NATIONAL TRANSPORTATION SAFETY BOARD

1997 ANNUAL REPORT

TO CONGRESS

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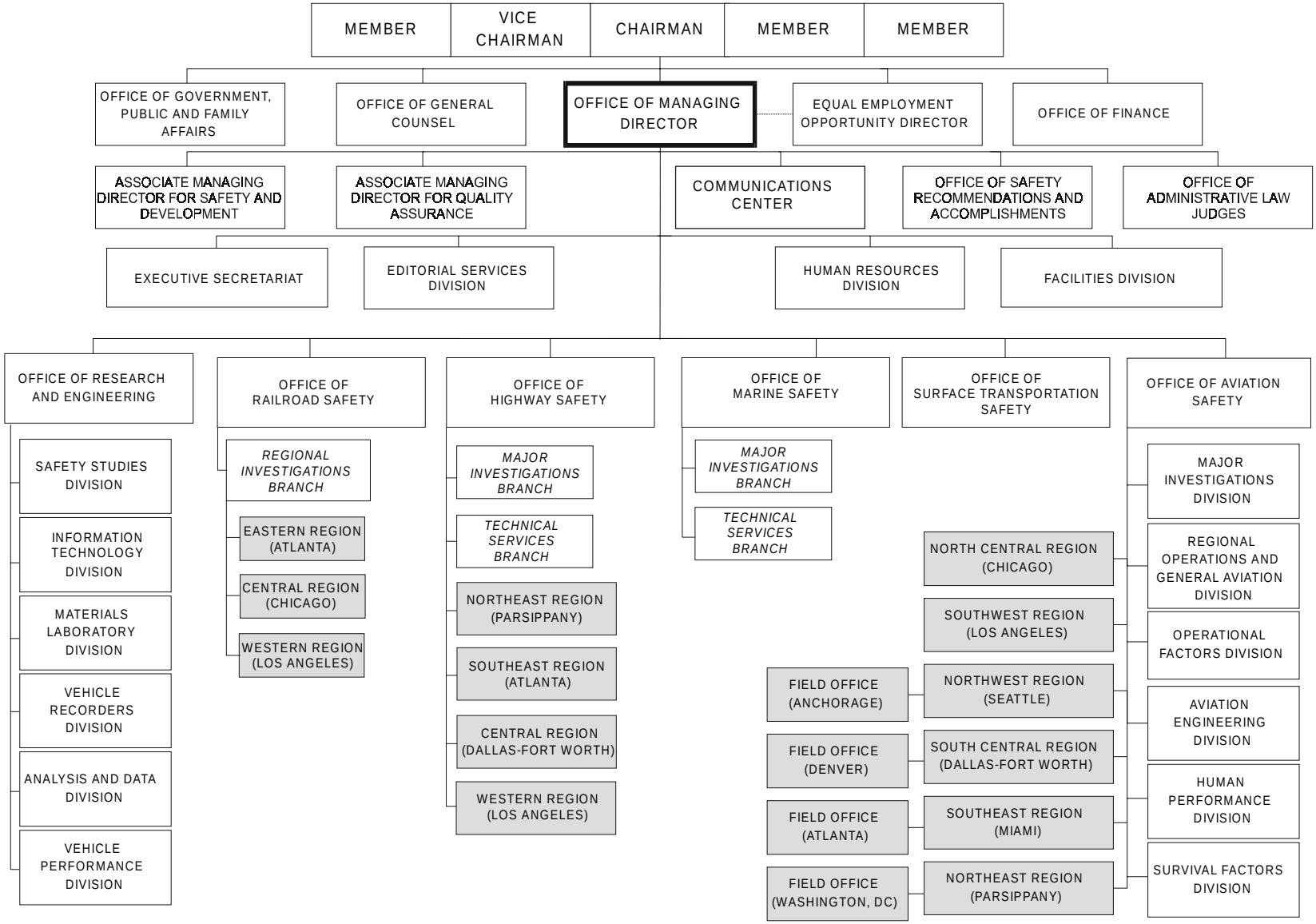
NATIONAL TRANSPORTATION SAFETY BOARD



FOREWORD

The National Transportation Safety Board (NTSB) is an independent agency charged with determining the probable cause of transportation accidents and promoting transportation safety. The Board investigates accidents, conducts safety studies, evaluates the effectiveness of other government agencies' programs for preventing transportation accidents, and reviews appeals of enforcement actions involving airman and seaman certificates by the Federal Aviation Administration (FAA) and the U.S. Coast Guard and civil penalty actions taken by the FAA.

To help prevent accidents, the NTSB develops safety recommendations, based on its investigations and studies, which are issued to federal, state and local government agencies and to industry and other organizations in a position to improve transportation safety. These recommendations are the focal point of the NTSB's efforts to improve safety in the nation's transportation system.

The NTSB's origins can be found in the Air Commerce Act of 1926, in which Congress charged the Department of Commerce with investigating the causes of aircraft accidents. Later, that responsibility was given to the Civil Aeronautics Board's Bureau of Aviation Safety. In 1967, Congress consolidated all transportation agencies into a new Department of Transportation (DOT) and established the National Transportation Safety Board as an agency within DOT. In creating the NTSB, Congress envisioned that a single organization with a clearly defined mission could more effectively promote a higher level of safety in the transportation system than the individual modal agencies working separately. Since 1967, the Board has investigated accidents in the aviation, highway, marine, pipeline and railroad modes.

In 1974, Congress re-established the NTSB as a completely separate entity, outside of DOT, reasoning that "…no federal agency can properly perform such (investigatory) functions unless it is totally separate and independent from any other… agency of the United States." As DOT is responsible for both the regulation and promotion of transportation in the U.S. and accidents may suggest deficiencies in the transportation system, the Board's independence was deemed necessary for proper oversight. The NTSB, which has no authority to regulate, fund, or be directly involved in the operation of any mode of transportation, seeks to conduct investigations and to make recommendations from a totally objective viewpoint. Under current operating criteria, the Board's response to an accident primarily is determined by:

- the need for independent investigative oversight to ensure public confidence in the transportation system;
- the need to concentrate on the most significant and life threatening safety issues; and,
- the need to maintain a data base so that trends can be identified and projected.

Since its inception, the NTSB has investigated more than 110,000 aviation accidents and over 10,000 surface transportation accidents. On call 24 hours a day, 365 days a year, NTSB investigators travel throughout the country and to every corner of the world to investigate significant accidents and develops factual record and safety recommendations with one aim – to ensure that such accidents never happen again.

To date, the NTSB has issued almost 11,000 safety recommendations pertaining to the various transportation modes to more than 1,250 recipients. As the Board has no authority to regulate the transportation industry, its effectiveness depends on its reputation for conducting thorough and accurate investigations and for producing timely, well considered recommendations to enhance transportation safety. The NTSB's role in fostering advances in transportation safety has been significant – more than 82 percent of its recommendations have been adopted by the regulatory and the transportation industry.

MEMBER PROFILES

CHAIRMAN
James E. Hall

James Evan Hall of Tennessee became a Member of the National Transportation Safety Board in October 1993. He has chaired the Board since June 1994.

Chairman Hall's chairmanship has seen a period of extraordinary activity for the Board, including recent investigations into the crash of ValuJet flight 592 in the Everglades and TWA flight 800 off Long Island. Among the accidents for which he was the on-scene Board Member were the January 1994 derailment of the Ringling Brothers Circus train in Florida; the October 1994 crash of an American Eagle ATR-72 in Roselawn, Indiana; the December 1994 crash of an American Eagle Jetstream in Raleigh-Durham, North Carolina; and the February 1995 crash of a cargo plane in Kansas City. He served as the Chairman of the Board of Inquiry for public hearings on three major accidents: the September 1994 crash of USAir flight 427 near Pittsburgh, the November 1994 runway collision in St. Louis, and the February 1996 commuter train/ Amtrak collision in Maryland. He also chaired a safety forum on commercial air service in Alaska, as well as symposiums on the impact of fatigue on transportation safety and prevention of pipeline excavation damage. During his chairmanship, the Board has issued landmark safety studies on commuter airlines and on the dangers to children of passenger-side automobile air bags.

In September 1996, President Clinton named Chairman Hall to the White House Commission on Aviation Safety and Security.

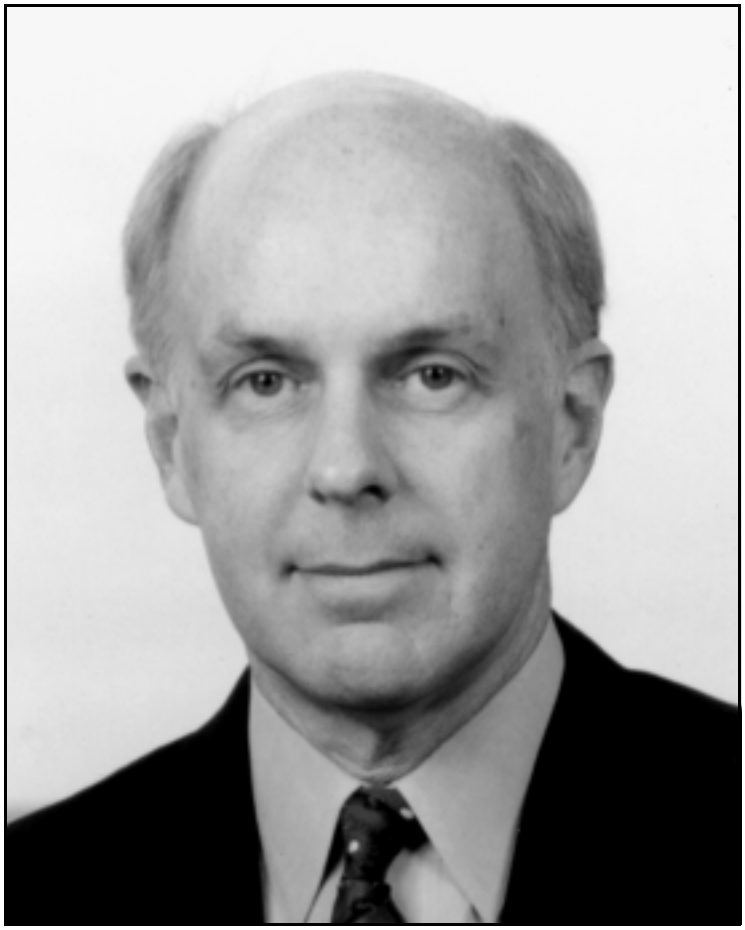
In January 1996, Chairman Hall was honored by Aviation Week and Space Technology, which presented him with an Aviation Laurel for "relentlessly pursuing every avenue available in an attempt to resolve what happened to USAir Flight 427." The magazine wrote, "Hall has exhibited exemplary leadership and has professionally and respectfully addressed the concerns of the accident victims' families." It also lauded him for his efforts to upgrade flight data recorders on U. S. airliners.

Chairman Hall received his law degree from the University of Tennessee and served for several years as counsel to the U.S. Senate Subcommittee on Intergovernmental Relations and on the staff of U.S. Senator Al Gore, Sr. He later maintained a private legal practice in Chattanooga, Tennessee.

Chairman Hall returned to Washington in early 1993 to serve as chief of staff for U.S. Senator Harlan Mathews. Before that, he was in the cabinet of Tennessee Governor Ned McWherter and served for five years as director of the Tennessee State Planning Office. As a member of the Governor's cabinet, Chairman Hall developed Tennessee's first comprehensive anti-drug effort.

An army veteran, Chairman Hall received the Bronze Star for Meritorious Service in Vietnam. He and his wife, the former Anne Stewart Impink, have two daughters. His term on the Board expires on December 31, 2002.

VICE CHAIRMAN
Robert T. Francis II



Robert Talcott Francis II has been the Vice Chairman of the National Transportation Safety Board since January 1995, when he was appointed to the Board by President Clinton. In August 1995, he was confirmed by the United States Senate.

Since joining the Board, Mr. Francis has been involved in a number of transportation accident investigations, including the explosion and crash of TWA Flight 800 off Long Island, New York, in July 1996; the crash of ValuJet Flight 592 in the Florida Everglades in May 1996; the crash of a DC-8 cargo carrier in Kansas City; a major parachuting accident in Virginia; and an Amtrak train derailment in Arizona. He also has chaired a Board public hearing on a New York MTA subway accident and a public forum on passive grade rail crossing safety. In addition to his accident investigation work and other Board duties, he has been actively involved as a member of the Air Transport Association of America's Steering Committee on Flight Operations Quality Assurance Programs and the Flight Safety Foundation's ICARUS Committee, which is a group composed of worldwide aviation experts who gather informally to share ideas on reducing human error in the cockpit.

Before his appointment to the Board, Mr. Francis served as senior representative for the FAA in Western Europe and North Africa and was based in Paris, France. Representing the FAA Administrator, he worked extensively on aviation safety and security issues with U.S. and foreign air carriers, transportation governmental authorities, aircraft manufacturers, and airports. At the Board, he continues to be actively involved in interna-

tional aviation issues and has spoken extensively about the Board's role in international activities. In conjunction with his work at the Board, he is a recipient of an Aviation Week and Space Technology 1996 Laurels Award and was recognized by both the U.S. Navy and the U.S. Coast Guard for meritorious service in the TWA Flight 800 investigation.

A native of Cohasset, Massachusetts, Mr. Francis received his A.B. from Williams College and attended Boston University and the University of Ibadan, Nigeria. An active general aviation pilot, he holds a commercial pilot certificate with instrument and twin-engine ratings. He is a member of the French Academy of Air & Space, a fellow of the Royal Aeronautical Society, and a member of the Wings Club of New York and a trustee of the Aero-Club of Washington. Mr. Francis and his wife, Judy, have two daughters, Allison and Carolyn.

His term as Vice Chairman expires on August 14, 1999, and his appointment as a Member of the Board expires on December 31, 1999.

MEMBER
John A. Hammerschmidt

John Arthur Hammerschmidt became a Member of the National Transportation Safety Board in June 1991 and is now serving his second 5-year term. Before becoming a Board Member, Mr. Hammerschmidt had extensive senior-level Board experience, serving as a special assistant to the Board Chairman and Member during 1985-91.

Mr. Hammerschmidt is a private pilot and is the senior Board Member. He has participated on-scene in more than four dozen major accident investigations and public hearings, involving all modes of transportation: highway; aviation; rail; marine; pipeline; and commercial space launch.

Recent on-scene investigations include: the 1997 Comair EMB-120 commuter airline accident near Monroe, Michigan; the 1996 collision of the bulk carrier BRIGHT FIELD with the Port of New Orleans River Walk Shopping Mall; the 1995 Atlantic Southeast Airlines EMB-120 commuter accident at Carrollton, Georgia; the 1994 USAir DC-9 accident at Charlotte, North Carolina; and the 1993 Amtrak accident near Mobile, Alabama, the worst in Amtrak history.

In 1997, Mr. Hammerschmidt chaired a 4-day board of inquiry into an explosion that killed 33 people in San Juan, Puerto Rico, the deadliest accident investigated by the Board's Pipeline Division. In 1996, he chaired the Board's public hearing into the Fox River Grove, Illinois, grade-crossing accident that killed 7 high school students in a school bus. In 1995, he chaired the 5-day public hearing in Indianapolis, Indiana, on the American Eagle ATR-72 accident near Roselawn, Indiana. In

1994, he chaired the public hearing in Charlotte, North Carolina, on the USAir DC-9 accident there, and he chaired the public hearing in Ypsilanti, Michigan, on the American International Airways DC-8 accident at the U. S. Naval Air Station, Guantanamo Bay, Cuba.

Before 1985, Mr. Hammerschmidt served in the Office of the Vice President of the United States (1984); and from 1974-83 he was the chief executive officer of the Hammerschmidt Lumber Company, Inc., Harrison, Arkansas. Mr. Hammerschmidt was president of the Boone County (Arkansas) Industrial Development Corporation.

In 1971, Mr. Hammerschmidt earned his bachelor of arts degree from Dartmouth College, graduating "with highest distinction" in a history honors program. At Dartmouth, he was named a Rufus Choate Scholar and was a member of the varsity football and wrestling teams. Later, he attended Vanderbilt University's Law School (1971-72) and Harvard University's Master of Business Administration program (1973-74). He also studied at the Catholic University of Ecuador in Quito as part of Georgetown University's foreign study program.

Mr. Hammerschmidt is a native of Harrison, Arkansas. He currently resides in Arlington, Virginia.

Mr. Hammerschmidt's term on the Board expires on December 31, 2000.

MEMBER
John J. Goglia

John Joseph Goglia is an internationally recognized expert in aviation maintenance and aircraft operations. In August 1995, he was sworn in as a Member of the National Transportation Safety Board.

He is the first working A&P mechanic to serve on the Board, with over 30 years of aviation experience. Before his Senate confirmation, he was based with USAir and was the recipient of the prestigious 1994 Industry Aviation Mechanic of the Year Award.

With a wealth of experience, Member Goglia is a leading advocate of the evaluation of human factors in the aviation workplace. He developed the Maintenance Resource Management Program, combining management, labor, regulatory agencies, and academia into what has become the premier human factors program in aviation maintenance.

Mr. Goglia served as the Governor's appointee to the Massachusetts Workers Compensation Board and to the Boston Area Second Airport Site Selection Board.

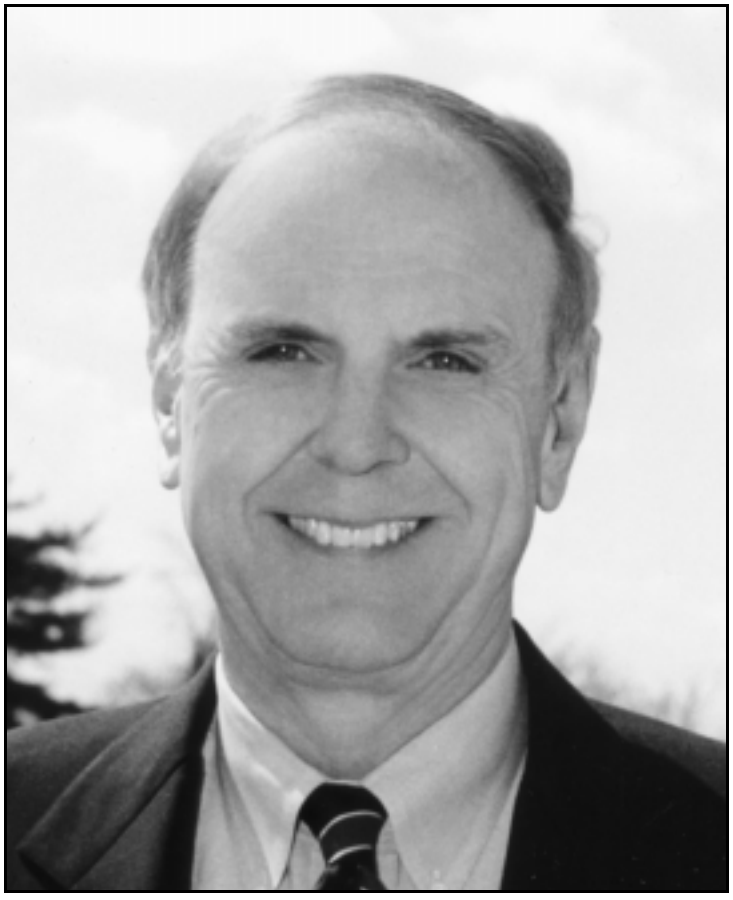
Mr. Goglia served as Team Coordinator of the International Association of Machinists and Aerospace Workers' (IAM) Accident Investigation Team, and for over 21 years, he served as the IAM's Flight Safety Representative. He was the IAM's principal specialist on aviation issues and served as liaison to the FAA, NTSB, DOT, and other executive branch agencies, as well as to the U. S. Congress. He represented the IAM on the Aviation Rulemaking Advisory Committee, which evaluates and recommends changes regarding aviation safety and operational regulations.

Member Goglia served as chair and a founding member of the National Coalition for Aviation Education, an aviation industry organization that advances aviation education among America's youth and aviation workforce. He was an original member of the steering committee to establish the International Society Aviation Maintenance Professionals, a professional society dedicated to advancing safety and professionalism throughout the aviation maintenance industry. He is an internationally known speaker and author, addressing aviation safety issues, lecturing at world symposiums, and serving as contributing editor to several industry periodicals. In 1960, Member Goglia learned to fly in a Piper J2-J3 and, for over 10 years, he was owner/operator of an aircraft service company.

Mr. Goglia was the Member on scene for the Board's investigation of the grade crossing accident in Fox River Grove, Illinois, in October 1995 that killed 7 high school students on a school bus. In January 1996, he chaired a briefing for government and industry representatives regarding the problem of ingestion of birds in the new generation of air carrier engines.

Member Goglia's term expires on December 31, 1998.

MEMBER
George W. Black, Jr.



George Washington Black, Jr., P.E., of Georgia became a Member of the National Transportation Safety Board on February 22, 1996, and is the first practicing highway engineer to be a Board Member.

He is a 1968 graduate of the Georgia Institute of Technology, with a Bachelor of Civil Engineering degree, and is a registered professional engineer. While at Georgia Tech, Mr. Black worked in one of the original multidisciplinary traffic crash investigation teams funded by the DOT.

Member Black served as an aircraft maintenance officer in the U.S. Air Force while stationed in Texas and southeast Asia. He was assigned to the supervision of flight line maintenance of B-52D and KC-135A aircraft.

He returned to traffic safety engineering in 1973, when he became the first traffic engineer for Gwinnett County, Georgia, in the Atlanta metropolitan area. The county has a population of 475,000 persons and 2,500 miles of roadway. Member Black remained with Gwinnett County for 23 years, retiring as Director of Transportation in 1996.

Mr. Black helped found the County police department's fatal accident investigation unit in 1974. He was a member of that unit for the next 22 years and assisted in the investigation of 2,000 fatal or critical-injury traffic crashes and rail-highway grade crossing incidents. He also taught accident investigation and reconstruction in the county and state police academies for 23 years.

Member Black is a fellow of the Institute of Transportation Engineers and a member of the American Society of Civil

Engineers, the National Society of Professional Engineers, the Society of Automotive Engineers, the Transportation Research Board, the National Committee on Uniform Traffic Control Devices (technical committee), and other professional organizations.

Mr. Black was the recipient of the 1991 Institute of Transportation Engineers' Karl Bevins Award, the 1997 Transportation Professional of the Year Award, the Gwinnett County Chamber of Commerce's Public Service Award, and the American Society of Civil Engineers' National Civil Government Award.

Since his appointment to the Board, Mr. Black has been the on-scene board member for several accidents, including Delta flight 1288 at Pensacola, Florida; United Express Flight 5926 at Quincy Illinois; a propane gas explosion in San Juan, Puerto Rico; a school bus accident in Monticello, Minnesota; and the crash of Korean Air flight 801 on Guam.

Mr. Black is married to Karen Marshall Black, and they have two daughters.

Mr. Black's term as a Board Member expires on December 31, 2001.

THE NTSB AND CONGRESS IN 1997

The National Transportation Safety Board Members and staff testified before Congressional committees seven times in calendar year 1997.

On February 26, Vice Chairman Robert Francis appeared before the House Committee on Transportation and Infrastructure, Subcommittee on Aviation. Vice Chairman Francis testified on the need for traffic alert and collision avoidance systems (TCAS) on cargo aircraft and on recent incidents involving military aircraft. The Board, Vice Chairman Francis stated, strongly supports more widespread installation of TCAS II in other national air space system user aircraft, including all large cargo category aircraft. He also discussed two incidents investigated by the Board involving F-16 aircraft that had occurred in the two weeks before his testimony.

Appearing before the House Appropriations Committee, Transportation and Related Agencies Subcommittee, on March 11, 1997, Chairman James Hall discussed the NTSB's fiscal year 1998 budget request and a supplemental request for fiscal year 1997. Chairman Hall noted that the 1998 request of $46 million represented an increase of $3.6 million and 11 additional full-time positions for the Board over the Fiscal Year 1997 level. The Board's request of $23.2 million in Fiscal Year 1997 supplemental funding, the Chairman explained, was to cover the anticipated costs of the TWA flight 800 investigation and other Board high priority requirements, especially in the area of assistance to families of victims of transportation disasters.

On April 16, Chairman Hall testified before the Senate Appropriations Committee's Subcommittee on Transportation and Related Agencies. His testimony concerned aviation safety and focused on issues highlighted on the NTSB's Most Wanted List, including runway incursions and enhanced flight data recorders. He also discussed the progress of the TWA flight 800 investigation, and the FAA's efforts in adopting NTSB recommendations regarding that accident, as well as those resulting from the 1994 crash of USAir flight 427. Finally, the Chairman briefed the subcommittee on the status of the NTSB family assistance program and discussed the accidents to which Board family affairs personnel had been dispatched.

Chairman Hall testified before the Senate Committee on Commerce, Science, and Transportation on April 29, about NTSB actions on automobile air bag safety. He discussed the Board's 4-day Public Forum held in March 1997, at which the Board discussed that the "one size fits all" approach to air bag design is inadequate and that the types of accidents in which air bags are deployed should be reexamined. Further, he briefed the Committee on the urgency of placing children up to the age of 12 in the back seat of an automobile, buckled or in a child safety seat. Additionally, Chairman Hall stressed the importance of seat belt usage and informed the Committee on Board plans to assist in ensuring that 85 percent of automobile occupants usage seat belts by the year 2000 and 90 percent by 2005.

Robert Chipkevich, Chief of the Board's Office of Pipeline and Hazardous Materials Safety, appeared before the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Surface Transportation and Merchant Marine, May 8 to address safety issues related to the transportation of hazardous materials. He discussed four areas where the Board believes additional action should be taken to enhance the safe transportation of hazardous materials. Those areas included testing requirements for tank cars to identify structural defects before sudden and complete failure; rollover protection requirements for highway cargo tanks; crash worthiness of front heads on rail cargo tanks used to transport liquefied flammable gases and potentially lethal nonflammable gases; and practices, procedures, and training to identify undeclared hazardous materials shipments.

On July 10, Chairman Hall appeared before the House Transportation and Infrastructure Committee's Subcommittee on Aviation to deliver a 1-year update on the investigation of TWA flight 800.

Chairman Hall again testified before that subcommittee on November 13 regarding runway incursions at our nation's airports and the FAA's efforts to prevent such mishaps. This is an issue on the Board's "Most Wanted" list. Chairman Hall expressed the Board's view that runway incursions are one of the most significant hazards to aviation today and noted that the Board will continue to urge the FAA to place greater emphasis on this hazard.

STATE AND LOCAL GOVERNMENT

The Board continued to expand its outreach to state and local officials to promote implementation of Board recommendations. The Board's increased efforts, in combination with the initiatives of others, led to enactment of laws implementing Board recommendations in an unprecedented 26 states.

Board Members and staff made personal visits to at least 13 states in 1997, including multiple visits in several cases. These visits have involved testimony at public hearings, as well as private meetings with legislators, other state officials, and a variety of private sector representatives. Presentations promoted the Board's recommendations for primary enforcement of mandatory safety belt use laws, zero alcohol tolerance for young drivers, improved driver licensing standards for teenagers, and strengthened boating safety standards for both children and adults. More general outreach efforts, such as providing background information on recommendations, reports, analyses, and technical assistance in a variety of formats, were provided in almost every state.

On February 5, Chairman Hall provided to the Tennessee House and Senate an overview of important highway safety initiatives for saving lives on Tennessee's highways. Tennessee has been a leader in highway safety over the years. However, while Tennessee has 2 percent of the nation's population, it has 3 percent of its highway deaths. The Chairman urged adoption of graduated driver licensing for new teenage drivers, enactment of primary safety belt enforcement, administrative license revocation, and measures to address such problems as truck driver fatigue and repeat offenders.

On January 23, Member George Black testified before the Washington Senate Natural Resources and Parks Committee regarding the Board's recommendations on personal flotation devices used by children on recreational boats. The minimal use of personal flotation devices in fatal recreational boating accidents investigated by the Board is disturbing. Thus, he noted, the Board has recommended that states require children to wear life jackets and urged Washington to adopt such a measure.

On February 4, Member Black testified before the Texas Senate Criminal Jurisprudence Committee regarding zero tolerance and the establishment of sobriety checkpoints. Member Black noted that more than 3,000 persons are killed in highway crashes in Texas each year, which is higher than any other state except California. He emphasized that too many young people are being killed and injured in highway crashes and described how zero alcohol tolerance laws have been effective in other states. With respect to sobriety checkpoints, he noted that programs such as North Carolina's alcohol "Booze It and Lose It" and safety belt "Click It or Ticket" programs have reduced alcohol-related fatal crashes and increased safety belt use.

In addition to visiting individual states, the Board also met with State leaders at a variety of national and regional conferences. On June 11, Chairman Hall addressed the American Public Transit Association's Rail Rapid Transit Conference. After describing several recent major investigations involving rail rapid transit accidents, the Chairman urged the rail transit industry to do all it can to ensure safe operation. "The practice of safely moving passengers is not just good business, it is a moral responsibility," he said.

The Board staff have been active in task forces in several states and have provided assistance to regional and state highway safety task forces. This recommendation follow-up effort has paid dividends in enactment of state laws and halting the increase in young driver deaths in many states.

On September 10, Chairman Hall addressed the National Association of State Boating Law Administrators regarding the Board's recommendations that children wear life jackets while on boats and that states require training and licensing for boat opera-

tors. He also described the Board's then ongoing safety study of the burgeoning personal watercraft industry.

The Board saw increased state interest in new safety issues, both in the highway and marine modes. While there are a variety of reasons for the increased interest, it is in no small part due to the concerted, coordinated efforts of the Board and other government and private sector organizations working cooperatively in coalitions. The Board has been a leader in two national coalitions -- one seeking enactment of measures to prevent or reduce impaired driving, and the other pursuing recreational boating safety improvements -- since their creation. In both cases, the coalitions provide for the exchange of information regarding state activities and enable interested organizations to become involved in specific state efforts.

SAFETY RECOMMENDATIONS AND ACCOMPLISHMENTS

Safety recommendations are the primary tool used by the Board to motivate implementation of safety improvements and prevent future accidents. The implementation of the safety recommendations achieves the NTSB's ultimate goal of saving lives, reducing injuries, and preventing future accidents.

Because of the importance of recommendations, the Board restructured its resources in 1997 to emphasize the development and follow-up of recommendations and to more aggressively pursue their implementation. The agency's recommendation function was centralized. Six specialists were moved to the Office of Safety Recommendations and Accomplishments to focus full-time on recommendation development and implementation. More emphasis was placed on an internal review process that assesses safety proposals submitted by the NTSB's nine regional offices. A program was strengthened in which the agency recognizes its investigators for achieving safety improvements before a formal recommendation process is needed.

RECOMMENDATIONS AND ACCOMPLISHMENTS

During the 1997 calendar year, 277 National Transportation Safety Board recommendations were implemented in all modes of transportation, resulting in safety improvements for the traveling public.

Here is a breakdown by mode of recommendations that were closed out by NTSB action as acceptable responses:

Aviation: 131
Highway: 26
Marine: 73
Pipeline: 14
Railroad: 33

A few examples of the wide range of safety advances contained in these recommendations follow.

HIGHWAY

School bus safety. In 1997, NTSB closed out the last of a series of more than 50 recommendations stemming from a fatal October 1995 school bus accident that occurred at a suburban Chicago grade crossing. Seven high school students were killed, and 24 others were seriously injured when the bus and train collided.

An unusually quick response by all states in less than 15 months resulted in the first nationwide data base to track, monitor, and inspect approximately 3,500 highway-railroad crossings that have interconnected road signals and rail warning lights. All states inspected and made safety adjustments to these intersections where needed in an extremely timely manner. For the first time the information from this data base is available to state transportation and education departments and school safety officials to help them plan and monitor local school bus routes and train drivers to avoid potential grade crossing hazards.

Work zone safety. Federal and state highway regulators now have a program of education, enforcement, and public information requiring strict adherence to safety procedures at highway construction and repair work zones, a major step to lower work-related deaths. The changes were spurred by an NTSB safety study of more than 40 work zone accidents. One of the worst was a 1990 West Virginia accident that took eight lives.

Bridge safety. An ambitious nationwide highway bridge inspection program was completed by federal and state highway agencies. More than 22,000 bridges across rivers and creeks received underwater checks for scouring and other water damage. Now all high priority bridges, (bridges that are vulnerable to collision by truck, train, or ship and/or are subject to scouring) are on inspection schedules of 5 years or less. NTSB's investigation into bridge collapses caused by water

damaged supports, including a 1989 collapse near Covington, Tennessee, and a 1990 collapse of a New York State Thruway bridge near Amsterdam, New York, prompted the inspection program.

AVIATION

Emergency exits. The FAA and the aviation industry took quick action to improve instructions on how to open emergency exits on a popular commuter aircraft. Now emergency responders have clear markings on the outside of Beech 1900 air stair doors. The action stems from an NTSB probe of a fatal accident in Quincy, Illinois, in November 1996. All 14 people on both the commuter and general aviation planes were killed in a runway collision.

Aircraft icing hazards. A series of recommendations aimed at improving forecasting and reporting of freezing rain and drizzle, dissemination of icing reports, and aircraft crew training for icing conditions was implemented following an NTSB probe of a 1994 aviation accident. An ATR-72 crashed near Roselawn, Indiana, during severe winter weather conditions, killing all 68 on board.

Improved air carrier procedures. Numerous recommendations to major U.S. airlines have resulted in renewed emphasis on maintenance procedures, training and supervision and on windshear training for flight crews. These were the result of NTSB investigations of an engine mount failure in Japan and of a fatal 1994 accident in Charlotte, North Carolina.

PIPELINE

Gas hazard education. An educational campaign to alert the people of Puerto Rico to the hazards of propane gas leaks and to the safety measures to take was prompted by an NTSB investigation into the worst pipeline accident in its 30-year history. In November 1996, a cracked and leaking gas line led to the explosion of a commercial building in San Juan that killed 33 people and injured 69. To accurately detect gas leaks, repair them and locate pipelines, the Puerto Rican government, as a result of the Board's recommendation, also ordered all operators of underground facilities to update their maps of buried facilities throughout the island.

Limit oil spills. To help limit oil spills when liquid pipelines rupture, pipeline operators were required to reevaluate and improve their spill response plans as a result of a disastrous flood near Houston, Texas, in October 1994. Flooding caused eight pipelines to break, dumping 35,000 barrels of petroleum products into the San Jacinto River. The petroleum ignited, causing injuries to more than 500 people. Cleanup and property damage topped $23 million. Federal pipeline regulators also completed two technical studies on pipeline risk factors from natural disasters and are developing a national pipeline mapping system.

MARINE

More life jackets on ships. As a result of an NTSB safety study, the U.S. Coast Guard and the International Maritime Organization now require that extra life jackets, in addition to those in passenger rooms, be placed in strategic locations on large U.S. and foreign passenger carrying ships. Boats for hire operating along the coasts of the United States are also now required to have better designed inflatable rafts, radio beacons to help emergency response teams locate them in emergencies, and accurate passenger lists on shore. These changes stem from several NTSB accident investigations of bulk carriers, charter fishing boats, and passenger vessels.

Fighting fatigue. Pilots who navigate ships along the Alaskan coast have been alerted to the dangers of fatigue and sleep disorders because of an NTSB investigation of a 1995 cruise ship accident. More than 2,200 passengers and crew were on board the ship when it grounded in a canal near Juneau, Alaska. Poor pilot performance, compounded by chronic fatigue and sleep apnea, was blamed for the accident, which caused economic damages of $27 million.

RAIL

Safer Washington Metrorail. The rapid rail system in the nation's capital adopted NTSB recommendations to improve safety following a 1996 accident that killed an operator and injured two passengers. The NTSB investigated when a computer-programmed train overshot a station in poor weather, hitting a parked train. Now manual train operation is required in adverse weather, along with recurrent manual operation training. The transit company instituted better distribution of safety information to its crews. It also improved its internal emergency response and emergency response from agencies in the District of Columbia, Maryland, and Virginia.

Safer freight trains. After a series of preventable freight train accidents, federal regulators now require an inexpensive, but vital, piece of equipment on freight trains that traverse steep grades. These "end-of-train" devices allow an engineer to apply brakes from the back of the train as a backup when there is a blockage in the brake lines. NTSB investigations of two disastrous freight train wrecks, in 1994 and 1996 near Cajon Junction, California, showed that these devices could have stopped runaway trains.

Old steam locomotive safety. Operators of popular nostalgia tourist train trips using old steam locomotives are getting new federal and industry guidance on how to monitor, inspect, and repair old fashioned boilers. Melding history with safe operation of steam engines stems from a 1995 accident near Gettysburg, Pennsylvania. A poorly maintained boiler on a tourist train exploded, seriously injuring three crew members. Annually, 5 million people take train rides using vintage equipment.

NEW STATE LAWS

Driving and boating safety. During the past year several states have enacted laws that fulfill NTSB recommendations.

- Nine states enacted "zero tolerance" (blood alcohol level of 0.02% or less) alcohol laws for automobile drivers under 21 (Colorado, Georgia, Hawaii, Louisiana, Nevada, North Dakota, Vermont, Texas, and Wisconsin).

- Seven states enacted graduated automobile licensing laws that put restrictions on younger drivers (California, Connecticut, Georgia, Hawaii, Illinois, New Hampshire, and Ohio).

- Two states and the District of Columbia enacted primary safety belt enforcement laws (police officers are allowed to stop citizens for not wearing seat belts). (Maryland and Oklahoma)

- Five states strengthened automobile child safety requirements by expanding coverage in laws (Florida, Louisiana, Missouri, New Hampshire and Virginia).

- Three states passed new requirements for children to wear personal flotation devices while on board boats (Connecticut, Illinois, and Tennessee).

"Most Wanted" Safety Recommendations

The Board uses its "Most Wanted" list of transportation safety improvements to focus attention on Board recommendations that have the most potential to save lives and to highlight recommendations with the greatest impact on transportation safety. In May 1997, the Board removed railroad hazardous materials tank car recommendations from the list because regulations are being modified to achieve an acceptable level of safety. The Board also added four issues to the list in 1997. Those issues are:

Airframe Structural Icing

The hazards of aircraft structural icing were first addressed by the Board in a 1981 safety study. New safety recommendations were issued following the Board's investigation of an in-flight icing encounter and loss of control by American Eagle flight 4184 at Roselawn, Indiana, on October 31, 1994. Airframe structural icing was also an issue being looked into as a result of the accident that occurred on January 9, 1997, involving Comair flight 3272 near Monroe, Michigan. At the Board's request, research on icing is being conducted at the National Center for Atmospheric Research and the National Aeronautics and Space Administration Lewis Research Center.

Explosive Mixtures in Fuel Tanks on Transport Category Aircraft

As a result of the Board's on-going investigation of the TWA flight 800 crash near East Moriches, New York, on July 17, 1996, four recommendations were issued to the FAA to require the development and implementation of design or operational changes that will preclude the operation of transport category airplanes with explosive fuel-air mixtures in the fuel tank. The Board asked that consideration be given to the development of airplane design modifications -- such as the addition of insulation between heat-generating equipment and fuel tanks -- for both newly certificated airplanes and, where feasible, for existing airplanes.

Airplane Cargo Compartment Fires

The hazard of fire in airplane cargo compartments was first highlighted in safety recommendations issued following the Board's investigation of an accident in February 1988, involving American Airlines flight 132 in Nashville, Tennessee. The airplane was carrying a 104-pound fiber drum of textile treatment chemicals that was undeclared and improperly packaged. An in-flight fire broke out in the cargo compartment. Later that year the Board asked the FAA to require fire and smoke detection systems for all Class D cargo compartments. The FAA initiated regulatory action in response to this recommendation, but never issued a final rule. The need for fire detection and suppression systems in cargo compartments was again highlighted during the investigation of the ValuJet accident in May 1996 near Miami, Florida, when poorly packaged oxygen generators were improperly carried as cargo, resulting in a fire in the cargo compartment, with the subsequent loss of the aircraft and all 110 persons on board. The Board again called on the FAA to require smoke detection and fire suppression systems for all Class D cargo compartments. The FAA responded that it would move as quickly as possible to issue a final rule.

Automatic Information Recording Devices

The Board has consistently sought the use of event data recorders in all modes of transportation to assist in accident investigations and the determination of probable cause. The need for and benefits of information about the events leading up to an accident/incident cannot be overstated. In order to fully define transportation safety problems and to propose effective solutions to these problems, accident investigators need the information that is provided by automatic data recorders.

In addition to the four issues added in 1997, the list highlighted these other areas needing safety improvements:

- Expanded parameter on flight data recorders
- Positive train separation
- Human fatigue in transportation operations
- Airport runway incursions
- Fishing vessel safety
- Youth highway crashes
- Excavation damage prevention to underground facilities
- Aircraft wake turbulence
- Administrative revocation of drivers' licenses
- School bus safety
- Heavy commercial truck safety
- Small passenger vessel safety
- Mode C intruder conflict alert in airport terminal areas
- Airline pilot background checks
- Recreational boating safety
- Safety of passengers on railroad passenger cars
- Highway vehicle occupant protection

FAMILY ASSISTANCE PROGRAM

The Aviation Disaster Family Assistance Act of 1996 (PL 104-264), passed by the Congress and signed by the President on October 9, conferred major new responsibilities on the NTSB for aiding the families of victims of aircraft accidents on U.S. territory. This new law closely followed a Presidential Executive Memorandum (dated September 9), which designated the Board as the coordinator of federal services for families of victims of major transportation disasters.

These actions were taken in response to inadequacies in the treatment accorded to families of victims in the wake of a number of major crashes. The intent was to marshal the resources of the Federal government and other organizations in support of the efforts of the airlines and local authorities, which traditionally had the responsibility of meeting the needs of aviation disaster victims and their families.

Under the new legislation, the airlines retain primary responsibility for notification of and caring for the families of accident victims. Similarly, local authorities maintain the same jurisdiction they had prior to the Act in areas such as emergency response, victim recovery, site security, medical examiner operations, and site cleanup.

The law gives the NTSB primary Federal responsibility for facilitating the recovery and identification of fatally injured airline passengers. In addition, to the extent practicable, the Board is to provide victims' families with information on the accident investigation before it is released to the media, including updates on victim recovery and identification and the disposition of personal effects.

The Board also has the primary responsibility to coordinate and integrate the efforts of other federal and private organizations in such areas as crisis counseling, forensic services, communicating with foreign governments, and translation services. Memoranda of understanding have been signed that have specified the responsibilities of these organizations.

It is planned that, under NTSB direction, the American Red Cross will provide crisis counseling to the families. The Department of Health and Human Services (DHHS) will be responsible for assisting the local medical examiner in the identification and return of remains to the families. Upon request of the medical examiner, the Board will ask the DHHS to provide a National Disaster Mortuary (D-MORT) Team composed of forensic pathologists, finger print experts, and other medical/technical personnel. The DHHS can also provide a fully equipped mobile mortuary to expand the local medical examiner's capabilities.

The Department of Defense (DOD) will also support victim identification efforts by providing military resources, such as personnel from the Armed Forces Institute of Pathology and the use of military facilities. If there are any foreign passengers or crew, the Department of State (DOS) will work with the victim's government and help the affected families travel to the United States. The DOS also will provide translation services to facilitate communication with all the parties. The NTSB also can call on the Federal Emergency Management Agency (FEMA) to augment the Board's public information efforts with additional staff and any communications equipment that may be needed. If the cause of an accident is due to a criminal act, the Department of Justice will provide information to the families on assistance available under the Victims of Crime Act of 1984.

Office Of Family Affairs

In October 1996, Public Law 104-264 gave the Board the additional responsibility of coordinating the federal effort for the families of the victims of major aviation accidents. Since that time, the Board has hired a Family Affairs staff of seven; developed, in concert with family advocacy groups and the aviation industry, a Board family assistance plan; and provided family assistance at the following four accidents:

- United Express flight 5925 runway collision in Quincy, Illinois – 14 fatalities
- Comair flight 3272 accident in Monroe, Michigan – 29 fatalities
- Korean Air flight 801 in Guam – 228 fatalities
- Scenic Airlines in Montrose, Colorado – 9 fatalities

The Board's plan, which will continue to be updated, has been shared with dozens of groups, ranging from the Air Transport Association of America and the American Bar Association, to family members of accident victims and mental health professionals -- particularly the American Red Cross.

In July 1997, the Board's staff assisted TWA flight 800 family members in arranging activities, including a tour of the Calverton, New York, wreckage hangars, to commemorate the first anniversary of that tragedy. Arrangements were also made to see to family needs at the Board's TWA investigative hearing held in December, and similar arrangements are being made for KAL flight 801 family members at our hearing regarding that accident to be held in March.

The family assistance for the Korean Air flight 801 accident in Guam exceeded any other which the Board has launched. Three Board employees and a D-MORT team composed of forensic pathologists, odontologists, anthropologists, funeral directors, and FBI fingerprint experts, along with D-MORT equipment, were sent to Guam to assist in victim identification and other family affairs issues. Board and D-MORT personnel were on Guam for about one month to assist the more than 700 family members who traveled to Guam in that one month period. Family members were provided twice daily briefings on the accident, and extensive briefings and private meetings were held regarding victim identification. Because of language differences and the lengthy victim recovery, family assistance at this accident was extremely delicate.

Congress recently passed legislation amending the Aviation Disaster Family Assistance Act of 1996 to require foreign air carriers flying in or out of the United States to file family assistance plans and fulfill the same family support requirements as their domestic counterparts. This disparity in the previous legislation was brought to light and corrected as a result of the Board's experiences with the crash of Korean Air flight 801. At the time of that accident, Korean Air did not have a plan of its own to support the family members who traveled to the accident site, nor were they aware of the Board's new family responsibilities.

In October 1997, eight employees of the Bureau of Reclamation and the pilot were killed in an accident that occurred near Montrose, Colorado. Federal agencies are currently not required to have a plan to assist their employees' family members should an accident occur. As recommended by the White House Commission on Aviation Safety and Security, Board staff is meeting regularly with Executive Branch officials to assist in their development of a plan to assist their employees' families following an aviation disaster.

In an effort to promote an understanding of the federal government's role in family affairs, in September 1998, the Board will host an international symposium in Washington, D. C. This symposium will be an opportunity to educate individuals and organizations responding to these tragedies by asking them to share experiences and new techniques in disaster resource management.

TRANSPORTATION FATALITIES IN 1997

Deaths from transportation accidents in the United States totaled 44,619. The overall number, derived from all modes of transportation, showed a very narrow increase over the 1996 total of 44,603 fatalities, according to preliminary figures.

Highway fatalities accounted for more than 94 percent of the transportation deaths, reaching a total of 42,000 for the year. The largest increase in highway deaths occurred in the category of light trucks and vans, which recorded 422 more fatalities in 1997 than in 1996. This continues a five-year trend in which this category has accounted for a larger share of highway deaths each year, from 21 percent in 1993 to 25 percent last year. Passenger car fatalities have remained at about 54 percent each year.

The number of persons killed in aviation accidents dropped from 1,093 in 1996 to 976 in 1997, despite a large increase involving aircraft not registered in the United States. The 236 deaths in that category, compared with just 5 in 1996, are mostly attributable to the 228 persons who died aboard Korean Air flight 801, which crashed in Guam in August. While general aviation fatalities increased from 631 to 646, airline deaths fell from 380 in 1996, the year of the ValuJet and TWA flight 800 accident, to 8 in 1997.

Fatalities involving rail transportation fell from 752 to 746 in 1997, with the vast majority (584) being persons walking along or crossings tracks. Deaths among train passengers dropped from 12 to 6.

Marine deaths increased from 814 to 870, due to an increase of almost 100 recreational boating fatalities. Fatalities in marine cargo transportation and commercial fishing declined.

Pipeline fatalities fell from 53 in 1996 (33 of them in one accident in Puerto Rico) to 11 in 1997.

National Transportation Safety Board 1997 U.S. Transportation Fatalities

		1996	1997[1]
Highway:	Passenger cars	22,416	22,227
	Light trucks and vans	9,901	10,323
	Pedestrians	5,412	5,300
	Motorcycles	2,160	2,099
	Pedalcycles	761	800
	Medium and heavy trucks	621	711
	Buses	21	15
	All other	615	525
	Total	41,907	42,000
Grade Crossings:	[2]	(488)	(450)
Rail:	Trespassers and nontrespassers[3]	570	584
	Employees and contractors	42	49
	Passengers on trains	12	6
	Light and commuter rail	128	107
	Total	752	746
Marine:	Recreational boating	709	800
	Cargo transport	29	16
	Commercial fishing	76	54
	Total	814	870
Aviation:	General aviation	631	646
	Airlines	380	8
	Air taxi	63	40
	Commuter	14	46
	Foreign / unregistered[4]	5	236
	Total	1,093	976
Pipeline:	Gas[5]	48	11
	Liquids	5	0
	Total	53	11
Grand Total:		**44,619**	**44,603**

[1]1997 figures are preliminary estimates supplied by the modal agencies within the Department of Transportation.

[2]Grade crossing fatalities are not counted as a separate category for determining the grand totals because they are included in the highway and rail categories, as appropriate.

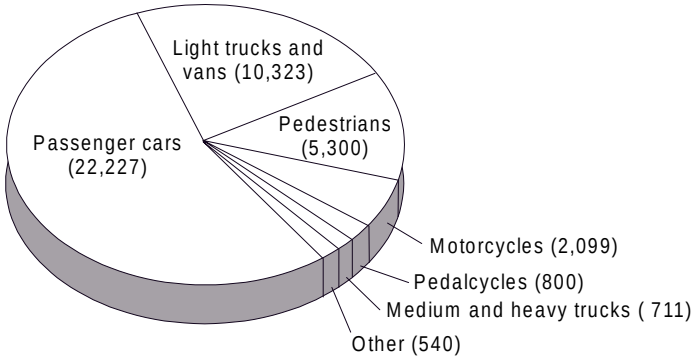
[3]Does not include motor vehicle occupants killed at grade crossings.

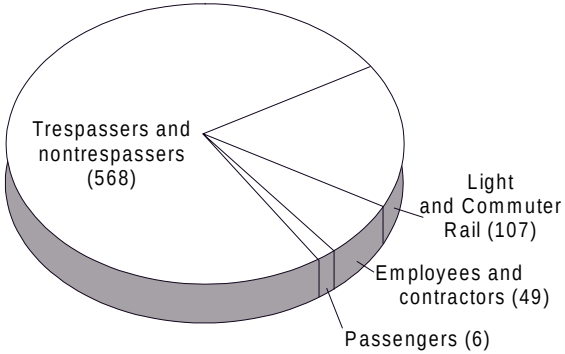
[4]Includes non-U.S. registered aircraft involved in accidents in the United States.

[5]The number of pipeline-related fatalities for 1996 gas systems includes 33 associated with explosion in San Juan, Puerto Rico, on November 21, 1996.

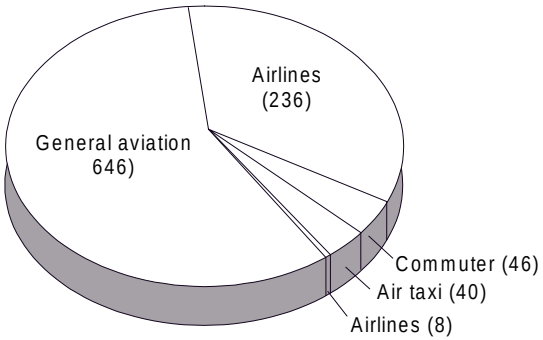
NATIONAL TRANSPORTATION SAFETY BOARD
44,603 Transportation Fatalities In 1997

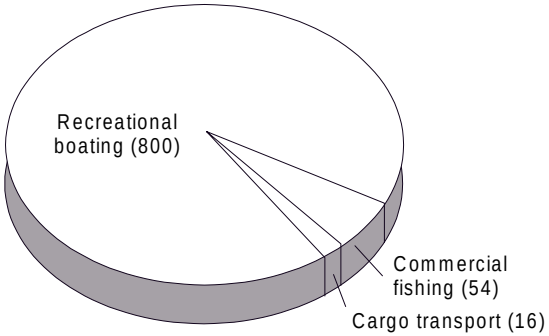
Highway: 42,000 **Grade crossings: 450** **Rail: 746**





Aviation: 976 **Pipeline: 11** **Marine: 870**





Note: All data are preliminary estimates. Grade crossing fatalities are not included in the grand total because they were counted in the rail and highway categories, as appropriate. The pie charts are not drawn proportionately to each other. Aviation data comes from the NTSB; all other data are from the U.S. Department of Transportation. Pipeline-related fatalities could increase by 33, pending official determination of the probable cause of the explosion in San Juan, Puerto Rico, on November 21, 1996.

AVIATION SAFETY

The Federal Aviation Act of 1958 and the Independent Board Act of 1974 placed the responsibility for investigating and determining the probable causes of all civil aviation accidents with the NTSB. Recent legislation also has authorized the Board to investigate accidents involving public use (government) aircraft, except those operated by the armed forces and intelligence agencies.

In practice, the Board sometimes delegates general aviation accidents to the FAA for investigation--primarily those involving agricultural, experimental, or home-built aircraft. However, although it may delegate the actual investigative fact finding to another agency, the Board is the only entity that may make an official determination of probable cause.

The Board is also charged with carrying out studies, special investigations, and assessments on issues that are aviation-related. In 1997, these included a study of turbulence, runway incursions, and air traffic controller shift rotations.

Because of the international nature of the air transportation industry and of the leading role of the United States in the development of aviation technologies, the Board's investigation of domestic accidents and participation in foreign investigations is essential to the enhancement of aviation safety on a worldwide basis. The Board fulfills U.S. obligations with regard to foreign accident investigations, established by treaty under the auspices of the International Civil Aviation Organization, by sending accredited representatives to participate in investigations in cases where U.S. interests are involved. These typically concern accidents involving U.S. airlines in foreign territories or U.S. manufactured aircraft or major components (e.g. engines) operated/utilized by foreign carriers. U.S. manufacturers and operators rely heavily on the Board to facilitate their access to foreign accident investigations. The safety issues that arise in these investigations often have wide-reaching implications for the aviation industry.

Foreign governments often request the assistance of NTSB analysts and laboratory specialists in their investigations. The Board's major aviation accident reports, safety recommendations, and accident statistics are disseminated worldwide and have a direct influence on the safety policies of foreign aviation authorities and airlines. The NTSB's role in international civil aviation safety has a direct impact on ensuring the safe transportation by air of U. S. citizens in the United States and overseas, as well as the general traveling public. The Board's role also ensures the high quality of aviation products operated worldwide.

Another important aspect of the NTSB's mandate is to investigate the more than 2,000 general aviation accidents that occur annually. In addition, the NTSB investigates accidents and incidents that are less complex and involve only property damage, as they often provide information that may be helpful in preventing accidents.

The NTSB serves as the nation's primary repository of aviation accident statistics and other related data, but its approach goes beyond the collection of data and a narrow determination of probable cause.

Typically, NTSB investigations examine all factors surrounding an accident or series of accidents or serious incidents, thereby ensuring that the regulatory agencies and the industry are provided with a thorough and objective analysis of actual, as well as potential, deficiencies in the transportation system. Only then can solutions be proposed to correct deficiencies that may have caused the accident.

Office Of Aviation Safety

The Office of Aviation Safety has the responsibility for investigating aviation accidents and incidents and for proposing probable causes for Board approval. Working with other NTSB units, the office also formulates aviation safety recommendations.

The staff is located in Washington, DC, and in 10 regional and field offices in major metropolitan areas throughout the United States. The office is composed of six divisions: Major Investigations, Regional Operations and General Aviation, Operational Factors, Human Performance, Aviation Engineering, and Survival Factors.

When the Board is notified of a major accident, it launches a "Go Team," which varies in size depending on the severity of the accident and the complexity of the issues involved. The team may consist of experts in as many as 14 different specialties. Each expert manages a group of other specialists from government agencies and industry in the collecting the facts and determining the conditions and circumstances surrounding the accident.

The participation of these other (non-NTSB) parties multiplies the Board's resources and fosters a greater likelihood of general agreement over the findings of the investigation. It also allows first-hand access to information so that timely corrective actions may be taken by the appropriate parties.

A public hearing may be convened or depositions may be taken to collect additional information and review the progress of the investigation to date. After an investigation is completed, a detailed narrative report is prepared that analyzes the investigative record and identifies the probable cause of the accident.

Safety recommendations resulting from major investigations generally are included in the final accident report, although, in the interest of safety, they may be issued at any time during the course of the investigation if deemed necessary by the Board.

The major investigations division provides the investigator-in-charge (IIC) for an accident and coordinates the preparation of the Board's aviation accident reports. The NTSB group chairman, under the direction of the IIC, coordinates the efforts of the other expert participants provided by industry and other government agencies in accident investigations.

Operational factors experts in three disciplines (air traffic control, operations, and weather) support major investigations with intensive work in the specialties. Aviation engineering experts provide strong technical skills in four areas: powerplants, structures, systems, and maintenance. Human performance specialists review the background and performance of persons associated with an accident. Survival factors experts investigate circumstances that affect the survival of persons involved in accidents, including the causes of injuries and fatalities.

The Office of Aviation Safety manages the NTSB's international aviation affairs program. It does this by providing the leadership of U.S. teams in support of foreign investigations that are conducted by other nations in accordance with the Convention on International Civil Aviation. The Office also maintains liaison and coordination with other governments with the U.S. Interagency Group on International Aviation and the International Civil Aviation Organization.

Completed Major Aviation Investigations

The Board completed action on four major aviation investigations in 1997. Below is a list of those accidents, followed by a summary of the Board's findings.

- May 11, 1996 – ValuJet Airlines flight 592 -- Miami Florida
- October 19, 1996 -- Delta Air Lines flight 554 -- LaGuardia Airport, New York
- November 19, 1996 -- United Express flight 5925 and Beech King Air -- Quincy, Illinois
- December 22, 1996 -- Airborne Express -- Narrows, Virginia

ValuJet Airlines/Miami, Florida

On May 11, 1996, ValuJet flight 592, a DC-9-32, crashed into the Everglades about 10 minutes after takeoff from Miami International Airport. Both pilots, three flight attendants, and all 105 passengers were killed. The Board's investigation revealed that the aircraft experienced intense in-flight fire leading to the crash.

Issues examined by the Board included: minimization of the hazards posed by fires in class D cargo compartments; equipment, training, and procedures for addressing in-flight smoke and fire aboard air carrier airplanes; guidance for handling of chemical oxygen generators and other hazardous aircraft components; procedures for handling company materials and hazardous materials; ValuJet's oversight of its contract maintenance facilities; the FAA's oversight of ValuJet and ValuJet's contract maintenance facilities; the FAA's and the Research and Special Programs Administration's hazardous materials program and undeclared hazardous materials in the U.S. mail; and ValuJet's procedures for boarding and accounting of lap children.

On August 19, 1997, the Board determined that the accident, resulting from a fire in the Class D cargo compartment from the actuation of one or more oxygen generators improperly carried as cargo, was probably caused by the failure of SabreTech (the company that performed maintenance under contract for ValuJet) to properly prepare, package, identify, and track unexpended chemical oxygen generators before presenting them to ValuJet for carriage; the failure of ValuJet to properly oversee its contract maintenance program to ensure compliance with maintenance, maintenance training, and hazardous materials requirements and practices; and the failure of the FAA to require smoke detection and fire suppression systems in Class D cargo compartments.

It was also determined that the FAA failed to adequately monitor ValuJet's heavy maintenance program and responsibilities, including ValuJet's oversight of its contractors and SabreTech's repair station certificate, and that the FAA failed to adequately respond to prior chemical oxygen generator fires with programs to address the potential hazards. ValuJet also failed to ensure that both ValuJet and its contract maintenance employees were aware of the carrier's no-carry hazardous materials policy, and they failed to provide appropriate hazardous materials training.

Delta Air Lines/LaGuardia Airport, New York

On October 19, 1996, Delta Air Lines flight 554, an MD-88, struck the approach light structure at the end of the runway deck during the approach to land on runway 13 at LaGuardia Airport, New York. The flight was a regularly scheduled domestic passenger flight from Atlanta, Georgia, with two crew members, three flight attendants, and 58 passengers on board. There were no fatalities or serious injuries as a result of the accident. The airplane sustained substantial damage to the lower fuselage, wings, main landing gear, and both engines.

Safety issues examined by the Board included possible hazards of monovision contact lenses, visual illusions encountered during the approach, non-instantaneous vertical

speed information, weather conditions encountered during the approach, the guidance in air carriers' manuals regarding flightcrew member duties, the stabilized approach criteria in air carriers' manuals, emergency evacuation procedures, criteria for special runways and/or approaches, and runway light spacing.

On August 25, 1997, the Board determined that the probable cause of the accident was the inability of the captain, because of his use of monovision contact lenses, to overcome his misperception of the airplane's position relative to the runway during the visual portion of the approach. This misperception occurred because of visual illusions produced by the approach over water in limited light conditions, the absence of visual ground features, the rain and fog, and the irregular spacing of the runway lights.

United Express and Beech King Air/ Quincy, Illinois

On November 19, 1996, United Express flight 5925, a Beech 1900C, collided with a Beech King Air A90 at Quincy Municipal Airport near Quincy, Illinois. Flight 5925 was completing its landing roll on runway 13, and the King Air was in its takeoff roll on runway 4. The collision occurred at the intersection of the two runways and resulted in a fire that engulfed both airplanes. All 10 passengers and two crew members aboard flight 5925 and the two occupants aboard the King Air were killed.

Safety issues examined by the Board included the importance of emphasizing careful visual scanning techniques during flight training, Beech 1900C certification standards and the crash worthiness and placarding of emergency exit doors, the certification of small airports used by scheduled commuter airlines, and aircraft rescue and fire fighting protection on scheduled commuter aircraft having 10 seats or more.

On July 1, 1997, the Board determined that the failure of the pilots in the King Air A90 to effectively monitor the common traffic advisory radio frequency or to properly scan for traffic was the probable cause of the accident. A Cherokee pilot's interrupted radio transmission which led to a misunderstanding of the transmission contributed to the accident.

Airborne Express/Narrows, Virginia

On December 22, 1996, a DC-8-63, operated by Airborne Express, Inc., struck mountainous terrain in the vicinity of Narrows, Virginia, while on a post-modification functional evaluation flight. The airplane was destroyed by the impact and a post-crash fire. The three flightcrew members and three maintenance-avionics technicians on board were fatally injured.

Issues examined by the Board included airplane stall recovery procedures for functional evaluation flights, stall warning systems, fidelity of the Airborne Express DC-8 flight training simulator, guidelines and limitations for conducting functional evaluation flights, and the FAA oversight of air carrier functional evaluation flight programs.

On July 15, 1997, the Board determined that the inappropriate control inputs applied by the flying pilot during a stall recovery attempt, the failure of the non-flying pilot-in-command to recognize, address, and correct the inappropriate control inputs, and the failure of Airborne Express to establish a formal, functional evaluation flight program were the probable causes of the accident. The inoperative stick shaker stall warning system and Airborne Express' DC-8 flight training simulator's inadequate fidelity in reproducing the airplane's stall characteristics contributed to the accident.

On-Going Major Aviation Investigations

The Board had six on-going major aviation investigations of accidents that occurred in 1997. Below is a list of those accidents, followed by a summary of each.

- January 9, 1997 – Comair flight 3272 -- Monroe, Michigan
- May 12, 1997 – American Airlines flight 903 -- West Palm Beach, Florida
- July 31, 1997 – Federal Express flight 14 -- Newark, New Jersey
- August 5, 1997 – Korean Airlines flight 801 -- Guam
- August 7, 1997 – Fine Air flight 101 -- Miami, Florida
- October 8, 1997 – Scenic Airlines -- Montrose, Colorado

Comair flight 3272/Monroe, Michigan

On January 9, 1997, Comair flight 3272, an Embraer 120, crashed near Monroe, Michigan, destroying the airplane and killing all 29 people on board. There were reports of moderate icing in the area at the time of the accident.

In May 1997, the Board issued four urgent safety recommendations to the FAA regarding icing. Almost concurrently, the FAA issued a notice of proposed rulemaking to modify operating procedures in icing conditions. Comair has modified its operating procedures based on the FAA's proposed rule, and the FAA issued a final rule. The Board is working with the National Center for Atmospheric Research and the NASA Lewis Research Center regarding weather issues, and in January 1998, Board personnel traveled to Brazil, where the airplane is manufactured, to review all pertinent test data on icing and to perform studies in the engineering simulator.

Issues being examined regarding this accident include flightcrew training, operations in icing conditions, and aircraft performance.

American Airlines/over West Palm Beach, Florida

On May 12, 1997, American Airlines flight 903, an Airbus A300, departed controlled flight over West Palm Beach, Florida. While flying level at 16,000 feet in instrument conditions, the airplane pitched, rolled, and descended rapidly. The flightcrew regained control at 12,500 feet. Flight attendants informed the captain of injuries in the passenger cabin, and he declared an emergency and landed at Miami International Airport without further incident.

Issues being examined include the design and use of flight automation systems and passenger safety during flight upsets.

Federal Express/Newark, New Jersey

On July 31, 1997, Federal Express flight 14, an MD-11, experienced a hard landing, bounced, and then rolled, causing the right wing tip to strike the ground. A fire broke out shortly after the hard landing, and the airplane came to rest inverted. The airplane and cargo were destroyed by the impact and the post-crash fire. The two pilots and three company personnel on the aircraft were able to exit the wreckage through the pilot's windows.

Issues being examined by the Board include main landing gear design and pilot recovery technique from a bounced landing.

Korean Air/Guam

On August 5, 1997, Korean Air flight 801, a Boeing 747-300, crashed into a hillside while attempting to land at Won Pat International Airport at Agana, Guam. The airplane was on a regularly scheduled passenger flight from Seoul, Korea, to Guam. There were 254 passengers and crew members aboard the

aircraft; 228 lost their lives. At the time of the accident, there was heavy rain. The glide slope for the runway had been reported as out of service since July 7, 1997, and remained so until September 1997.

Issues being examined by the Board include controlled-flight-into-terrain, air traffic control, and policies and procedures for installation and maintenance of navigational aids.

Agana, Guam. Korean Airlines flight 801 crashed on August 5, 1997.

Agana, Guam. 228 of the 254 people on board lost their lives on Korean Airlines flight 801.

Agana, Guam. Korean Airlines flight 801 crashed into a hillside.

Fine Air/Miami, Florida

On August 7, 1997, Fine Air flight 101, a DC-8-61 cargo plane, crashed shortly after takeoff from Miami International Airport, Miami, Florida. The airplane initially crashed in the grass at the end of the runway then slid through the airport fence, across a four-lane road, and into an industrial office/warehouse complex. The airplane had a crew of four. All on board and a driver on the ground were killed.

Issues being examined include cargo lock-down procedures, cargo balance when loading, flight data recorder malfunctions, and FAA oversight of cargo airlines.

Miami, Florida. August 7, 1997. Fine Air flight 101. Cargo plane crashed shortly after takeoff.

Miami, Florida. The cargo plane crashed into the grass at the end of the runway.

Miami, Florida. After crashing airplane ran through the runway fence, slid across a four lane road and into an industrial office/ warehouse.

Public Hearing

In December 1997, the Board held a week-long public hearing concerning the TWA flight 800 accident in Baltimore, Maryland.

On July 17, 1996, a Boeing 747-131, operated as Trans World Airlines flight 800 (TWA800), crashed into the Atlantic Ocean, about 8 miles south of East Moriches, New York, after taking off from John F. Kennedy International Airport, Jamaica, New York. All 230 people aboard the airplane were killed. The airplane was bound for Charles De Gaulle International Airport, Paris, France.

Issues discussed at the hearing included recovery operations, recorded data and wreckage examination, medical factors and cabin interior, fuel flammability, aircraft design and certification, ignition sources, aging aircraft, and flammability reduction.

The Board has been able to:

- complete an underwater search and salvage operation of unprecedented scope -- diving and trawling operations that covered 40 square miles of ocean floor;
- create a 94-foot long reconstruction of the center section of the airplane to better demonstrate the relationship of the various pieces of structure and systems and the sequence of the breakup of the airplane (this is the largest aircraft reconstruction in the world);
- conduct test flights with a leased Boeing 747-100 outfitted with over 150 sensors that measured temperature, vibrations, and pressure in the center wing tank;
- conduct a series of explosives tests on a retired Boeing 747-100 located in Bruntingthorpe, England;
- contract with the California Institute of Technology to study the explosive characteristics of Jet A fuel, and contract with the University of Nevada at Reno to study the chemical characteristics of Jet A fuel;
- conduct several quarter scale fuel/air vapor explosion tests in a custom-built, reusable center wing tank model;
- contract with two independent computational engineering firms to create a mathematical model of the fuel/air explosion dynamics being studied in the quarter scale testing;
- conduct at Wright Patterson Air Force Base extensive testing of static charging related to spraying and dripping fuel; and
- conduct numerous examinations of fuel system wiring – both from TWA flight 800 and from other retired Boeing 747s.

Since the accident the Board recommended that the FAA:

Require the development of and implementation of design or operational changes that will preclude the operation of transport-category airplanes with explosive fuel/air mixtures in the fuel tanks.

Require that the B-747 flight handbooks of TWA and other operators of B-747s and other aircraft in which fuel tank temperature cannot be determined by flightcrews be immediately revised to reflect the increases in center wing tank (CWT) fuel temperatures found by flight tests, including operational procedures to reduce the potential for exceeding CWT temperature limitations.

Require modification of the CWT of B-747 airplanes and the fuel tanks of other airplanes that are located near heat sources to incorporate temperature probes and cockpit fuel tank temperature displays to permit determination of the fuel tank temperatures.

Require research in copper-sulfide deposits on fuel quantity indication system parts in fuel tanks to determine the levels of deposits that may be hazardous, how to inspect and clean the deposits, and when to replace the components.

Require, in all applicable transport airplane fuel tanks, surge protection systems to prevent electrical power surges from entering fuel tanks though fuel quantity indication system wires.

Develop and implement procedures, including a checklist of safety-related items, for the handling and placement of explosive training aids by K-9 explosives detection teams to prevent contamination of aircraft and airport facilities and to ensure an effective K-9 explosives detection program.

Major Launches 1997

Accident Date	Operator, Aircraft	Location
01/09/97	Comair Flight 3272, Embraer 120	Monroe, Michigan
05/12/97	American Airlines Flight 903, Airbus A300	near Palm Beach, Florida
07/30/97	Federal Express Flight 14, MD-11	Newark, New Jersey
08/5/97	Korean Airlines Flight 801, 747-300	Agana, Guam
08/7/97	Fine Airlines Flight 101, DC-8	Miami, Florida
10/8/97	Scenic Airlines	Montrose, Colorado

Major Investigations Completed 1997

Board Meeting	Operator, Aircraft	Location
02/11/97	Continental Airlines Flight 1943, DC-9-30	Houston, Texas
02/25/97	Cessna 177B	Cheyenne, Wyoming
06/17/97	Delta Air Lines Flight 554, MD-88	Flushing, New York
07/1/97	United Express Flight 5925, Beech King Air 1900C	Quincy, Illinois
07/15/97	Airborne Express, DC-8	Narrows, Virginia
8/19/97	ValuJet Airlines Flight 592, DC-9	Everglades, Florida

GENERAL AVIATION INVESTIGATIONS IN 1997

In 1997, the NTSB's regional and field offices initiated 2,097 general aviation accident investigations. Although these investigations generally do not have the high visibility of those involving major air carriers, they are an important source of transportation safety information. In addition, the NTSB regional offices investigated 61 aviation incidents in 1997. Incidents are defined as occurrences not serious enough to be considered accidents, but incident investigations often can lead to significant safety improvements.

A general aviation accident is handled in a manner similar to a major investigation, but because the investigation typically is much smaller in scope, it often is conducted by a single regional investigator who, working with representatives from other parties, gathers the pertinent information. Analysts located at the Board headquarters review the standardized accident forms and narrative reports prepared by regional investigators for the public record. Computer "brief" reports containing relevant facts, findings, and probable causes are prepared for all regional investigations; and summary narrative reports are prepared for selected cases. The data from all investigations is maintained to identify trends, assess program effectiveness, and provide statistical support for NTSB safety recommendations and studies.

Table 1. Accidents, Fatalities, and Rates, 1996 Preliminary Statistics U.S. Aviation

	Accidents		Fatalities				Accidents per 100,000 Flight Hours		Accidents per 100,000 Flight Hours	
	All	Fatal	Total	Aboard	Flight Hours	Departures	All	Fatal	All	Fatal
U.S. air carriers operating under 14 CFR 121										
Scheduled	42	3	3	2	14,500,000	9,500,000	0.290	0.021	0.422	0.032
Nonscheduled	7	1	5	4	790,00	375,000	0.886	0.127	1.867	0.267
U.S. air carriers operating under 14 CFR 135										
Scheduled	16	5	46	46	1,120,000	1,580,000	1.429	0.446	1.013	0.316
Nonscheduled	82	16	40	40	1,980,000	n/a	4.14	0.81	n/a	n/a
U.S. general aviation	1,854	350	646	640	24,700,000	n/a	7.51	1.42	n/a	n/a
U.S. civil aviation	2,000	375	740	732						
Other accidents in the U.S.										
Foreign registered aircraft	15	4	233	231						
U.S. registered aircraft operated by foreign air carriers	1	0	0	0						
Unregistered aircraft	6	3	3	3						
U.S. registered aircraft operated abroad by foreign air carriers	4	1	2	2						

Notes **All data are preliminary.**
Hours and departures are compiled and estimated by the Federal Aviation Administration.
n/a - not available
Accidents and fatalities in the categories do not necessarily sum to the figures in U.S. civil aviation because of collisions involving aircraft in different categories.

Table 2. Accidents and Accident Rates by NTSB Classification, 1982-1997, for U.S. Air Carriers Operati
March 20, 1997 includes aircraft with 10 or more seats formerly operated under 14 CFR 135)

	Accidents				Accidents Hours Flown	Accidents per Mil	
Year	Major	Serious	Injury	Damage	(millions)	Major	Serious
1982	3	4	6	5	7.040	0.426	0.568
1983	4	2	9	8	7.299	0.548	0.274
1984	2	2	7	5	8.165	0.245	0.245
1985	8	2	5	6	8.710	0.918	0.230
1986	4	0	14	6	9.976	0.401	0.000
1987	5	1	12	16	10.645	0.470	0.094
1988	4	2	13	10	11.141	0.359	0.180
1989	8	4	6	10	11.275	0.710	0.355
1990	4	3	10	7	12.150	0.329	0.247
1991	5	2	10	9	11.781	0.424	0.170
1992	3	3	10	2	12.360	0.243	0.243
1993	1	2	12	8	12.706	0.079	0.157
1994	4	0	12	7	13.124	0.305	0.000
1995	3	2	14	17	13.510	0.222	0.148
1996	6	0	18	14	13.963	0.430	0.000
SEE NOTE BELOW							
1997	2	4	24	19	15.290	0.131	0.262

Notes **Effective March 20, 1997, aircraft with 10 or more seat must conduct scheduled passenger operations under 14 CFR 121.**
Definitions of NTSB Classifications
Major - an accident in which any of three conditions is met:
· a Part 121 aircraft was destroyed, or
· there were multiple fatalities, or
· there was one fatality and a Part 121 aircraft was substantially damaged.
Serious - an accident in which at least one of two conditions is met:
· there was one fatality without substantial damage to a Part 121 aircraft, or
· there was at least one serious injury and a Part 121 aircraft was substantially damaged.
Injury - a nonfatal accident with at least one serious injury and without substantial damage to a Part 121 aircraft.
Damage - an accident in which no person was killed or seriously injured, but in which any aircraft was substantially damaged.

**Table 3. Passenger Injuries and Injury Rates, 1982 through 1997, for U.S. Air Carriers Operating Unde
20, 1997 includes aircraft with 10 or more seats formerly operated under 14 CFR 135)**

Year	Passenger Fatalities	Passenger Serious Injuries	Total Passenger Enplanements (millions)	Mi En Pas
1982	210	17	299	
1983	8	8	325	
1984	1	6	352	
1985	486	20	390	
1986	4	23	427	
1987	213	39	458	
1988	255	44	466	
1989	259	55	468	
1990	8	23	483	
1991	40	19	468	
1992	26	14	494	
1993	0	7	505	
1994	228	16	545	
1995	152	15	561	
1996	319	16	590	
SEE NOTE BELOW				
1997	2	21	625	

Notes Injuries exclude flight crew and cabin crew.
Effective March 20, 1997, aircraft with 10 or more seats must conduct scheduled passenger operations under 14 CFR 135)

Table 4. Number and Rate of Destroyed Aircraft, 1982 through 1997, for U.S. Air Carriers Operating Und
20, 1997 includes aircraft with 10 or more seats formerly operated under 14 CFR 135)

Year	Hull Losses	Aircraft Hours Flown (millions)	Hull Losses per M F
1982	3	7.040	0
1983	2	7.299	0
1984	2	8.165	0
1985	8	8.710	0
1986	2	9.976	0
1987	5	10.645	0
1988	3	11.141	0
1989	7	11.275	0
1990	3	12.150	0
1991	5	11.781	0
1992	3	12.360	0
1993	1	12.706	0
1994	3	13.124	0
1995	3	13.510	0
1996	4	13.963	0
SEE NOTE BELOW			
1997	2	15.290	0

Note **Effective March 20,1997, aircraft with 10 or more seats must conduct scheduled passenger operations under 14 CFR 121.**

Table 5. Accidents, Fatalities, and Rates, 1982 through 1997, for U.S. Air Carriers Operating Under 14 CFR 121, Scheduled and Nonscheduled Service (Airlines) (since March 20, 1997 includes aircraft with 10 or more seats formerly operated under 14 CFR 135)

	Accidents		Fatalities					Accidents per 100,000 Flight Hours		Acci per 1 Miles
Year	All	Fatal	Total	Aboard	Flight Hours	Miles Flown	Departures	All	Fatal	All
1982	18	5	235	223	7,040,325	2,938,513,000	5,351,133	0.241	0.057	0.0058
1983	23	4	15	14	7,298,799	3,069,318,000	5,444,374	0.315	0.055	0.0075
1984	16	1	4	4	8,165,124	3,428,063,000	5,898,852	0.196	0.012	0.0047
1985	21	7	526	525	8,709,894	3,631,017,000	6,306,759	0.241	0.080	0.0058
1986	24	3	8	7	9,976,104	4,017,626,000	7,202,027	0.231	0.020	0.0057
1987	34	5	232	230	10,645,192	4,360,521,000	7,601,373	0.310	0.038	0.0076
1988	29	3	285	274	11,140,548	4,503,426,000	7,716,061	0.251	0.018	0.0062
1989	28	11	278	276	11,274,543	4,605,083,000	7,645,494	0.248	0.098	0.0061
1990	24	6	39	12	12,150,116	4,947,832,000	8,092,306	0.198	0.049	0.0049
1991	26	4	62	49	11,780,610	4,824,824,000	7,814,875	0.221	0.034	0.0054
1992	18	4	33	31	12,359,715	5,054,916,000	7,880,707	0.146	0.032	0.0036
1993	23	1	1	0	12,706,206	5,249,469,000	8,074,393	0.181	0.008	0.0044
1994	23	4	239	237	13,122,221	5,478,118,000	8,242,903	0.168	0.030	0.0040
1995	36	3	168	162	13,513,219	5,648,512,000	8,451,606	0.266	0.022	0.0064
1996	38	5	380	350	13,683,00	5,761,935,000	8,554,000	0.278	0.037	0.0066
SEE NOTE BELOW										
1997	49	4	8	6	15,290,000	6,441,911,000	9,875,000	0.320	0.026	0.0076

Notes **1997 data are preliminary.**
Hours, miles, and departures are compiled by the Federal Aviation Administration.
Effective March 20, 1997, aircraft with 10 or more seats must conduct scheduled passenger operations under 14 CFR 121.
The 62 total fatalities in 1991 includes the 12 persons killed aboard a Skywest commuter aircraft and the 22 persons killed abo the two aircraft collided.
The following suicide/sabotage cases are included in "Accidents" and "Fatalities" but are excluded from accident rates in this

Year	Location	Operator	Fatalities Total	Fatalities Abroad
1982	Honolulu, HI	Pan American	1	1
1986	Near Athens, Greece	Trans World	4	4
1987	San Luis Obispo, CA	Pacific Southwest	43	43
1988	Lockerbie, Scotland	Pan American	270	259
1994	Memphis, TN	Federal Express	0	0

Table 6. Accidents, Fatalities, and Rates, 1982 through 1997, for U.S. Air Carriers Operating Under 14 C
(Airlines) (since March 20, 1997 includes aircraft with 10 or more seats formerly operated under 14 CFI

	Accidents		Fatalities					Accidents per 100,000 Flight Hours		A p M
Year	All	Fatal	Total	Aboard	Flight Hours	Miles Flown	Departures	All	Fatal	A
1982	16	4	234	222	6,697,770	2,806,885,000	5,162,346	0.224	0.045	0.0
1983	22	4	15	14	6,914,969	2,920,909,000	5,235,262	0.318	0.058	0.0
1984	13	1	4	4	7,736,037	3,258,910,000	5,666,076	0.168	0.013	0.0
1985	17	4	197	196	8,265,332	3,452,753,000	6,068,893	0.206	0.048	0.0
1986	21	2	5	4	9,495,158	3,829,129,000	6,928,103	0.211	0.011	0.0
1987	32	4	231	229	10,115,407	4,125,874,000	7,293,025	0.306	0.030	0.0
1988	28	3	285	274	10,521,052	4,260,785,000	7,347,575	0.257	0.019	0.0
1989	24	8	131	130	10,597,922	4,337,234,000	7,267,341	0.226	0.075	0.0
1990	22	6	39	12	11,524,726	4,689,287,000	7,795,761	0.191	0.052	0.0
1991	25	4	62	49	11,139,166	4,558,537,000	7,503,873	0.224	0.036	0.0
1992	16	4	33	31	11,732,026	4,782,825,000	7,515,373	0.136	0.034	0.0
1993	22	1	1	0	11,981,347	4,936,067,000	7,721,975	0.184	0.008	0.0
1994	19	4	239	237	12,292,356	5,112,633,000	7,824,802	0.146	0.033	0.0
1995	34	2	166	160	12,770,405	5,326,266,000	8,102,491	0.266	0.016	0.0
1996	32	3	342	342	12,900,000	5,419,380,000	8,185,000	0.248	0.023	0.0
SEE NOTE BELOW										
1997	42	3	3	2	14,500,000	6,084,011,000	9,500,000	0.290	0.021	0.0

Notes **1997 data are preliminary.**
Hours, miles, and departures are compiled by the Federal Aviation Administration.
Effective March 20, 1997, aircraft with 10 or more seats must conduct scheduled passenger operations under 14 CFR 121.
The 62 total fatalities in 1991 includes the 12 persons killed aboard a Skywest commuter aircraft and the 22 persons killed aboar two aircraft collided.
The following suicide/sabotage cases are included in "Accidents" and "Fatalities" but are excluded from accident rates in this ta

Year	Location	Operator	Fatalities Total	Fatalities Abroad
1982	Honolulu, HI	Pan American	1	1
1986	Near Athens, Greece	Trans World	4	4
1987	San Luis Obispo, CA	Pacific Southwest	43	43
1988	Lockerbie, Scotland	Pan American	270	259
1994	Memphis, TN	Federal Express	0	0

Table 7. Accidents, Fatalities, and Rates, 1982 through 1997, for U.S. Air Carriers Operating Under 14 Service (Airlines)

	Accidents		Fatalities					Accidents per 100,000 Flight Hours		Accident per 100,00 Miles Flow	
Year	All	Fatal	Total	Aboard	Flight Hours	Miles Flown	Departures	All	Fatal	All	Fa
1982	2	1	1	1	342,555	131,628,000	188,787	0.584	0.292	0.0152	0.0
1983	1	0	0	0	383,830	148,409,000	209,112	0.261	0.00	0.0067	0.
1984	3	0	0	0	429,087	169,153,000	232,776	0.699	0.00	0.0177	0.
1985	4	3	329	329	444,562	178,264,000	237,866	0.900	0.675	0.0224	0.0
1986	3	1	3	3	480,946	188,497,000	273,924	0.624	0.208	0.0159	0.0
1987	2	1	1	1	529,785	234,647,000	308,348	0.378	0.189	0.0085	0.0
1988	1	0	0	0	619,496	242,641,000	368,486	0.161	0.00	0.0041	0.
1989	4	3	147	146	676,621	267,849,000	378,153	0.591	0.443	0.0149	0.0
1990	2	0	0	0	625,390	258,545,000	296,545	0.320	0.00	0.0077	0.
1991	1	0	0	0	641,444	266,287,000	311,002	0.156	0.00	0.0038	0.
1992	2	0	0	0	627,689	272,091,000	365,334	0.319	0.00	0.0074	0.
1993	1	0	0	0	724,859	313,402,000	352,418	0.138	0.00	0.0032	0.
1994	4	0	0	0	829,865	365,485,000	418,101	0.482	0.00	0.0109	0.
1995	2	1	2	2	742,814	322,246,000	349,115	0.269	0.135	0.0062	0.0
1996	6	2	38	8	783,000	342,555,000	369,000	0.766	0.255	0.0175	0.0
1997	7	1	5	4	790,000	357,900,000	375,000	0.886	0.127	0.0196	0.0

Notes **1997 data are preliminary.**
Hours, miles, and departures are compiled by the Federal Aviation Administration

Table 8. Accidents, Fatalities, and Rates, 1982 through 1997, for U.S. Air Carriers Operating Under 14 C (since March 20, 1997 only aircraft with fewer than 10 seats)

	Accidents		Fatalities					Accidents per 100,000 Flight Hours		A p M
Year	All	Fatal	Total	Aboard	Flight Hours	Miles Flown	Departures	All	Fatal	A
1982	26	5	14	14	1,299,748	222,355,000	2,026,691	2.000	0.385	0.1
1983	17	2	11	10	1,510,908	253,572,000	2,328,430	1.125	0.132	0.0
1984	22	7	48	46	1,745,762	291,460,000	2,676,590	1.260	0.401	0.0
1985	21	7	37	36	1,737,106	300,817,000	2,561,463	1.209	0.403	0.0
1986	15	2	4	4	1,724,586	307,393,000	2,798,811	0.870	0.116	0.0
1987	33	10	59	57	1,946,349	350,879,000	2,809,918	1.695	0.514	0.0
1988	19	2	21	21	2,092,689	380,237,000	2,909,005	0.908	0.096	0.0
1989	19	5	31	31	2,240,555	393,619,000	2,818,520	0.848	0.223	0.0
1990	16	4	7	5	2,341,760	450,133,000	3,160,089	0.683	0.171	0.0
1991	22	8	99	77	2,291,693	433,900,000	2,820,440	0.960	0.349	0.0
1992	23	7	21	21	2,363,745	508,242,000	3,114,932	0.931	0.296	0.0
1993	16	4	24	23	2,641,268	554,963,000	3,601,902	0.606	0.151	0.0
1994	10	3	25	25	2,787,904	594,716,000	3,850,372	0.359	0.108	0.0
1995	11	2	9	9	2,478,872	565,577,000	3,216,900	0.444	0.081	0.0
1996	11	1	14	12	2,474,000	608,814,000	3,171,000	0.445	0.040	0.0
SEE NOTES BELOW										
1997	16	5	46	46	1,120,000	235,260,000	1,580,000	1.429	0.446	0.0

Notes **1997 data are preliminary.**
Hours, miles, and departures are compiled by the Federal Aviation Administration.
Effective March 30, 1997, aircraft with 10 or more seats must conduct scheduled passenger operations under 14 CFR 121.
The 99 total fatalities in 1991 includes the 12 persons killed aboard a Skywest commuter aircraft and the 22 persons killed aboard two aircraft collided.
The following attempted suicide case is included in "Accidents" and "Fatalities" but are excluded from accident rates in this tabl

Year	Location	Operator	Fatalities Total	Fatalities Abroad
1992	Lexington, KY	Mesaba Airlines	0	0

Table 9. Accidents, Fatalities, and Rates, 1982 through 1997, for U.S. Air Carriers Operating Under 14 Service (On-demand Air Taxis)

	Accidents		Fatalities			A p Fl
Year	All	Fatal	Total	Abroad	Flight Hours	All
1982	132	31	72	72	3,008,000	4.39
1983	141	27	62	57	2,378,000	5.93
1984	146	23	52	52	2,843,000	5.14
1985	154	35	76	75	2,570,000	5.99
1986	117	31	65	61	2,690,000	4.35
1987	96	30	65	63	2,657,000	3.61
1988	101	28	59	55	2,632,000	3.84
1989	110	25	83	81	3,020,000	3.64
1990	106	28	50	48	2,249,000	4.71
1991	87	27	70	66	2,241,000	3.88
1992	76	24	68	65	2,009000	3.78
1993	69	19	42	42	1,809000	3.81
1994	85	26	63	62	1,993,000	4.26
1995	75	24	52	52	1,910,000	3.93
1996	87	27	59	59	1,902,000	4.57
1997	82	16	40	40	1,980,000	4.14

Notes **1997 data are preliminary.**
Hours are estimated by the Federal Aviation Administration (FAA).

Table 10. Accidents, Fatalities, and Rates, 1982 through 1997, U.S. General Aviation

	Accidents		Fatalities			
Year	All	Fatal	Total	Aboard	Flight Hours	
1982	3,233	591	1,187	1,170	29,640,000	1
1983	3,078	556	1,069	1,062	28,673,000	1
1984	3,017	545	1,042	1,021	29,099,000	1
1985	2,739	498	955	944	28,322,000	9
1986	2,582	474	967	878	27,073,000	9
1987	2,495	447	838	823	26,972,000	9
1988	2,385	460	800	792	27,446,000	8
1989	2,232	431	768	765	27,920,000	7
1990	2,215	442	766	761	28,510,000	7
1991	2,175	432	786	772	27,226,000	7
1992	2,073	446	857	855	23,792,000	8
1993	2,039	398	736	732	22,531,000	9
1994	1,994	404	730	723	21,873,000	9
1995	2,054	411	733	726	23,538,000	8
1996	1,907	358	631	614	23,650,000	8
1997	1,854	350	646	640	24,700,000	7

Notes **1997 data are preliminary.**
Hours are estimated by the Federal Aviation Administration.
Suicide/sabotage cases included in "Accidents" and "Fatalities" but exclude from accident rates in this table are: 1982 (3 acc., 0
1984 (3, 2); 1985 (3, 2); 1987 (1, 1); 1988 (1, 0); 1989 (5, 4); 1990 (1, 0); 1991 (3, 2); 1992 (1, 1); 1993 (1, 1); 1994 (2, 2); 1995
Effective in April, 1995 the NTSB is required by law to investigate all public use accidents. The effect upon the number of gener
an increase of approximately 1 1/2 percent.

Table 11. Fatal Accidents, 1997 Preliminary Data for All Operations Under 14 CFR 121 and for Scheduled Operations Under 14 CFR 135

Date	Location	Operator	Service	Aircraft	Fatalities				Number Aboard	
					Psgr	Crew	Other	Total		
Scheduled 14 CFR 121										
3/27/97	Jamaica, NY	Delta Air Lines	Psgr	L-1011	0	0	1	1	202	Gro by r bac
8/2/97	Lima, Peru	Continental Airlines	Psgr	B-757	1	0	0	1	150	Elde an c boa
12/28/97	Pacific Ocean	United Airlines	Psgr	B-747	1	0	0	1	396	Unr inju enc
Nonscheduled 14 CFR 121										
8/7/97	Miami, FL	Fine Air	Cargo	DC-8-61	0	4	1	5	4	Cra the
Scheduled 14 CFR 135										
1/9/97	Monroe, MI	Comair Airlines	Psgr	EMB-120RT	26	3	0	29	29	Cra for a
2/8/97	St. Thomas Virgin Islands	Air Sunshine	Psgr	Cessna 402C	2	0	0	2	5	Des the land
4/10/97	Wainwright, AK	Hageland Aviation Services	Psgr	Cessna 208B	4	1	0	5	5	Cra atte
6/27/97	Nome, AK	Olson Air Service	Psgr	Cessna 207	1	1	0	2	2	Coll 222 atte
11/8/97	Barrow, AK	Hageland Aviation Services	Psgr	Cessna 208B	7	1	0	8	8	Cra afte

SPECIAL EMPHASIS AREAS

USAir flight 427-
Rudder Power Control Unit

On September 8, 1994, USAir flight 427, a Boeing 737-300, N513AU, crashed near Aliquippa, Pennsylvania. The airplane was destroyed by impact and post-crash fire. The 2 pilots, 3 flight attendants, and 127 passengers were fatally injured.

This investigation has involved extensive scientific testing of the rudder power control unit (PCU). Thermal jamming of the secondary slides within the rudder PCU housing was initially demonstrated in a series of tests conducted in August 1996. These tests were conducted pursuant to suggestions made by the expert panel that was created following the second public hearing, which was held in November 1995. After the thermal jamming phenomenon was initially demonstrated, extensive follow-up work was required to replicate the phenomenon under controlled conditions and to further quantify the conditions that can produce such a jam. This work led to the discovery that secondary slide jamming could also involve primary slide overtravel, which could cause rudder reversal. These findings caused the Board to carefully reexamine its investigation of the United Airlines flight 585 accident in Colorado Springs, Colorado, and to begin conducting detailed engineering simulations to validate the laboratory work. All of this work has progressed slowly because of limited staff and the complexity of the investigation

Turbulence

Between 1983 and 1997, the Board investigated 99 turbulence accidents and incidents that resulted in 2 fatalities and 117 serious injuries. Most of these injuries–many of which involve fractures of the spine, skull, and extremities--were completely preventable if the occupants had been restrained by seatbelts.

Since 1972 the Board has made several safety recommendations to the FAA and the National Weather Service (NWS) and has been involved in numerous investigations dealing with the hazards of turbulence. For example, in March of 1993, the engine of a B-747 cargo flight separated from the airplane in severe turbulence conditions while departing from Anchorage, Alaska. As a result of its investigation, the Board recommended that the NWS develop in greater detail turbulence forecasts using data from the Weather Service's Doppler Weather Radars (WSR-88D). The NWS has implemented this recommendation.

The Board is currently investigating the severe turbulence encounter involving a United Airlines B-747 that occurred in the Western Pacific on December 28, 1997. This encounter resulted in 1 fatality and many injuries to passengers and flight attendants. The Board's investigation is focusing on turbulence forecasting, flight crew training, dissemination of information on turbulence, and crew procedures in areas where turbulence is forecast.

The Board is also aware that the NWS's Aviation Weather Center is making progress in improving its clear air turbulence and mountain wave forecast products. Further, the FAA Aviation Weather Research program has a multidisciplinary team addressing the turbulence problem, and researchers from the National Center for Atmospheric Research (NCAR) are working on new algorithms for using data from the NWS's doppler weather radars to detect turbulence. The NCAR researchers are also developing software that may be able to turn airborne commercial aircraft into a real-time turbulence-sensing platform. The software will use on-board sensors and computers to measure and analyze turbulence as the aircraft flies through it. The data will be transmitted to the NWS, where it will be used to create accurate, real-time turbulence maps.

Runway Incursions

Since the Board issued its original runway incursions safety study in 1986, the FAA has made great strides in implementing actions to reduce runway incursions. For example, the FAA now requires air traffic controllers to obtain readbacks from pilots for all "hold short" clearances. The FAA has also completed a one-time examination of all U.S. tower-controlled airports to determine the existence of any restrictions to visibility from the control tower.

The NTSB participated in an FAA-sponsored runway incursions roundtable in October 1997. Although the FAA and the aviation industry are concerned about this important topic, the incidence of runway incursions has been increasing since 1993. The FAA has made progress in the installation of Airport Surface Detection Equipment radar systems and Airport Movement Area Safety Systems (AMASS). The FAA has committed to procure and install AMASS units at all sites during the year 2000, and the Board will monitor the progress of this program closely.

Aviation Weather Forecasting Research

The FAA is currently involved in several Aviation Weather Research (AWR) programs, which are organized into 8 Product Development Teams (PDTs). Each PDT leader plans and coordinates the efforts of multiple laboratories and agencies working toward a common goal. The agencies and laboratories involved in these efforts include the NCAR, the National Oceanic and Atmospheric Administration, and the Massachusetts Institute of Technology's Lincoln Laboratory.

The in-flight icing PDT is currently the FAA's top weather research priority. Current weather products do not adequately address the hazards associated with icing. Improved operationally-available, high resolution, accurate forecasts of atmospheric icing conditions are needed. Several safety recommendations dealing with in-flight icing were issued as the result of the Board's investigation of the ATR-72 accident that occurred at Roselawn, Indiana, on October 31, 1994. These recommendations and the findings from the investigation provided the major impetus to the current icing research efforts of the FAA.

In addition, the Board's continuing investigation of the Comair flight 3272 accident, which occurred at Monroe, Michigan, on January 9, 1997, has resulted in several significant research activities in icing. These activities include the quantification of the performance loss due to small amounts of surface roughness on a wing's leading edge and the performance penalties associated with pneumatic deice boot inter-cycle ice.

Other FAA AWR efforts include:

- ***Aviation gridded forecast system***. (Goal: to provide computerized weather information tailored to each particular aircraft and its specific situation.)
- ***Turbulence***. (Goal: to provide an hourly, three dimensional field of turbulence intensity and location.)
- ***Weather support to ground deicing decision making***. (Goal: to provide accurate information to optimize deicing operations.)
- ***Convective weather***. (Goal: to accurately forecast and detect convective weather conditions.)
- ***Ceiling and visibility***. (Goal: to provide accurate predictions of terminal-area ceiling heights. Visibility research is presently deferred for lack of funding.)
- ***Model development enhancement***. (Goal: to improve the accuracy of numerical weather models.)
- ***Next Generations radar enhancement***. (Goal: to enhance the doppler weather radar system by improving the detection and location convective weather hazards.)

Inspector Training

Following the crash of an Express II Airlines Jetstream BA-3100 in Hibbing, Minnesota, the Board called on the FAA to develop a clear and specific directive to flight standards inspectors and managers emphasizing the need for compliance with existing FAA orders, directives, and other guidance material during the certification and surveillance of commuter air carriers. The FAA subsequently issued Handbook Bulletins and other guidance for its inspectors.

Following its investigation of the ValuJet DC-9 crash in the Florida Everglades, the Board called on the FAA to review the volume and nature of the work requirements of principal maintenance inspectors assigned to 14 Certification of Flight Regulation (CFR) Part 145 repair stations that perform maintenance for 14 CFR Part 121 air carriers, and to ensure that these inspectors have adequate time and resources to perform their surveillance duties. The FAA has informed the Board that it is considering issuing policy guidance that will help resolve resource conflicts and balance the surveillance workload.

Air Traffic Controller Shift Rotations

The Board has reviewed three studies concerning air traffic controller shift rotation conducted by the Civil Aeromedical Institute (CAMI) in Oklahoma City. Many air traffic controllers work rotating shifts. Although a variety of shift rotation strategies exist, one common schedule is called the "2-2-1 schedule." Under this schedule, controllers work two afternoon shifts followed by two morning shifts and finally a midnight shift in one work week. This scheduling strategy is said to rotate counterclockwise because controllers report for duty at progressively earlier times throughout the week. Such a schedule minimizes the number of midnight shifts each controller works, and it compresses the work week, providing more time off between work weeks. On the other hand, such shifts can require "quick-turnarounds" with as little as eight hours off between shifts.

The Board is concerned about any shiftwork schedule that does not provide transportation workers the opportunity to obtain sufficient sleep and is pleased that CAMI has studied the effect of counterclockwise shift rotation in a series of studies. CAMI field studies have found that air traffic controllers working 2-2-1 rotating shifts report more fatigue and an average of a 30-minute-per-week sleep loss compared to controllers who work non-rotating shifts. In laboratory studies using non-controllers, CAMI researchers have found that people working 2-2-1 rotating shifts do experience some sleep disruptions, but they probably do not build up a sleep debt that accumulates during the week. However, using a test battery, the researchers did find some performance decrements in the non-controller research subjects on the night shift. This work has been conducted as part of a program to develop fatigue countermeasures for air traffic controllers.

Fatigue and alertness are important issues for the Board. The Board held a multimodal fatigue symposium in November 1995, and professionals and safety researchers from the air traffic control community participated. Although the Board has never identified controller fatigue as a cause of an aviation accident, we recognize the huge complexities involved in scheduling air traffic control services around the clock.

English Language Proficiency

As a result of its participation in the government of Colombia's investigation of the December 20, 1995, accident involving an American Airlines Boeing 757 that crashed while on descent to Cali, Colombia, the Board issued a recommendation to the FAA that urged it to develop, with air traffic authorities of member states of the ICAO, a program to enhance controllers' fluency in common English-language phrases and interaction skills sufficient to assist pilots in obtaining situational awareness about critical features of the airspace, particularly in non-radar environments. In response, the FAA wrote to ICAO in support of the development of a program to

enhance English language fluency among the air traffic control authorities of its member states.

In November 1997, the Air Navigation Bureau of ICAO issued a draft statement calling for a comprehensive review to identify deficiencies in air-ground and ground-ground communications in international civil aviation. The ICAO Commission has agreed to include this matter in future work programs.

The Board continues to support this effort to improve the standard of communications in the world's airspace. The Board is working closely with ICAO on this program.

SURFACE TRANSPORTATION SAFETY

The NTSB investigates selected surface transportation accidents and incidents. Until a major reorganization in October 1997, the Board's Office of Surface Transportation Safety managed these investigations with multi-disciplinary "Go-Teams" dispatched to accident sites, while smaller-scale accidents were usually investigated by one person or a partial team from one of the Board's seven regional surface transportation offices.

The Surface Transportation office contained five investigative divisions: Highway, Marine, Railroad, Pipeline and Hazardous Materials, and Human Factors. These divisions provided the investigators-in-charge for the teams that conduct the investigations and also coordinated the preparation of the Board's comprehensive surface transportation accident report. After the October reorganization, each of these divisions formed the bases of new modal investigative offices.

When the Board is notified of an accident, the team that is launched varies in size depending on the severity and complexity of the event. As with aviation accidents investigated by the NTSB, the teams consist of experts in various technical specialties, including vehicle factors, hazardous materials analysis, operational and environmental factors, systems design and support, human performance, and survival factors. Each expert manages a team of specialists from industry and other government entities in collecting the facts and determining the circumstances surrounding the accident.

A hearing may be conducted (or depositions taken) to gather additional information in connection with an investigation. After the investigation is concluded, a detailed narrative report that analyzes the investigation record and identifies the probable cause of the accident is prepared. A major surface accident investigation often takes from six months to a year to complete.

Safety recommendations resulting from the investigations are generally included in the final report, although they may be issued at any time during the course of an investigation if warranted by events. These Surface Transportation offices are also responsible for follow-up with safety recommendations recipients, once an agency or organization has responded to particular recommendations.

Office Of Highway Safety

Each year, highway traffic crashes cost the nation more than 40,000 lives, and five million injuries. Medical costs, lost productivity, and property damage amount to $137 billion, or $375 million each day. About 4,600 vehicles annually are involved in accidents at railroad grade crossings that kill about 500 persons and injure more than 1,800. The NTSB is charged with investigating highway accidents, including railroad grade crossing collisions, that it selects in cooperation with the state authorities. The Board's limited highway resources prevent us from investigating most highway accidents. We devote our resources to accidents that have a significant impact on the public's confidence in highway safety, generate high public interest, or concern technical safety issues that cause or contribute to accidents or injuries on a national scale.

In-depth investigations, therefore, tend to focus on collisions involving multiple fatalities and/or substantial property damage. Under current highway accident selection criteria, the Board generally will investigate:

- Crashes involving a passenger bus resulting in fatalities or serious injuries on the bus;
- Crashes involving a school bus resulting in a fatality or serious injury on the school bus;
- Grade crossing collisions involving a hazardous materials carrier, school bus, passenger bus or van, or emergency vehicle;
- Highway bridge collapses or closures;
- Highway crashes resulting in five or more fatalities; and
- Highway crashes involving a heavy truck resulting in three or more fatalities.

Investigative areas selected by the Board for special emphasis include:

- Intrastate trucks not subject to federal/state oversight;
- School bus passenger protection;
- Air bag induced injuries; and
- Motor coach oversight.

COMPLETED MAJOR HIGHWAY INVESTIGATIONS

The Board completed action on three major highway investigations or reports. Below is a list of those accidents or reports, followed by a summary of each.

- April 25, 1996 -- Plymouth Meeting, Pennsylvania
- November 26, 1996 -- Cosmopolis, Washington
- March 17 - 20, 1997 --Public Forum, Air Bags and Automobile Occupant Restraint Use

Plymouth Meeting, Pennsylvania

On April 25, 1996, a 1988 Mack truck with a concrete mixer body was unable to stop as it approached a "T" intersection at the bottom of an exit ramp in Plymouth Meeting, Pennsylvania. As the truck proceeded through the intersection, it collided with and overrode a 1985 Subaru passenger car. The Subaru driver was killed, and the truck driver sustained minor injuries.

Issues examined by the Board included the maintenance and truck inspection practices of JDM Materials Company, Inc., and the adequacy of federal and state guidelines for conducting truck air brake system inspections.

On September 30, 1997, the Board determined that the improper maintenance of the accident truck by JDM Materials Company, Inc., the fracture of the drain valve, and the inoperative low-air-warning switch that resulted in the driver's loss of braking control were the probable causes of the accident. The lack of federal and state inspection procedures for commercial vehicles with dual air brake systems to detect reversed air brake lines or inoperative low-air-warning switches contributed to the accident. The Board issued eight recommendations to federal, state, and industry groups to address the safety issues regarding air brake inspections on large trucks.

Cosmopolis, Washington

On November 26, 1996, near Cosmopolis, Washington, a utility truck fatally injured a 10-year-old child who ran from behind a transit bus that transported him from school to his residence. The transit bus stopped in the northbound lane (opposite the residence) and activated its headlights and four-way flashers. Meanwhile, a southbound utility truck proceeded around a curve in the road and approached the bus. When its driver saw the bus with its lights activated, he slowed the truck to a speed of about 20 miles per hour. As the truck driver came to a near stop, the lights on the transit bus were deactivated, and the bus driver began to drive away from the stop. At the same time the truck driver began to accelerate, the child ran out from behind the transit bus, and the utility truck struck him.

On October 17,1997, the Board determined that the accident was probably caused by the lack of adequate safety procedures and equipment (similar to those in place for school bus operations) to ensure the safety of children being discharged from transit buses used to transport students. The Board also found no mechanism in place that documents the extent to which transit buses are being used to transport children to and from school. The Board issued several recommendations to federal agencies and industry groups to address the safety of school children on transit buses.

Air Bags and Automobile Occupant Restraint Use

In March 1997, the Board convened a public forum in Washington D.C., regarding air bag and automobile occupant restraint use with the participation of representatives from the National Highway Traffic Safety Administration (NHTSA), the automobile industry, air bag manufacturers, insurance and safety and consumer groups, family members involved in crashes in which air bags deployed, and automobile safety specialists from Australia, Canada, and Europe. The Board published its proceedings of the public forum later in the year.

The following actions by the automobile industry and the NHTSA were taken as a result of several safety recommendations issued by the Board following the forum.

The automobile industry has:

- begun producing vehicles with less aggressive airbags;
- participated in improved public education through warning labels and the distribution of education materials; and
- initiated efforts to increase adult seat belt use and have children ride in back seats of automobiles.

NHTSA has:

- established procedures to permit cut-off switch hardware that will allow activating or disabling under certain circumstances airbag protection; and
- initiated efforts to develop a time schedule for the installation of advanced-technology airbags.

ON-GOING MAJOR HIGHWAY INVESTIGATIONS

The Board is investigating seven major highway accidents and conducting two highway safety studies. Below is a list, followed by a summary of each.

- February 12, 1997 – Multiple vehicle head-on collision -- Slinger, Wisconsin
- June 11, 1997 – Transit bus collision with pedestrians -- Normandy, Missouri
- July 29, 1997 – Collision between two vehicles -- Jackson, Michigan
- July 29, 1997 – Passenger motor coach collision -- Stoney Creek, Virginia
- October 9, 1997 – Tractor cargo tank semi-trailer collision with passenger vehicle – Yonkers, New York
- October 16, 1997 – Tractor semi-trailer and full size school bus -- Franklin, North Carolina
- October 31, 1997 – Tractor semi-trailer and full-size school bus -- Easton, Maryland
- Safety Study – Safety at Passive Grade Crossings
- Safety Study – Intrastate Trucking

Slinger, Wisconsin

On February 12, 1997, a 1993 Freightliner tractor/double trailer (both trailers empty) was traveling northbound on U.S. 41 at Slinger, Wisconsin, when it lost control and crossed over the 50-foot snow-covered median into the southbound lanes. A 1994 Mack tractor pulling a flatbed trailer loaded with lumber and traveling southbound struck the right front of the Freightliner, lost control, and crossed over the median into the northbound lanes. A 1997 Dodge van carrying nine adult occupants struck and under-rode the right front side of the flatbed trailer. A 1992 Ford straight truck operated by Glandt Dahlke, Inc., loaded with produce, also traveling northbound, struck the right rear side of the flatbed trailer. Eight of the nine van occupants suffered fatal injuries, and the remaining occupant suffered serious injuries.

Although the weather was clear at the time of the accident, it had been snowing for approximately 10 hours. Motorists and the emergency responders stated that the roadway was icy in places.

Issues being examined include the following: judgment and experience of the truck driver, stability of double trucks, effectiveness of snow and ice removal, adequacy of the American Association of State Highway and Transportation Officials divided freeway median barrier warrants, and the availability and use of occupant restraints.

Slinger, Wisconsin. Eight out the nine van occupants suffered fatal injuries.

Slinger, Wisconsin. February 12. 1997. Mutiple vehicle head-on collision.

Normandy, Missouri. June 11, 1997. Transit bus collision with pedestrians.

Normandy, Missouri

On June 11, 1997, a 40-foot 1981 GMC transit bus operated by Bi-State Development Agency was involved in a single-vehicle accident involving multiple pedestrians in Normandy, Missouri. The bus, operated by a trainee driver who was being monitored by a line trainer, began to pull forward and reportedly continued forward in an uncontrolled manner for approximately 130 feet. The bus surmounted a five-inch-high curb and continued on to a station platform, where it collided with two passenger shelters, four public phone booths, one mail box, one portable toilet facility, and several other fixed objects. The accident resulted in four pedestrian fatalities and a number of injuries.

Issues being examined include sawtooth parking bay design and the need for positive separation between the roadway and pedestrian areas of parking facilities. The Board will conduct a public hearing in St. Louis, Missouri, early in 1998 to address the transit bus safety issues arising from this accident.

Normandy, Missouri. Transit bus collision resulted in 4 pedestrian fatalities.

Jackson, Michigan

On July 29, 1997, near Jackson, Michigan, a 1985 GMC pickup truck with an extended cab and enclosed camper shell traveling westbound collided with a dump truck pulling a low-boy trailer hauling a front end loader.

The GMC pickup truck contained two adults and three children riding in the extended cab and eight children riding in the rear of the pickup truck. The two adults riding in the pickup truck and nine children received fatal injuries. The remaining two children received serious injuries. The driver of the dump truck was uninjured. According to the Sheriff's office, the dump truck had the right of way, and the driver of the pickup truck either ran the stop sign or drove out in front of the dump truck. The road had recently been paved and had no posted speed limit signs, although the speed limit was 55 mph in the area.

Issues being examined include drivers' performance and state laws restricting riding in the open bed of a pickup truck.

Stony Creek, Virginia

Also on July 29, a motorcoach carrying 35 people ran off the road on northbound I-95. The bus went down a sloping 150-foot embankment, through trees, and ended on its side, three-quarters under water in the 30-yard-wide Nottoway River. Individuals were trapped in the bus and had to be removed by the fire department.

Those on board included the driver, 29 students (ages 10 to 12 years) and five chaperones. There was one adult fatality and about 10 injuries. The charter bus was taking the students on a Pathway to Freedom tour (tracing the route of the Underground Railroad) sponsored by the DOT and a restaurant chain. The trip included children from all over

the country and began on July 10, 1997, in Charleston, South Carolina, and was to end in Washington, D. C., on August 13, 1997.

Issues being examined include driver fatigue, physical condition of the driver/medical qualifications, use of rumble strips on interstate highways, and bus egress information.

Stoney Creek, Virginia. Motor coach ran off road, down into an embankment and into Nottoway River.

Stoney Creek, Virginia. July 29, 1997. Passenger motor coach collision.

Yonkers, New York

On October 9, 1997, about 12:10 a.m., a truck tractor pulling a cargo tank semi-trailer was going under an overpass of the New York State Thruway when it was struck by a sedan. The car hit the right side of the cargo tank in the area of the tank's external loading/unloading lines, releasing the gasoline they contained. The ensuing fire destroyed both vehicles and the overpass; the thruway remained closed for approximately 6 months. The driver of the car was killed. The driver of the truck was not injured. Property damage was estimated at $7 million.

The safety issue being examined is the danger of operating a truck when its cargo tank's loading lines are carrying hazardous materials.

Franklin, North Carolina

On October 16, 1997, a tractor-semi-trailer was descending a steep, rural, two-lane road when it went out of control and collided with a school bus transporting the Hayesville girls' volleyball team on its way home from a tournament in Rosman, North Carolina. The 48-year-old school bus driver (also the team's coach) and a 16-year-old student were killed. The truck driver was not injured.

The tractor-semitrailer operating in interstate commerce was hauling (interstate) three large concrete septic tanks, each described as being the size of a car. The 33-year-old truck driver, who refused to take a blood-alcohol test, was charged with two counts of second-degree murder and one count of driving while impaired.

Issues being examined include the adequacy of Commercial Drivers License revocation process, medical qualifications for commercial vehicle operators, the adequacy of load securement regulations, and shipper selection of motor carriers.

Easton, Maryland

On October 31, 1997, in dense fog, an empty tractor semi-trailer traveling west approaching Easton, Maryland, allegedly ran a red traffic light at the intersection of Route 50 and Dutchman Lane. The semi-trailer struck the driver's area of a southbound school bus, killing the bus driver. Twenty-two students were injured. The bus was fully loaded, transporting elementary, middle, and high school students.

Issues being examined include school bus crash worthiness, medical qualifications of commercial drivers and adequacy of regulations, and the conspicuity of school buses in limited visibility situations

Easton, Maryland. October 31, 1997. Tractor semi-trailer struck school bus killing bus driver.

Easton, Maryland. Tractor semi-trailer traveling west allegedly ran red light.

SAFETY STUDIES

Passive Grade Crossings

Every year about 4,600 motor vehicles are involved in accidents at railroad grade crossings that kill about 500 and injure more than 1,800 persons. Two-thirds of all crossings have no train-activated warning devices, and these passive crossings are rarely targeted by federal and state safety programs and research projects.

As part of a safety study on passive grade crossings, the Board held a public forum on this issue in May 1997 in Jacksonville, Florida to facilitate the sharing of information on passive grade crossing safety. Several hundred individuals from government, industry, and safety organizations and private citizens attended this forum.

Information from the forum will be incorporated into the Board's final report, which will examine how the number of grade crossing accidents could be reduced through engineering improvements in the physical characteristics of the crossings and in warning devices, such as signs and train horns, and through public education programs. The study will also address the role of intelligent transportation systems at passive grade crossings. Completion of this safety study is expected in early summer 1998.

Intrastate Trucking

Commercial vehicles are driven billions of miles each year in commercial cargo operations, yet the extent of information regarding the scope of intrastate trucking operations varies widely. For example, Texas registers intrastate trucking operations, while California maintains information only on the number of licensed drivers. The Board's study will document how some operations differ between interstate and intrastate trucking, examine how exemptions to the regulations influence safety, and explore the impact of intrastate truck operations on highway safety. We estimate completion of this study in FY 1999.

Office Of Marine Safety

The NTSB is authorized to investigate marine accidents involving U.S. and foreign flagged vessels in U.S. territorial waters and U.S. vessels in international waters. In past years, the Board has conducted marine accident investigations as far away as the Persian Gulf and the South China Sea.

The marine accident investigation function is performed entirely from NTSB headquarters. There are no regional marine offices or marine personnel assigned to any of the Board's modal field offices. To carry out its marine safety program, the Board maintains a small staff of professional investigators with industry and/or U.S. Navy or Coast Guard experience. These investigators include licensed master mariners, marine engineers, and naval architects who possess a wealth of hands-on maritime experience.

During an average year, about 4,000 accidents involving commercial vessels and more than 6,500 accidents involving recreational boats occur in the United States. Given these numbers of accidents, the Board must decide whether the severity of an accident and the safety issues involved require an NTSB investigation. In practice, the Board tries to target only those accidents that appear to involve the most significant safety issues. Under current marine accident selection criteria, the Board generally will investigate accidents involving:

- The loss of six or more lives;
- The loss of a self-propelled vessel of over 100 gross tons or damage to any vessel and/or property exceeding $500,000;
- Serious hazardous materials threats to life, property, and the environment;
- Coast Guard safety functions (e.g., vessel traffic services, search and rescue operations, vessel inspections, aid to navigation positioning/lighting); and
- A public/non-public vessel collision or other accident with one or more fatalities or $75,000 or more in property damage.

Investigative areas selected by the Board for special emphasis include:

- Large passenger vessels, including ocean cruise ships, ferries, and gaming vessels;
- Small passenger vessels carrying more than six passengers and excursion vessels;
- Maritime technology and communications;
- Tank ships and tank barges;
- Fatigue and hours of service on all vessels;
- Commercial fishing vessels;
- Collisions and groundings involving oceangoing vessels; and
- Inland tow vessel rammings.

The Board does have the option of requesting that the Coast Guard investigate an accident without NTSB participation. In such cases, the Coast Guard will send the accident file to the Board when the investigation is completed. If the Board does decide to investigate a marine accident, then it coordinates with the Coast Guard on whether the investigation will be conducted jointly under Coast Guard rules or independently under NTSB rules.

As in the other transportation modes, the Board also undertakes studies involving specific marine safety issues, which typically result in the issuance of recommendations to federal and state agencies and to the maritime industry.

COMPLETED MAJOR MARINE INVESTIGATIONS

The Board completed action on two major marine accidents and one incident summary report. Below is a list of those cases, followed by a summary for each.

- June 10, 1995 – *Royal Majesty* -- near Nantucket Island, Massachusetts
- June 23, 1995 – *Star Princess* -- Lynn Canal, Alaska
- October 15, 1995 -- *Patriot* -- off Mexico's Yucatan Peninsula

Grounding of *Royal Majesty* near Nantucket Island, Massachusetts

On June 10, 1995, the Panamanian passenger ship *Royal Majesty,* with 1,509 persons on board, grounded on a sand bar about 10 miles east of Nantucket Island, Massachusetts. The *Royal Majesty* was being navigated by a global positioning system (GPS). Although the navigation watch personnel were plotting positions on the navigation chart, they were not verifying positions by any alternative method of navigation. Because of equipment malfunction, the GPS-determined positions were in error by about 20 miles.

Issues examined include the following: the performance of the *Royal Majesty's* integrated bridge system and the global positioning system; the performance of the *Royal Majesty's* watch officers; the effects of automation on watch officers' performance; the training standards for watch officers aboard vessels equipped with electronic navigation systems and integrated bridge systems; and the design, installation, and testing standards for integrated bridge systems.

On March 12, 1997, the Board determined that the cause of the accident was the watch officers' over-reliance on the automated features of the integrated bridge system; the company's failure to ensure that its officers were adequately trained in the automated features of the integrated bridge; the deficiencies in the design and implementation of the integrated bridge system, the procedures for its operation, and the implications of this automation on bridge resource management; and the failure to take corrective action after several clues indicating that the vessel was off course. Thirty safety recommendations addressing these matters were adopted.

Grounding of the *Star Princess*/ Lynn Canal, Alaska

On June 22, 1995, the Liberian-registered passenger vessel *Star Princess*, carrying 1,568 passengers and 639 crew members, grounded on the submerged Poundstone Rock in Lynn Canal, about 21 miles northwest of Juneau. The vessel's bottom sustained significant damage. The total cost resulting from required repairs and the delay before the vessel could return to service was estimated at $27 million.

Issues examined include the adequacy of the pilot's physical fitness for duty; the importance of bridge resource management; the pilotage practices in the Alaskan cruise industry; and the need for search and rescue planning.

On June 20, 1997, the Board determined that the grounding of the *Star Princess* was probably caused by the pilot's poor performance, which may have been exacerbated by chronic fatigue caused by sleep apnea. Seventeen safety recommendations were issued to the Coast Guard, Princess Cruise Lines, and several marine associations as a result of this accident.

Near Grounding of the *Patriot*/Yucatan Peninsula

On October 15, 1995, the Liberian-registered *Patriot* tank ship came within 10 miles of grounding on the north side of the Yucatan Peninsula near Campeche, Mexico, while navigating in the path of an approaching hurricane. Although the Board did not have jurisdiction over the incident because it occurred in international waters and did not involve a public or privately-owned vessel of the United States, the owner of the vessel,

Conoco Shipping Company, asked the Board to undertake an investigation because of the potential damage to the ship, injuries to the crew, and damage to the environment and in an attempt to prevent similar incidents in the future.

Issues examined include the master's decision-making, Conoco Shipping Company's monitoring of weather, its management of the movement of its vessels, and its shoreside support for shipboard decision making.

On April 8, 1997, the Board determined that the probable cause of the near grounding was the master's decision to sail his vessel into the predicted path of a hurricane, a decision that resulted from the company's ineffective management of the movement of its vessels and inadequate shoreside support for critical shipboard decisions affecting vessel safety. Six safety recommendations were issued as a result of this investigation.

ON-GOING MARINE INVESTIGATIONS

The Board is currently investigating five major marine accidents and conducting a special safety study. The accidents and safety study are listed below, followed by a summary.

- January 19, 1996 – *Scandia And North Cape* – near Pt. Judith, Rhode Island
- July 27, 1996 – *Universe Explorer* – near Juneau, Alaska
- September 27, 1996 –*Julie N* – near Portland, Maine
- December 14, 1996 - *Bright Field* - New Orleans, Louisiana
- April 6, 1997 -- *Vistafjord* – 20 mm south of Freeport, Bahamas
- Special Study – Personal Watercraft Safety

Fire on the *Scandia* and Grounding of *North Cape*/near Pt. Judith, Rhode Island

On January 19, 1996, the 111-foot-long, uninspected U.S. tug *Scandia* suffered an engine room fire while towing the unmanned U.S. tankbarge *North Cape*, five miles off Pt. Judith, Rhode Island. The fire forced the six-member tug crew to abandon the vessel amid 15-foot waves and 45-knot winds. The fully laden oil barge then drifted aground and spilled 828,000 gallons of home heating oil, causing the largest pollution incident in Rhode Island's history.

Issues being examined in this accident include the adequacy of oil spill preventative measures for tank vessels, the adequacy of fire safety aboard uninspected tugs, and the adequacy of the emergency response.

Fire on Board the *Universe Explorer*/near Juneau, Alaska

On July 27, 1996, the Panamanian passenger ship *Universe Explorer* was underway in the Lynn Canal en route from Juneau, Alaska, to Glacier Bay with 732 passengers and 274 crew members on board. Although it was on a pleasure cruise service at the time, this ship is used most of the year as a floating university campus in affiliation with the University of Pittsburgh. About 3:00 a.m., a fire was discovered in the main laundry room, which was not outfitted with a sprinkler system. Dense smoke and heat from the fire spread from the laundry upward two decks via an open stairwell. The fire resulted in the deaths of five crew members and caused smoke inhalation injuries to 55 other crewmen. Two passengers were also treated for pre-existing medical conditions.

Issues involved in this accident include the adequacy of fire prevention, detection, and suppression procedures; the adequacy of escape, rescue, medical care, and evacuation procedures on board; and the assessment of the current status of Coast

Guard and local authority contingency planning for response to a major passenger ship accident in Alaskan waters.

Allision of the *Julie N* with Bridge/Portland, Maine

On September 27, 1996, the *Julie N*, a Liberian tankship, struck the Million Dollar Bridge in Portland, Maine. The ship was under the direction of a state-licensed docking master when it struck the bridge and spilled about 170,000 gallons of oil into the waterway. The pilot underwent the required post-accident testing for drugs, but the required alcohol testing was not accomplished.

The issues involved in this accident include the adequacy of risk analysis justifying navigation through the Million Dollar bridge by tankships like the *Julie N*, and the adequacy of Coast Guard regulations for post-accident drug and alcohol testing.

Allision of the *Bright Field* with Riverwalk Marketplace in New Orleans, Louisiana

On December 14, 1996, the fully loaded Liberian bulk carrier *Bright Field* temporarily lost propulsion power as the vessel was navigating outbound in the lower Mississippi River at New Orleans, Louisiana. The vessel struck a wharf adjacent to a populated commercial area that included a shopping mall, a condominium, parking garage, and a hotel. No fatalities resulted from the accident, and no one aboard the *Bright Field* was injured; however, four serious injuries and 58 minor injuries were sustained during evacuation.

Issues involved in this accident include the adequacy of the ship's main engine and automation systems, the adequacy of emergency preparedness and evacuation plans of vessels moored in the Poydras Street wharf area, and the adequacy of port risk assessment for activities within the Port of New Orleans.

On September 5, 1997, the Board issued the following safety recommendation to the New Orleans Dock Board:

Develop, as part of the River Front Alert Network, an emergency evacuation announcement for broadcast by the harbor police department dispatcher using a public address system linked to river front properties that provides for a timely and efficient evacuation in the event of an impending collision or other emergency.

New Orleans, Louisiana. December 14, 1996. Bright Field vessel.

New Orleans, Louisiana. Riverwalk marketplace included a shopping mall, condominium, parking garage and a hotel.

New Orleans, Louisiana. Liberian vessel Bright Field struck wharf adjacent to a populated commercial area.

Fire on Board the *Vistafjord* near Freeport, Bahamas

On April 6, 1997, the Bahamian passenger ship *Vistafjord* was underway on a voyage from Fort Lauderdale, Florida, to the Azores with 569 passengers and 422 crew members on board. At 1:12 a.m., a fire was discovered in a storage room adjacent to the laundry when a heat detector activated an alarm on the fire control panel in the wheelhouse. The fire was isolated to its compartment of origin, but it developed heavy, black smoke that spread through the ship via the ventilation system. There were no smoke alarms that automatically sounded in the crew accommodation area when the smoke was initially detected, nor were such alarms required. One crewman lost his life, and six additional crew members and four passengers were injured.

As a result of this accident, the Board is examining the adequacy of smoke alarms in passenger and crew accommodation areas on board passenger ships. Urgent recommendations were issued as a result of this accident and the fire on board the *Universe Explorer* calling for the installation of automatic smoke alarms that sound locally in crew and passenger accommodations areas.

SAFETY STUDY

Personal Watercraft Safety

Personal watercraft (PWC) are a type of recreational boat that has become increasingly popular in recent years. Manufacturers estimate that about 200,000 PWC are sold each year and that more than 1 million are in current operation. Although the overall number of recreational boating fatalities has been declining in recent years, the number of personal watercraft-related fatalities has been increasing. PWC are the only type of recreational vessel for which the leading cause of fatalities is not drowning. In PWC fatalities, more people die from blunt force trauma than from drowning.

The Board initiated this study to more closely examine fatalities and injuries in addition to accident characteristics associated with PWC accidents. According to the U.S. Coast Guard, about 2.4 million personal watercraft are in operation. The Board's study will review state accident reports for all fatal accidents and a sample of nonfatal personal watercraft accidents.

Issues being addressed include protecting PWC riders from injury, PWC operator experience and training, and boating safety standards. The study will also address the need for recreational boating data. Completion of this study is expected in late spring 1998.

PUBLIC HEARING

In March 1997, the Board held a two-day public hearing as part of its ongoing investigation into the *Julie N* tankship accident in Portland Maine.

On September 27, 1996, the *Julie N* tankship, under the direction of a state-licensed docking master, enroute to the Rolling Mills terminal, struck a bridge and spilled about 170,000 gallons of oil into the waterway. There were no injuries, but the ship and bridge suffered substantial damage.

Issues discussed at the hearing included the federal drug and alcohol program for testing marine personnel after accidents and federal, state, and local pollution risk assessments involving vessels carrying oil; and navigating into the Portland harbor.

Pipeline & Hazardous Materials Safety

More than 1.6 million miles of pipelines carry natural gas to about 60 million customers in the United States. These gas pipelines are operated by 500 gas gathering, 1,065 transmission, 1,389 distribution, and 52,000 master meter companies. Additionally, there are about 155,400 miles of hazardous liquid pipelines subject to Federal safety jurisdiction.

The Board is responsible for investigating all pipeline accidents in which there is a fatality, substantial property damage, or a significant impact on the environment. The Board completed action on a pipeline accident, a hazardous materials related aviation accident, and a safety study. Below is a summary of each.

Propane Gas Explosion in San Juan, Puerto Rico - San Juan Gas Company, Inc./ Enron Corp.

On November 21, 1996, the Humberto Vidal building, a commercial building in San Juan, Puerto Rico, exploded as a result of a propane gas leak. Thirty-three people were killed and at least 69 others injured in the blast. The Humberto Vidal building was destroyed in the blast, as was a major portion of an adjacent building. Several other nearby buildings suffered moderate to severe damage. The Board determined that the propane gas explosion was fueled by an excavation-caused leak in the basement of the Humberto Vidal building.

As a result of the investigation of this accident, the Board identified and addressed the following safety issues: adequacy of employee training; need for an excavation-damage prevention program; adequacy of maps and records of buried facilities; public education on what to do when the odor of gas is detected; and adequacy of the oversight of San Juan Gas Company. Specific safety recommendations were made in order to address these issues to DOT, RSPA-Office of Pipeline Safety, the Puerto Rico Public Service Commission, Enron Corporation, and Heath Consultants, Inc.

San Juan, Puerto Rico. November 21, 1996. Propane gas explosion.

HAZARDOUS MATERIALS

Inflight Fire and Impact with Terrain - ValuJet Airlines Flight 592

On May 11, 1996, ValuJet flight 592, a Douglas DC-9, crashed into the Everglades approximately 10 minutes after taking off from Miami International Airport. All 110 persons on board were killed. The Board determined that the accident resulted from a fire in the plane's Class D cargo compartment that was initiated by the actuation of one or more oxygen generators that were being improperly carried as cargo. The oxygen generators, identified by the DOT as hazardous materials, were not properly prepared, packaged, and identified when presented to ValuJet Airlines, Inc. for carriage.

The Office of Pipeline and Hazardous Materials Safety played a major role in this aviation accident investigation. Several hazardous materials transportation safety issues were addressed, including: minimization of the hazards posed by fires in Class D cargo compartments; company procedures for handling company materials and hazardous materials; RSPA's and FAA's hazardous materials programs; and undeclared hazardous materials in the U.S. mail. Safety recommendations concerning these issues were made to the FAA, RSPA, U.S. Postal Service, and the Air Transport Association.

SAFETY STUDIES

Protecting Public Safety Through Excavation Damage Prevention

Excavation and construction activities are by far the largest single cause of accidents to pipelines. Damage resulting from outside forces accounts for more than 40% of the reported failures, and two-thirds of these failures are a result of damage caused by someone other than the pipeline operator. Although there are fewer fatalities annually from pipeline accidents than in any of the other modes of transportation, in the pipeline accidents have the potential to result in catastrophic damages in terms of injuries, service disruptions to large segments of the population, environmental damage and restoration, property damage, and insurance costs.

Miami, Florida. Hazardous materials. ValuJet flight 592, crashed into Florida everglades.

Miami, Florida. ValuJet flight 592. One of the oxygen generators that were improperly carried as cargo.

In March 1994, in Edison, New Jersey, damage to a 36-inch gas pipe resulted in an explosion that injured 112 persons, destroyed eight buildings, necessitated widespread evacuation, and caused in excess of $25 million in damages. Less than three months later, a gas explosion in Allentown, Pennsylvania, caused 1 fatality, 66 injuries, and more than $5 million in damages. Finally, on November 21, 1996, one of the deadliest accidents in pipeline history occurred in San Juan, Puerto Rico. A propane gas explosion resulted in 33 deaths and 69 injuries. All were determined to be the results of excavation damage.

Six serious pipeline accidents that occurred in 1993 and 1994 caused the Board and RSPA to co-sponsor a workshop in September 1994. It was attended by 400 representatives from government, private industry, and trade associations. This safety study analyzed the findings of that workshop, discussed actions taken since the workshop, and formalized recommendations aimed at advancing excavation damage prevention programs.

The study focused on three major safety issues: essential elements of an effective excavation damage prevention program; accuracy of information related to buried facilities; and system measuring, reporting requirements, and data collection. Thirty-nine recommendations applicable to these issues were directed to RSPA, the Federal Highway Administration, the American Public Works Administration, the Association of American Railroads, the American Short Line Railroads Association, the American Society of Civil Engineers, and the Associated General Contractors of America. As a result of the study, the Board is seeking improvements in subsurface utility engineering, mapping standards, locator equipment testing, excavator training, and accident reporting.

Office Of Railroad Safety

Railroads are one of this nation's safest forms of transportation, but the potential for tragedy exists in railroad operations as it does in every other mode of transportation. Millions of passengers are carried each year on Amtrak and rapid rail systems, and over 1.52 million carloads of hazardous materials move by rail each year. Projected growth rates show that there will be 600 million train miles completed in the year 2002, an increase of 108 million train miles from 1997.

Since 1967, the primary responsibility for railroad accident investigation has been assigned by Congress to the NTSB. As in the other surface modes, the Board performs in-depth analyses of selected rail accidents, determines the probable cause, and issues recommendations to make changes to prevent similar accidents.

The Board also conducts studies of significant railroad safety issues, often based on a set of accident investigations specifically undertaken as the basis for the study. In other cases, the studies may be based on an analysis of regulations, railroad safety programs and procedures, audit reviews of management and operational practices, or other research. In addition, the Board investigates selected accidents involving specific life saving issues.

Because of its limited resources, the Board is able to investigate only a fraction of the approximately 2,000 accidents and incidents that are reported each year to the Federal Railroad Administration (FRA). Under current railroad accident selection criteria, the Board generally will investigate:

- Collision or derailments involving passenger, rail transit, or commuter trains;
- Collisions between trains that result in an employee fatality, serious injury to two or more employees, or damage of $500,000 or more to railroad and/or non-railroad property;
- Accidents involving a passenger fatality; and
- Rail/highway grade crossing accidents involving 5 or more fatalities, release of hazardous materials release, or a failure of crossing protection equipment or derailment of a passenger train.

Investigative areas selected by the Board for special emphasis include:

- Train collisions;
- Rail transit;
- Human performance failures;
- FRA track safety standards;
- FRA power brake regulations; and
- Oversight of short line railroads and tourist/scenic railways.

COMPLETED MAJOR RAILROAD INVESTIGATIONS

The Board completed action on 4 major railroad accident investigations, which are summarized below.

- February 9, 1996 – Collision and derailment of New Jersey Transit Commuter Train – near Secaucus, New Jersey
- February 16, 1996 – Derailment and collision of a Maryland Rail Commuter Train and an Amtrak train – Silver Spring, Maryland
- November 23, 1996 – Derailment of Amtrak train – Portal Bridge, New Jersey
- January 12, 1997 – Derailment of Union Pacific freight train – near Kelso, California

Collision and Derailment of New Jersey Transit Commuter Train/ Secaucus, New Jersey

On February 9, 1996, an eastbound New Jersey Transit (NJT) commuter train collided nearly head-on with a westbound NJT commuter train near Secaucus, New Jersey, resulting in three fatalities and 158 injuries. About 400 passengers were on the two trains.

Issues examined by the Board included the medical condition of the engineer, the adequacy of medical standards and examinations for locomotive engineers, and the adequacy of the NJT train crew members' response to the accident.

On March 25, 1997, the Board determined that a train engineer failed to perceive correctly a red signal aspect because of his diabetic eye disease and resulting color vision deficiency, which he failed to report to New Jersey Transit during annual medical examinations. The Board made recommendations to the Federal Railroad Administration, New Jersey Transit, Association of American Railroads, Brotherhood of Locomotive Engineers, United Transportation Union and American Public Transit Association.

Secaucus, New Jersey. February 9, 1996. Collision and Derailment of NJ Transit Commuter Train.

Derailment and Collision of Maryland Rail Commuter Train with Amtrak Train, Silver Spring, Maryland

On February 16, 1996, a Maryland Rail Commuter (MARC) train collided with an Amtrak passenger train near Silver Spring, Maryland. The three MARC crew members and eight passengers in the first MARC car received fatal injuries. The fuel tank of Amtrak's lead locomotive ruptured on impact and the diesel fuel ignited. Fire engulfed the rear superstructure of the Amtrak locomotive, fuel spilled on the MARC cab control car, ignited, and destroyed the car.

Issues examined by the Board included the performance of the MARC train crew members; the oversight of CSX Transportation, Inc., (CSXT) signal system modifications; the Federal oversight of commuter rail operations; the lack of positive train separation control systems; and the adequacy of passenger car safety standards and emergency preparedness.

On June 17, 1997, the Board determined that the probable cause of the accident was the failure of the engineer and the train crew, because of multiple distractions, to operate the MARC train 286 according to the signal indications; and the failure of the (FRA), the Federal Transit Administration, the Maryland Mass Transit Administration, and CSXT to ensure that a comprehensive human factors analysis for the Brunswick Line signal modifications was conducted to identify potential sources of human error and to provide a redundant safety system that could compensate for human error.

As a result of the investigation, the Board made recommendations to the Federal Railroad Administration, the Federal Transit Administration, CSXT, the Maryland Mass Transit Administration, the U. S. Department of Transportation, the railroad industry, and other Federal and local government agencies.

Sliver Spring, Maryland. February 16, 1996. Derailment and Collision of Maryland Rail Commuter Train with Amtrak Train.

Silver Spring, Maryland. February 16, 1996. The fuel tank of Amtrak's lead locomotive ruptured on impact and the diesel fuel ignited.

Derailment of Amtrak Train - Portal Bridge, New Jersey

On November 23, 1996, Amtrak passenger train 12 derailed on the Portal Bridge, an open deck through a truss swing bridge spanning the Hackensack River in Secaucus, New Jersey. The derailment also resulted in train 12 sideswiping Amtrak passenger train 79. Both locomotives and all 12 following cars of train 12 derailed, coming to rest with both locomotives and the four head cars down the embankment at the east end of the bridge. Train 79 sustained sideswipe damage and stopped with the entire train intact and on the rails west of Portal Bridge. There were 49 minor and four serious injuries, and estimated damages were in excess of $3.6 million.

Issues examined as a result of this accident include the design of Portal Bridge, quality control of bridge components, inspections of the track structure and miter rails on Portal Bridge, and the lack of standards or regulations for special track work.

On October 7, 1997, the Board determined that the probable cause of the accident was the failure of Amtrak management to foster an environment that promoted adequate inspection, maintenance, and repair of the miter rail assemblies on Portal Bridge and to permanently correct defects in the miter rail side bars that were discovered 10 months before the accident. Contributing to the accident were the failure of the FRA to develop track inspection standards for special track work and to periodically inspect such track as part of its oversight responsibilities and Amtrak's removal of the miter rail position detection circuitry without installing replacement circuitry or implementing procedures to compensate for the loss of this safety critical system.

The Board made recommendations to the FRA, Amtrak, the AAR, and the American Short Line Railroad Association.

Derailment of Union Pacific Railroad Freight Train near Kelso, California

On January 12, 1997, a Union Pacific Railroad Company (UP) freight train derailed near Kelso, California, resulting in damage of $4,376,400. While descending a hill, the engineer inadvertently activated the multiple-unit engine shutdown switch, which shut down all the locomotive unit diesel engines and eliminated the train's dynamic braking capability. The train eventually reached a speed of 72 miles per hour and derailed 68 of its 75 cars.

Issues examined by the Board included the placement of safety-critical locomotive cab controls, adequate train-speed safety margins for steep-grade railroads, and the criticality of dynamic braking systems.

On October 28, 1997, the Board determined that the probable cause of the accident was a prolonged pattern of inattention and lack of action by UP management to protect effectively or relocate the multiple-unit engine shutdown switch in SD60M locomotives after the switch had repeatedly been recognized as subject to inadvertent activation and the failure of UP management to adequately address critical safety issues such as dynamic braking system operational reliance and protection and authorized maximum train speeds in the event of dynamic braking failure. The Board made recommendations to the FRA, the AAR, and the UP.

ON-GOING MAJOR RAILROAD INVESTIGATIONS

The Board is investigating four major railroad accidents and conducting one special investigation. Below is a list of those accidents and the study, followed by a summary of each.

- June 23, 1997 – Collision and derailment of two UP freight trains – Devine, Texas
- July 2, 1997 – Collision of two UP freight trains – Delia, Kansas
- August 9, 1997 – Amtrak passenger train derailment – Kingman, Arizona

- October 9, 1997 – Collision and derailment of Amtrak train – Garden City, Georgia

- Special Investigation -- Safety issues regarding UP

Collision and Derailment of UP Freight Trains/Devine, Texas

On June 23, 1997, a northbound and a southbound UP freight train collided and derailed near Devine, Texas, about 40 miles southwest of San Antonio. The collision occurred on a single main track between Laredo and San Antonio. There are no wayside signals on this segment of track and authorization orders for train movements are issued by radio to each train by a dispatcher. The accident resulted in four fatalities and one injury.

Issues being looked into include the effectiveness and management oversight of train dispatching in non-signalized territory, positive train control, and crash worthiness of locomotive event recorders.

Collision of UP Freight Trains/ Delia, Kansas

On July 2, 1997, near Delia, Kansas, a westbound UP freight train struck the side of an eastbound UP freight train. The collision occurred where the main line and the siding merge. The engineer on the westbound train was killed, and the conductor sustained minor injuries. The westbound train failed to stop at the stop signal and entered the route of the eastbound train. Fifteen cars from the eastbound train and two locomotives and three cars from the westbound train were derailed. Following the collision, a fire caused by the punctured locomotive fuel tanks on the eastbound train engulfed the derailed cars and locomotives. Five of the derailed cars contained hazardous materials, and 1,500 people were evacuated. Damage caused by this accident exceeded $5 million.

Issues being examined include the effect of fatigue on the engineer on the westbound train, UP's fatigue countermeasures program, the need for alerters on locomotives, the crashworthiness of locomotives, and positive train separation.

Delia, Kansas. July 2, 1997. Collision of UP Freight Trains.

Delia, Kansas. A westbound UP Freight Train struck side of an eastbound UP Freight Train.

Amtrak Passenger Train Derailment/ Kingman, Arizona

On August 9, 1997, an Amtrak train derailed about five miles east of Kingman, Arizona. Amtrak train 4 was en route from Los Angeles, California, to Chicago, Illinois, operating at about 89 miles per hour on the eastbound track when both the engineer and assistant engineer saw a dip in the track as they approached the bridge. They applied the train's emergency braking and derailed as the train traversed the bridge. The bridge's foundation support had been undermined from severe erosion during a flash flood.

Issues being examined include safety of track and structures subject to damage in severe storms; passenger safety and emergency procedures; and operating rules and circumstances for weather notifications, including special instructions issued following an accident.

Collision and Derailment of Amtrak Train/ Garden City, Georgia

On October 9, 1997, an Amtrak train en route from New York City to Miami, Florida, struck a tractor trailer at a passive grade crossing near Garden City, Georgia. The trailer, a low-profile semitrailer combination, was lodged on a high-vertical profile crossing. The crossing was on a CSXT track. Subsequent to the collision, the two locomotive units and all 11 passenger cars derailed. One crew member sustained serious injuries, and the other crew member and 10 passengers sustained minor injuries.

Issues being examined include CSXT's emergency notification procedures and the identification of highway/railroad grade crossings.

SPECIAL INVESTIGATION

Safety Issues Regarding the UP Railroad

The Board has launched investigators to seven UP collisions in the past year, and the railroad has experienced 14 recent accidents. We remain concerned over the problems the UP seems to be experiencing, and the Board will host a three-day public hearing near Washington, D. C., in March 1998, to address safety problems at UP since its merger with Southern Pacific Railroad. The effectiveness of safety oversight of the UP will be the focus of the hearing.

RESEARCH & ENGINEERING

The Office of Research and Engineering provides laboratory and technical support for NTSB investigations and conducts studies that examine safety issues in all transportation modes.

Laboratory specialists in this office analyze voice recordings from aircraft, ship, train, and supporting systems communications. The office also provides electronic engineering support for all accident investigation modes in examining communication and control systems, including digital and analog formats.

Laboratory staff also extract, format, and analyze data from digital aircraft flight recorders and recorders installed in locomotives, large ships, and some highway vehicles. Advanced computer technology is used to examine the performance characteristics of vehicles in accidents, including animated three-dimensional vehicular performance studies and complex analytical studies of vehicle dynamics and operation.

Materials specialists provide engineering support for all transportation modes in areas such as fracture, deformation and failure analysis, chemical composition and strength of materials, design, fabrication and testing of components, friction, rolling contact and wear, impact and crash reconstruction, instrument and system component inspection, and fire and explosion effects.

The Research and Engineering Office also provides computer and data processing support for all NTSB units and manages the aviation accident data base. The office publishes reviews of aviation accidents and statistical surveys and analyses of accident data on an annual basis. The office also is responsible for management of the NTSB world wide web site.

Safety Studies

The Safety Studies Division, in collaboration with the model investigative offices, conducts field studies of safety issues in all transportation modes and performs analyses of accident statistics to detect trends and patterns. The division also evaluates the effectiveness of federal, state, and local government and industry transportation safety programs by examining policy issues and performances. Comprehensive reports containing recommendations for corrective action are prepared for public release.

Safety studies are performed to stimulate improvements in the policies, programs, or statutory authority of government agencies or to advance technological improvements in a transportation system or component.

In selecting subjects for safety studies, the Board identifies ongoing or potential safety problems or issues of national significance. Close consideration is given to matters that have the potential for reducing accident losses and improving the safety effectiveness of other agencies and to attaining implementation of previous Board recommendations. The adequacy of program resources committed by other governmental agencies, timeliness of studies with regard to transportation agency program planning and implementation, and the potential impact on regulatory or other safety programs are also considered.

VEHICLE PERFORMANCE, ENGINEERING SERVICES AND MATERIALS

The NTSB operates several laboratories at its Washington, D.C., headquarters. Here commercial airliner flight data and cockpit voice recorders, railroad event recorders, and marine course recorders are read out and analyzed as a part of the investigative process. The laboratories' world-renowned technical staff is considered to be among the most experienced in accident investigation techniques.

The Vehicle Performance and Engineering Services laboratories examine electronic information in radio, video, and recorded communications and their supporting systems from aircraft, ships, and trains. The laboratories also extract, format, and analyze data from digital and mechanical aircraft flight recorders and recorders installed in locomotives and large ships.

Aircraft performance is analyzed through advanced computer technology that examines the characteristics of vehicles in accidents, including three-dimensional performance animations and complex analytical studies in vehicle dynamics and operation.

The Materials Laboratory provides engineering analysis for all modes of transportation. The laboratory performs fracture, deformation, and failure analysis, in addition to determining the chemical composition and strength of materials.

ANALYSIS AND DATA

The Analysis and Data Division is responsible for the management of the aviation accident data base and provides statistical analyses in regularly published reports and special safety studies. Accurate and accessible data are essential to pinpointing areas of safety need, developing insight into solutions, monitoring the effectiveness of safety countermeasures, and reviewing the progress of safety efforts. The division is also responsible for handling public inquiries and requests for the Board's reports and other information.

ADMINISTRATIVE LAW JUDGES

Since 1967, the Safety Board has served as the "court of appeal" for airmen, mechanics or mariners whenever a certificate action is taken by the FAA or the Coast Guard.

Under 49 U.S.C. section 1133 and 49 C.F.R. Part 821, the Board's administrative law judges hear, consider and issue initial decision on appeals of FAA certificate actions under 49 U.S.C., section 44703. The judges' decisions in these cases may be appealed to the five-member Safety Board by either the airman or the FAA.

The FAA Civil Penalty Administrative Assessment Act of 1992 transferred all civil penalty appeals for enforcement cases involving pilots, engineers, mechanics and repairmen from the FAA to the NTSB. (The civil penalty act is now codified at U.S.C., sections 46301, et. seq.) That law also gave the FAA the right to appeal certain decisions of the five-member Board to the U.S. Courts of Appeals. Airmen and mechanics have always had the right to appeal adverse Board decisions to the Federal appeals courts.

Under the Equal Access to Justice Act of 1980, as amended ("EAJA"), the NTSB's judges also review and decide applications for attorney fees and expenses from airmen who prevail against the FAA in cases brought pursuant to 49 U.S.C. section 44709. Applications filed in connection with actions brought by the FAA under to 49 U.S. C. section 46301 (d) (civil penalty cases) also are decided by the board's judges and, on appeal from the judges' decisions, by the full Safety Board.

The Board's review on appeal of its administrative law judges' decision is based on the record of the proceeding, which includes hearing testimony (transcript), exhibits and the judge's decision, as well as appeal briefs submitted by the parties.

Upon review of the Board's decision, the U.S. Courts of Appeals have the power to affirm, modify or set aside that decision in whole or in part – or, if need is found, to order further proceedings by the Board. The judgement and the decree of the Court of Appeals is subject to review by the U.S. Supreme Court on certiorari.

Marine certificate actions are heard first by the Coast Guard's administrative law judges and may be appealed to the Commandant of the Coast Guard. The ruling of the Commandant may then be appealed to the NTSB, where the Board follows the same appellate process as it does in considering the initial decisions of its law judges in aviation cases. In 1997, one marine appeal was filed with the NTSB, and the Board closed one marine case.

There were 448 aviation certificate appeals filed with the Board's Office of Administrative Law Judges in 1997. One hundred and twenty seven of these cases were from emergency orders. The Board's judges held 122 hearings and closed 470 cases in 1997.

During 1997, 81 of the judges' decisions were appealed to the full five-member Safety Board for review. The Board decided 85 appeals, reversing the judges' decisions in 3 cases. Fifteen of the Board's decisions were appealed to the U.S. Courts of Appeals, which rendered 17 decisions in 1997, affirming the Board in 12 of these. (Of the five remaining cases, four were dismissed and one was remanded to the FAA.)

There were 15 EAJA applications filed with the Board's administrative law judges in 1997, and 14 EAJA cases were decided by the judges. In 1997, 5 of the judges' EAJA decisions were appealed to the full Board, which issued rulings in one EAJA case.

NTSB SYMPOSIUM AND FORUMS IN 1997

Corporate Culture and Transportation Safety Symposium

The Safety Board examined the affect that corporate management philosophies and practices have on transportation safety and the role corporate culture plays in the cause of accidents. The Board gathered a group of experts from government, academia and industry who are internationally recognized for their work in this area. The Forum was held on April 24 - 25, 1997, in Crystal City, Virginia.

Air Bags and Child Passenger Safety

The Safety Board noted that air bag-related fatalities, particularly involving children were rising and that there are millions of cars on the road with airbags that are not safe. The Board brought together experts from government, industry, and safety/consumer groups to share information on the role of air bags in today's vehicles, the benefits and safety concerns, and improvements in child passenger transportation for the future. The Forum was held on March 17-20, 1997, in Washington, D.C.

Passive Grade Crossing Safety

The Board addressed the growing concern of safety at passive grade crossings, where railroads and highways meet without gates or warning lights and the need for new and innovative directions to achieve increased levels safety. The Safety Board facilitated the sharing of information on passive grade crossing safety across the lines of government, industry, safety organizations, and private citizens. The Forum was held on May 8-9, 1997 in Jacksonville, Florida.

PUBLIC HEARINGS IN 1997

March 13 -14, 1997	Julie N Liberian tankship	Portland, Maine
March 26-28,1997	Delta Airlines	Atlanta, Georgia
June 2-5, 1997	San Juan pipeline explosion	San Juan, Puerto Rico
December 8-13, 1997	TWA flight 800	Baltimore, Maryland

SUBJECT INDEX

NATIONAL TRANSPORTATION SAFETY BOARD WEB SITE

The National Transportation Safety Board has established a World Wide Web home page to provide the public with direct access to accident, news releases and other important safety information.

The NTSB web site can be accessed at:

http://www.ntsb.gov

Some NTSB home page features:

- The Board's history and mission, regional and field office locations, board Member profiles;
- News releases;
- Speeches and Congressional testimony by Board Members;
- The NTSB's "Most Wanted" list of safety improvements;
- Summaries of aviation accident investigations; (e.g., accident reports, safety studies).

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490 L'Enfant Plaza East, S.W.
Washington, DC 20594
http://www.ntsb.gov