDICAL FITNESS – SCREEN FOR AND TREAT OBSTRUCTIVE SLEEP APNEA

Undiagnosed and untreated obstructed sleep apnea continues to be deadly on our roads and rails, causing too many preventable accidents. We want to see mandatory screening and

treatment for obstructive sleep apnea for rail and highway personnel in safety-sensitive positions.

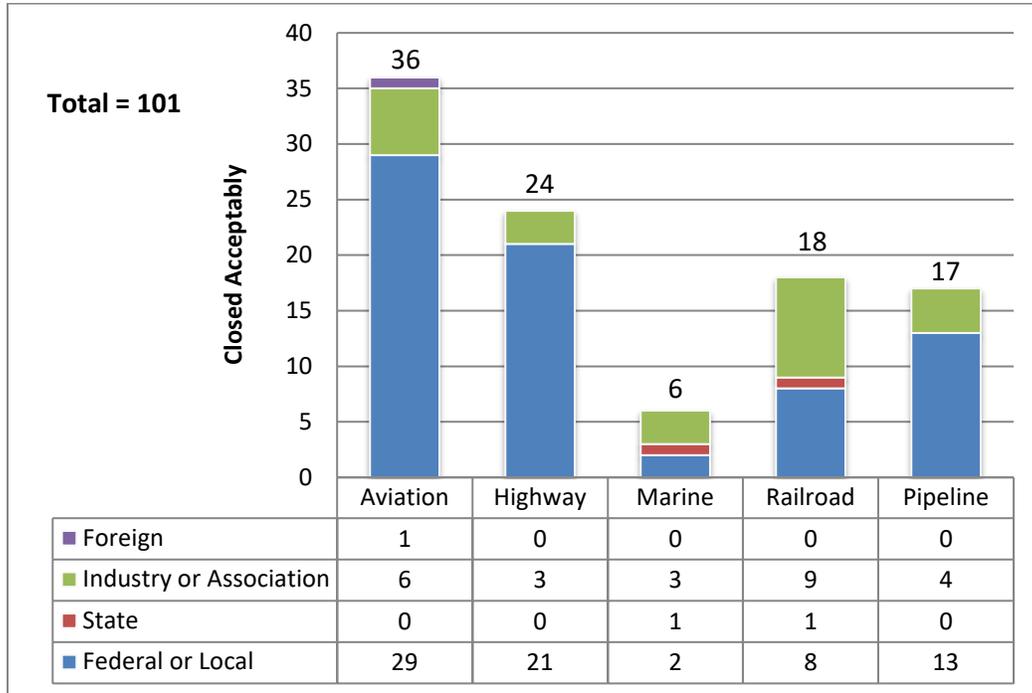
STRENGTHEN OCCUPANT PROTECTION

Seat belts, child car seats, and child safety restraint systems in highway vehicles and on airplanes reduce the risk of injury and death. Restraints in motor vehicles saved 14,668 lives in 2016 alone. We want all states to enact laws and regulations requiring all motor vehicle occupants to use seatbelts, and allowing primary enforcement of seat belt laws for all vehicle occupants. We also want to see requirements for enhanced vehicle design to provide better occupant protection, and for general aviation aircraft owners to install shoulder harness systems.

APPENDIX B: STATUS OF SAFETY RECOMMENDATIONS

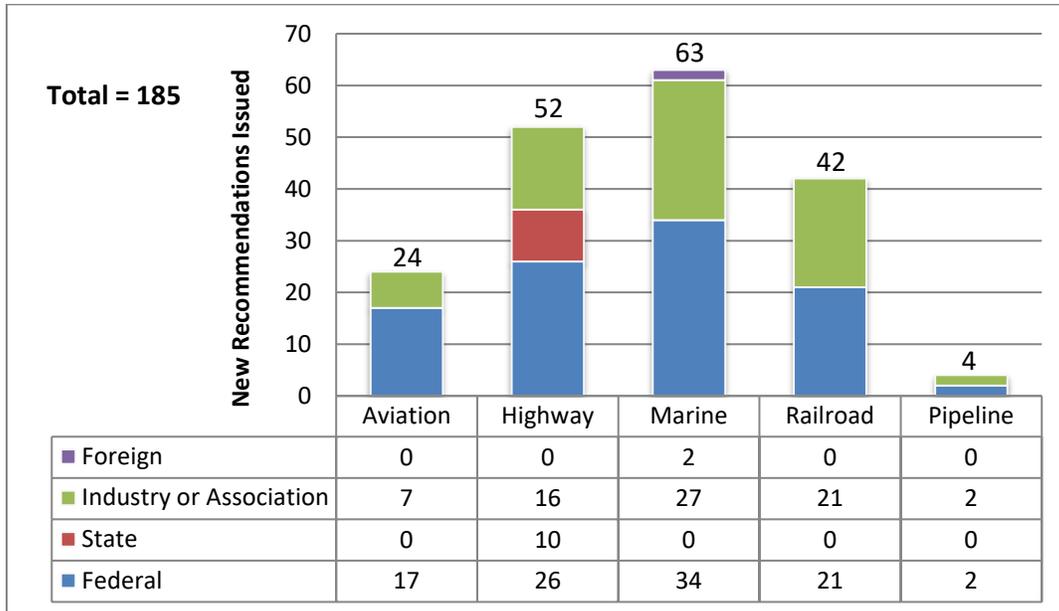
Recommendations Closed

The chart below shows the distribution by transportation mode of the 101 NTSB recommendations closed in an acceptable status in FY 2018.



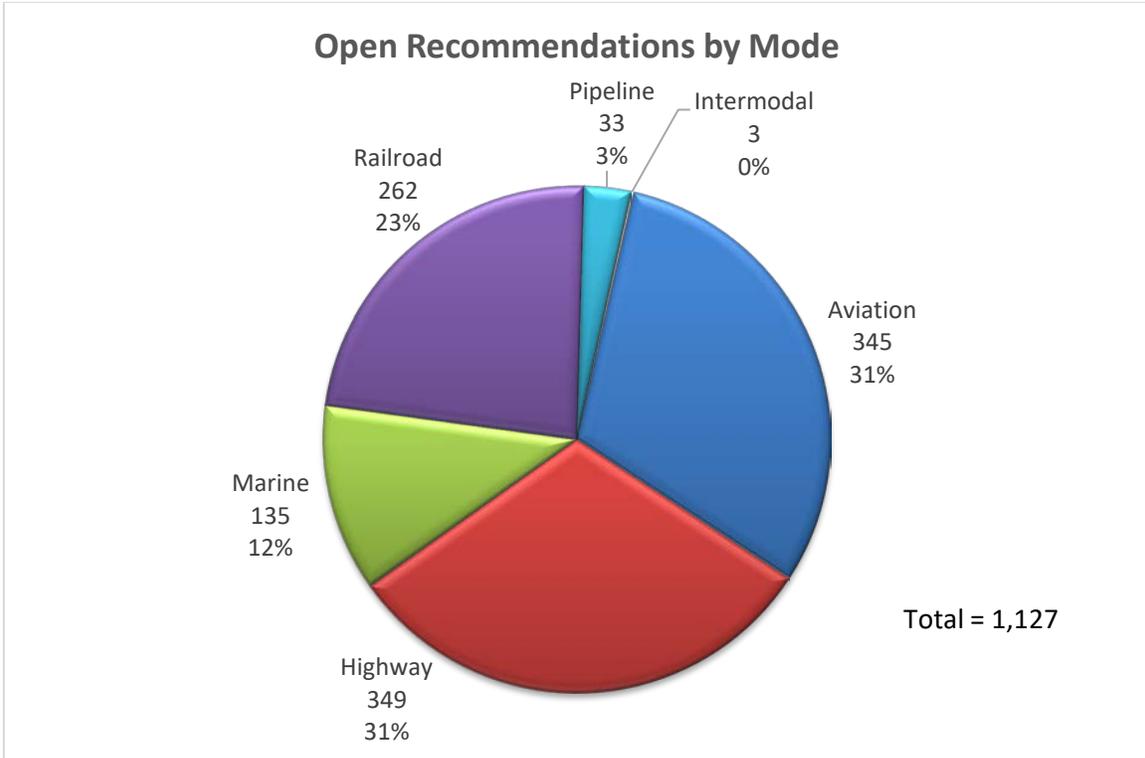
New Recommendations Issued

The chart below shows the distribution by transportation mode of the 185 new recommendations issued by the NTSB in FY 2018:



Open Recommendations

The chart below displays the distribution by transportation mode of the 1,127 open safety recommendations as of September 30, 2018:



APPENDIX C: AVIATION SAFETY REGIONAL OFFICES



	Alaska Region	Western Pacific Region	Central	Eastern Region
Coverage Area	Entire state of Alaska	Montana, Idaho, Utah, Arizona, Nevada, Washington, Oregon, California, and Hawaii, as well as the territories of Guam and American Samoa	Ohio, Michigan, Indiana, Wisconsin, Illinois, Minnesota, Iowa, Missouri, Arkansas, Louisiana, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Wyoming, Colorado, and New Mexico	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
Staff Office Location	Main office: Anchorage, Alaska	Main office: Federal Way, Washington 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	Main office: Denver, Colorado 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	Main office: Ashburn, Virginia 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

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
2018	\$110.4

* Includes across-the-board rescissions

Current Board Members

Name	Board Title	Appointment	Term Expiration
Robert L. Sumwalt	Chairman	August 9, 2017	December 31, 2021
Bruce Landsberg	Vice-Chairman	July 25, 2018	December 31, 2022
Jennifer Homendy	Member	July 25, 2018	December 31, 2019
Earl F. Weener	Member	June 22, 2010	December 31, 2015*
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
2018			\$1,997,884	No activity

Training Center Costs and Revenues

	FY 2016	FY 2017	FY2018
Earned revenue	\$1,057,083	\$954,567	\$1,164,133
Subleases	\$594,309	\$0	\$0
Total revenue	\$1,651,392	\$954,567	\$1,164,133
Costs:			
Pay	\$839,126	\$864,886	\$593,021
Travel	\$94,029	\$70,495	\$93,287
Contracts	\$269,436	\$339,963	\$228,087
Supplies	\$23,727	\$13,589	\$4,534
Equipment	\$130,979	\$6,849	\$0
Costs before space rental	\$1,357,297	\$1,295,782	\$918,929
Space rental	\$2,675,675	\$2,616,876	\$2,626,073
Total operating costs	\$4,032,972	\$3,912,658	\$3,545,002
Deficit	\$2,381,580	\$2,958,091	\$2,380,869

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
2018	291	112	403

FTE Staffing by State and Region FY 2018

Location	Administration	Administrative Law Judges	Aviation Safety	Highway Safety	Information Technology & Services	Marine Safety	Policy & Direction	Railroad, Pipeline & Hazardous Materials Investigations	Research & Engineering	Safety Recommendations & Communications	Training Center	Total
Alaska			6									6
Colorado			10	2								12
Illinois			9		1			1				11
Indiana								1				1
Louisiana								1				1
Minnesota			2									2
Missouri			1									1
Texas		1	7	6				1				15
Wisconsin			1									1
Alabama			1									1
Connecticut							1					1
Delaware				1								1
Florida			3			1				1		5
Georgia			3					1		1		5
Maine				1								1
Massachusetts				1								1
New Hampshire			1									1
New Jersey			1					1				2
New York			1									1
North Carolina			3									3
Virginia	1		9					1			2	13
Washington, DC	33	7	44	18	28	18	45	22	41	34	1	291
Arizona			2									2
California			8	1				4				13
Montana			1									1
Oregon			1	1								2
Washington			8	1								9
Grand Total	34	8	122	32	29	19	46	33	41	36	3	403

*Regions:

Alaska
Central
Eastern
Western

International Investigations

*FY 2018 Investigation Costs by Accident**

Description	Location	Costs
An Air France A380 with Engine Alliance GP7200 engines had No. 4 engine fan and inlet cowling separation.	Goose Bay, Canada	\$172,488
A B737 crashed shortly after takeoff.	Havana, Cuba	\$82,550
A Cessna 208 B-0900 crashed during departure.	Punta Islita, Costa Rica	\$60,153
A Piper PA-31T crashed shortly after takeoff from runway.	Cascais, Portugal	\$54,501
An AeroCaribe B737 runway overrun on landing.	Leticia, Colombia	\$29,123
An ATR 42-500 crashed after reporting a No. 1 engine failure/shutdown.	Havelian, Pakistan	\$27,293
An Airbus A321-231 tail struck the runway during landing.	Christ Church, Barbados	\$26,820
A SA de CV Embraer ERJ190-100 IGW lost control during climb and the aircraft was destroyed by impact and fire.	Durango, Mexico	\$23,564
A Boeing 747-400 cargo aircraft crashed while landing at Manas International Airport.	Bishkek, Kyrgyzstan	\$21,931
A Socatta TBM700 departed controlled flight and impacted open water after occupants succumbed to hypoxia.	Caribbean Sea	\$19,109
A Cessna 441 collided with terrain.	Renmark, Australia	\$17,940
An MU-2B was lost from radar in the vicinity of the Bahamas.	Eleuthera, Bahamas	\$17,868
Bravo Airways flight 4959 experienced a "thunder-gust" resulting in a runway excursion during landing.	Zhuliany, Ukraine	\$15,250
A Cessna 208B impacted terrain.	Clonbullogue, Ireland	\$14,464
A Gulfstream III reported control issues and impacted the water.	Nueva Esparta, Venezuela	\$13,480
A FlyDubai B737 crashed during approach.	Rostov-on-Don, Russia	\$13,065
The left hand nose wheel of an Austral Lineas Aereas Embraer ERG-190 broke loose during taxi out for takeoff.	Mar Del Plata, Argentina	\$12,452
A Bombardier CL-604 had a temporary LOC in flight due to wake turbulence after being overflown by an Emirates Airbus A380.	Arabian Sea	\$12,151
An Avior B737-200 experienced an in-flight shut down of the #2 engine.	Guayaquil, Ecuador	\$12,092

Description	Location	Costs
A Boeing 727-200, operated by Aerosucre as a cargo flight, overran the departure runway on takeoff.	Puerto Carreno, Colombia	\$11,448
An AVRO 145-RJ85A had an uncontained engine failure in cruise flight.	Johannesburg, South Africa	\$10,879
A Ryanair 737 nosewheel detached on takeoff. Partial collapse of nose gear on landing.	London, United Kingdom	\$10,757
A Passaredo Transportes Aereos S.A. (Brazil) ATR-72 experienced an aileron control malfunction while on approach to Guarulhos Airport.	Guarulhos, Brazil	\$10,633
A Delta A330 engine fire warning turnback.	Lagos, Nigeria	\$10,343
A 40-foot Bahamian tour boat caught fire.	Exuma Island, Bahamas	\$10,313
A Japan Airlines Boeing 767-300 performed an air turnback after experiencing high No. 1 engine N2 vibrations during climb.	Kumamoto, Japan	\$9,809
A Korean Air Boeing 777 uncontained engine failure/fire during takeoff.	Tokyo, Japan	\$9,609
A small fire in tail of Dassault Falcon 7X at Changi Airport.	Singapore, Singapore	\$8,581
An Emirates Boeing 777-300 crashed during landing.	Dubai, UAE	\$7,569
An Antonov AN-148-100 accident with a Honeywell Enhanced Ground Proximity Warning System crashed after takeoff.	Argunovo, Russia	\$7,551
A Learjet 25 disappeared from radar within a few minutes of taking off from Simón Bolívar International Airport.	Naiguata, Venezuela	\$6,733
A Boeing B747-400F, operated as a cargo flight, veered off runway at the start of the takeoff.	Maastricht, Netherlands	\$6,615
American Airlines Flight 927 declared an emergency due to unresponsive right throttle.	Guayaquil, Ecuador	\$6,600
A Malaysian Airlines Boeing 777-200 was reported missing while en route from Kuala Lumpur International Airport.	Kuala Lumpur, Malaysia	\$6,454
An unstabilized approach in IMC.	Paris, France	\$6,101
A Cessna 162 crashed into terrain shortly after takeoff.	Faisalabad, Pakistan	\$6,019
A Peruvian Air Line Boeing 737 had uncommanded in-flight shutdown of CFM56 engine.	Lima, Peru	\$5,981
A Boeing 737-200 experienced smoke in the cockpit.	Lahore, Pakistan	\$5,697
A Delta Air Lines 747-400 lost power in No. 1 engine.	Tokyo, Japan	\$5,636
A Boeing 777-300 experienced a main landing gear failure.	Narita, Japan	\$5,059

Description	Location	Costs
Safe Skies for Africa (SSA)	Senegal, Nigeria	\$88,300
Grand Total		\$902,981

* Report includes investigations of accidents with more than \$5,000 in FY 2018 expenses. Costs include payroll as well as travel and other direct costs.

*Total Accident Investigation Costs by Fiscal Year 2012 - 2018**

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
2018 (g)	\$902,981

* 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.
- (g) Includes \$88,300 billed to DOT under the SSA Program.

US Transportation Fatalities, 2016 - 2017

Mode	Description	2016	2017 ¹
Highway:	Passenger cars	13,508	13,363
	Light trucks and vans	10,369	10,188
	Pedestrians	6,080	5,977
	Motorcycles	5,337	5,172
	Pedalcycles ²	852	783
	Medium and heavy trucks	725	841
	Buses	64	44
	Other ³	871	765
	Total, Highway	37,806	37,133
	Grade Crossings: ⁴	(255)	(273)
Rail:	Freight, passenger, and commuter rail ⁵	630	684
	(Trespassing) ⁶	(467)	(512)
	Rail Transit ⁷	73	77
	Total, Rail	703	761
Marine:	Recreational boating	701	658
	Cargo transport	13	9
	Commercial fishing ⁸	17	27
	Commercial passenger	2	0
	Total, Marine	733	694
Aviation:	General aviation	386	330
	Airlines	0	0
	Air taxi	19	15
	Commuter	8	1
	Foreign/unregistered ⁹	4	4
	Total, Aviation ¹⁰	412	350
Pipeline:	Gas	13	19
	Liquids	3	1
	Total, Pipeline	16	20
	Total	39,670	38,958

- ¹ Numbers for 2017 are preliminary estimates. Aviation data are from the NTSB; marine data are reported by the US DHS; all other data are reported by the US DOT.
- ² Pedalcycles include bicycles and other cycles.
- ³ *Other* refers to non-occupants (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
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	Yes	
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	Yes
Michigan	Yes	Partial	Yes	Partial		
Minnesota	Yes	Yes	Yes	Partial		
Mississippi	Partial	Yes		Partial	Yes	Partial
Missouri	Yes		Partial	Partial	Yes	Yes
Montana	Partial		Partial			
Nebraska	Yes(b)		Partial	Partial	Yes	Yes
Nevada	Partial		Partial	Partial	Yes	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	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	Yes	Yes	Partial	Yes	Partial
Wisconsin	Yes	Yes	Yes	Partial		
Wyoming	Yes		Partial	Partial		
Total	Yes = 38 + DC Partial = 11	Yes = 24 + DC Partial = 10	Yes = 31 + DC Partial = 14	Yes = 0 Partial = 49 + DC	Yes = 31 + 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) Nebraska's new law became effective 1/1/19.



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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