



**NTSB** National Transportation Safety Board

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# **Inside the NTSB: An NASA Alum's Perspective**

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February 8, 2011



1967

**In 1967, the Congress created an independent NTSB within the newly formed Department of Transportation (DOT); expanded the NTSB's authority to include all modes of transportation.**





**In 1974, Congress made the NTSB completely independent of the DOT.**

*1974*





**In 1996, the Aviation Disaster Family Assistance Act:  
NTSB to coordinate victim and family assistance  
following a major aviation accident.**

**This responsibility was extended to other modes  
by Executive Order.**





UNITED STATES CODE, TITLE 49

## CHAPTER 11—NATIONAL TRANSPORTATION SAFETY BOARD

### SUBCHAPTER 1—GENERAL

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1101. Definitions.

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1113. Administrative.  
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1115. Training.  
1116. Reports and studies.  
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1118. Authorization of appropriations.

### SUBCHAPTER 3—AUTHORITY

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### SUBCHAPTER 5—GENERAL

§1181. Definitions

Section 40102(a) of this title applies to this chapter.

### SUBCHAPTER 6—ORGANIZATION AND ADMINISTRATIVE

§1183. General organization

(a) ORGANIZATION.—The National Transportation Safety Board is an independent constitutional body of the Government.

(b) APPOINTMENT OF MEMBERS.—The Board is composed of 5 members appointed by the President, by and with the advice and consent of the Senate. Not more than 3 members may be appointed from the same political party. Members shall be appointed on the basis of technical qualification, professional standing, and demonstrated knowledge of accident reconstruction, safety engineering, human factors, transportation safety, or transportation regulation.

(c) TERMS OF OFFICE AND REMOVAL.—The term of office of each member is 7 years. At the end of the term, the President may appoint a member to fill a vacancy occurring before the expiration of the term for which the predecessor of that member was appointed for the remainder of that term. When the term of office of a member ends, the successor may not be a successor in office.

(d) CHAIRMAN AND VICE CHAIRMAN.—The President shall designate, by and with the advice and consent of the Senate, a Chairman of the Board. The President also shall designate a Vice Chairman of the Board. The terms of both the Chairman and Vice Chairman are 2 years. When the Chairman is absent or unable to perform his or her duties, the Vice Chairman shall perform the duties of the Chairman.

# Mission

The NTSB is charged with:

- 1) determining the probable cause of transportation accidents
- 2) making recommendations to prevent their recurrence



## **The NTSB is Responsible for Investigating:**

**All U.S. aviation accidents (except those of military and intelligence agencies).**





**Highway accidents  
(including certain grade-  
crossing accidents)  
which involve issues of  
wide-ranging safety  
significance.**





**Railroad accidents in which there is a fatality, substantial property damage, or which involve a passenger train.**







**Major marine accidents  
and accidents involving  
a public and a non-public  
vessel or accidents  
involving Coast Guard  
functions.**





**Pipeline accidents in which there is a fatality, significant environmental or property damage.**



**Transportation accidents involving the release of hazardous materials, including fatal accidents or those causing major disruptions to a community.**





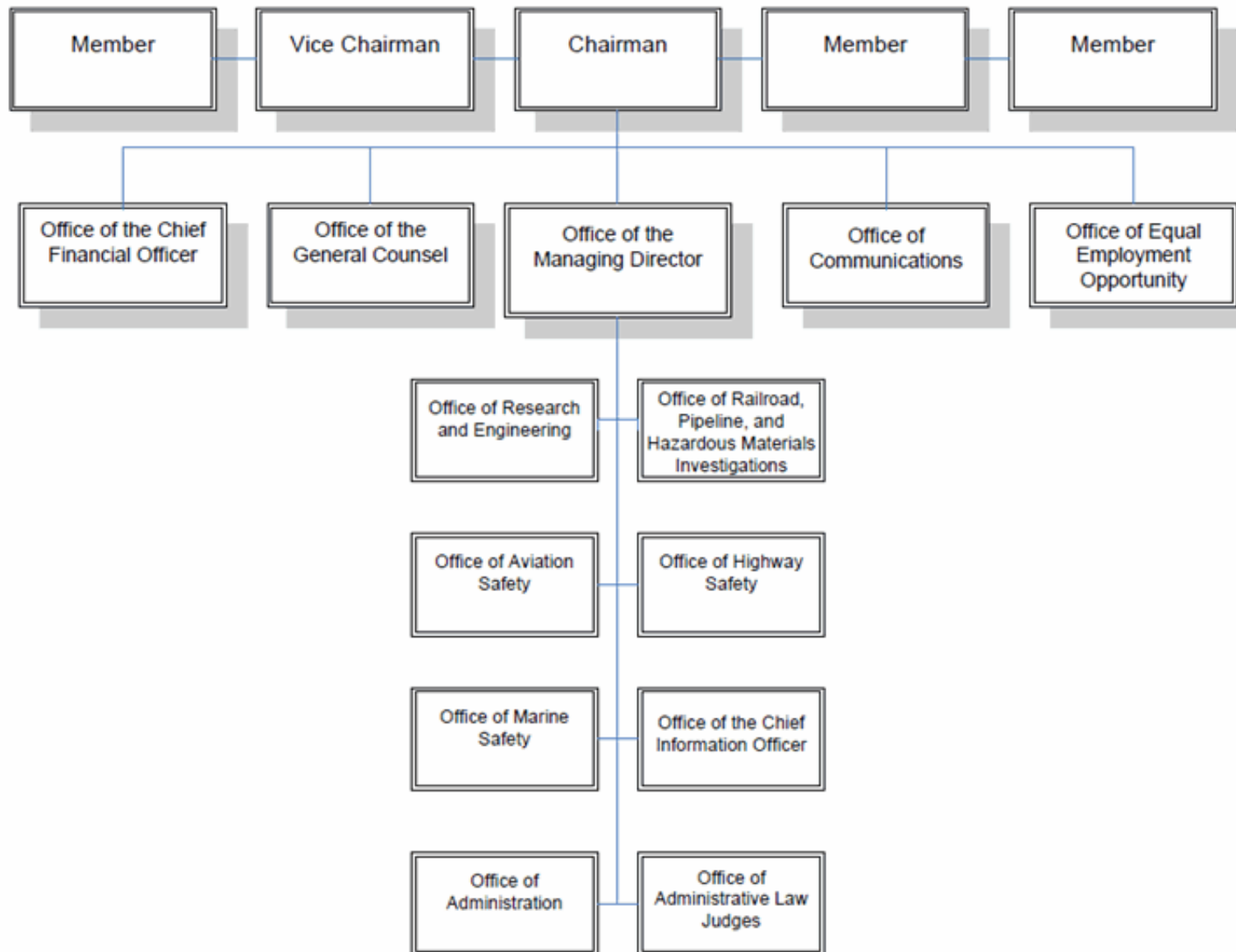
Major product: safety recommendations

Moral compass and industry conscience



- 130,000+ accident investigations
- 13,000+ safety recommendations
  - 82% acceptance rate

# NATIONAL TRANSPORTATION SAFETY BOARD



# NTSB: The Board

- Five Members:
  - President nominates
  - Senate confirms



Mark Rosekind  
Member



Chris Hart  
Vice Chairman



Debbie Hersman  
Chairman



Robert Sumwalt  
Member



Earl Weener  
Member



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# Midair Collision Over Hudson River



# History of Flight

- August 8, 2009
- 1153:14 eastern daylight time
- Piper PA-32R-300, N71MC
- Eurocopter AS350BA, N401LH, operated by Liberty Helicopters
- Piper operated under Part 91; Eurocopter operated under Parts 135 + 136
- Nine fatalities
- Visual meteorological conditions

# History of Flight - Airplane

- Airplane departed Wings Field, Philadelphia, Pennsylvania
- Destination of Ocean City, New Jersey
- Stopover at Teterboro Airport (TEB), Teterboro, New Jersey



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# History of Flight - Airplane

- Routing over Hudson River
- Airplane to be operated below class B airspace until transfer to Newark Airport (EWR) tower
- Electronic radar handoff of flight to EWR
- No radio communications transfer at that time
- Airplane leveled off at 1,100 feet about 2 minutes before collision

# History of Flight - Helicopter

- Helicopter departed West 30th Street Heliport for planned 12-minute sightseeing flight
- Operating in Hudson River class B exclusion area
- No air traffic control services
- Common traffic advisory frequency
- Climbed through 1,000 feet



# History of Flight

- TEB local controller involved in 2.5-minute personal telephone call
- Controller divided attention between telephone conversation and air traffic control duties
- Pilot read back incorrect frequency
- Collision occurred 4 secs after personal call ended



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## **Flight Path Animation**

Midair Collision Over Hudson River,  
Piper PA-32R-300, N71MC, and  
Eurocopter AS350BA, N401LH,

Near Hoboken, New Jersey

August 8, 2009

ERA09MA447AB

# View From Airplane 4 Sec. Before Collision



# View From Airplane 3 Sec. Before Collision





# View From Airplane 2 Sec. Before Collision



# View From Airplane 1 Sec. Before Collision



# Probable Cause

- (1) the inherent limitations of the see-and-avoid concept, which made it difficult for the airplane pilot to see the helicopter until the final seconds before the collision
- (2) the Teterboro Airport local controller's nonpertinent telephone conversation, which distracted him from his air traffic control (ATC) duties, including correcting the airplane pilot's read back of the Newark Liberty International Airport (EWR) tower frequency and the timely transfer of communications for the accident airplane to the EWR tower.

# Contributing Factors

1. both pilots' ineffective use of available electronic traffic information to maintain awareness of nearby aircraft
2. inadequate Federal Aviation Administration (FAA) procedures for transfer of communications among ATC facilities near the Hudson River Class B exclusion area
3. FAA regulations that did not provide adequate vertical separation for aircraft operating in the Hudson River Class B exclusion area.

# Recommendations

- Previous safety recommendations issued to the FAA addressed standard operating procedures for the Hudson River Class B exclusion area, ATC performance deficiencies, the designation of a special flight rules area (SFRA) for the Hudson River Class B exclusion area and surrounding areas, and standard operating procedures within and training for SFRAs.

# Recommendations

- The safety issues discussed in this report address changes within the recently designated SFRA surrounding the Hudson River corridor, vertical separation among aircraft operating in the Hudson River SFRA, the see-and-avoid concept, and helicopter electronic traffic advisory systems. Five new safety recommendations to the FAA are included in the report.



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# **Collision of Two WMATA Metrorail Trains Near Fort Totten Station, June 22, 2009**

# Accident Summary

- June 22, 2009
- WMATA Metrorail
- Near Fort Totten Station
  - Nine fatalities, 52 injuries
- \$12M in damages





# Accident Chronology

- Train 214 (the struck train)
  - Operating in manual mode
  - Was following train 110
  - Lost speed commands between Takoma and Fort Totten, which caused train to stop
  - Operator attributed loss of speed command to the proximity of train 110 ahead

# Accident Chronology

- Train 112 (the striking train)
  - Operating in automatic mode
  - Followed train 214
  - Train separation should be maintained by automatic train control system
  - ATC lost detection of train 214
  - ATC issued commands to train 112 to move forward until it collided with standing train 214

# Train Operation

- Operator of train 112 reacted to the emergency, but there was not enough time to stop the train and avoid the collision
- The train control system failed to detect train 214
- Operator of train 214 would have had no reason to suspect the train control system malfunctioned



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## Metro Collision Animation

Collision between two Washington Metropolitan Area  
Transit Authority Trains  
Washington, District of Columbia

June 22, 2009  
DCA09MR007

NTSB



# Safety Issues

- Rail Car Issues
  - Crashworthiness
  - Event recorders
- Train Control System
  - Loss of train 214 detection
- Safety Culture
- Safety Oversight

# Probable Cause

1. a failure of the track circuit modules, built by GRS/Alstom Signaling Inc., that caused the automatic train control system to lose detection of train 214 (the struck train) and thus transmit speed commands to train 112 (the striking train) up to the point of impact
2. WMATA's failure to ensure that the enhanced track circuit verification test (developed following the 2005 Rosslyn near-collisions) was institutionalized and used systemwide, which would have identified the faulty track circuit before the accident.

# Contributing Factors

1. WMATA's lack of a safety culture
2. WMATA's failure to effectively maintain and monitor the performance of its automatic train control system
3. GRS/Alstom Signaling Inc.'s failure to provide a maintenance plan to detect spurious signals that could cause its track circuit modules to malfunction
4. ineffective safety oversight by the WMATA Board of Directors
5. the Tri-State Oversight Committee's ineffective oversight and lack of safety oversight authority
6. the Federal Transit Administration's lack of statutory authority to provide federal safety oversight

# Recommendations (23)

- to the U.S. Department of Transportation, the Federal Transit Administration, the Tri-State Oversight Committee, the Washington Metropolitan Area Transit Authority, the Board of Directors of the Washington Metropolitan Area Transit Authority, Alstom Signaling Inc., and six transit systems that use GRS track circuit modules (the Massachusetts Bay Transportation Authority, the Southeastern Pennsylvania Transportation Authority, the Greater Cleveland Regional Transit Authority, the Metropolitan Atlanta Regional Transportation Authority, the Los Angeles County Metropolitan Transportation Authority, and the Chicago Transit Authority)



# Guantanamo Bay Cuba

First NTSB aviation accident to cite fatigue as probable cause



- acute sleep loss, sleep debt, circadian disruption

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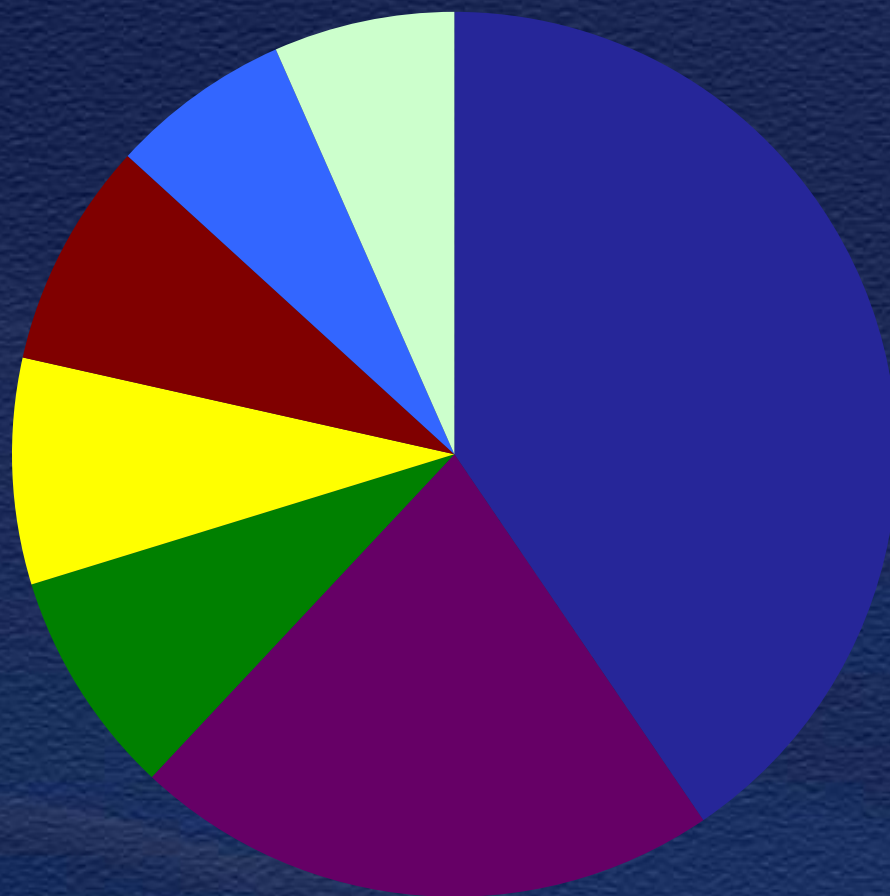
# NASA Fatigue Countermeasures Program

- Examining fatigue factors in accident investigations (GB)
- Education and Training Module/Workshop
- Planned Cockpit Rest (NASA Nap)/Activity Breaks
- Principles and Guidelines for Duty/Rest Scheduling
- Outlined an Alertness Management Program
- Scientific studies: surveys, lab, sim, field/operational

# NTSB Fatigue Recommendations

- MOST WANTED since 1990
- 150+ fatigue recommendations

# Complex Issue: Requires Multiple Solutions



- Scheduling Policies and Practices
- Education
- Organizational Strategies
- Raising Awareness
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation

# Education/Strategies

- Develop a fatigue education and countermeasures training program
- Educate operators and schedulers
- Include information on use of strategies: naps, caffeine, etc.
- Review and update materials

# Hours of Service / Scheduling

- Science-based hours of service
- Allow for at least 8 hours of uninterrupted sleep
- Reduce schedule irregularity and unpredictability

# Fatigue Management Systems

- Develop guidance based on empirical and scientific evidence for operators to establish fatigue management systems
- Develop and use a methodology that will continually assess the effectiveness of fatigue management systems

# Honorable John K. Lauber:

No Accident  $\neq$   
Safe Operation





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