



NTSB National Transportation Safety Board

Sleep and Fatigue in Transportation Safety: An NTSB Perspective

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November 14, 2011



UNITED STATES CODE, TITLE 49
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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 President may reappoint a member if the member is appointed and qualified. The President may remove a member for inefficiency, neglect of duty, or other cause 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



**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.**





The NTSB is Responsible for Investigating:

**Aviation, highway, rail, marine, pipeline,
and hazardous material accidents**



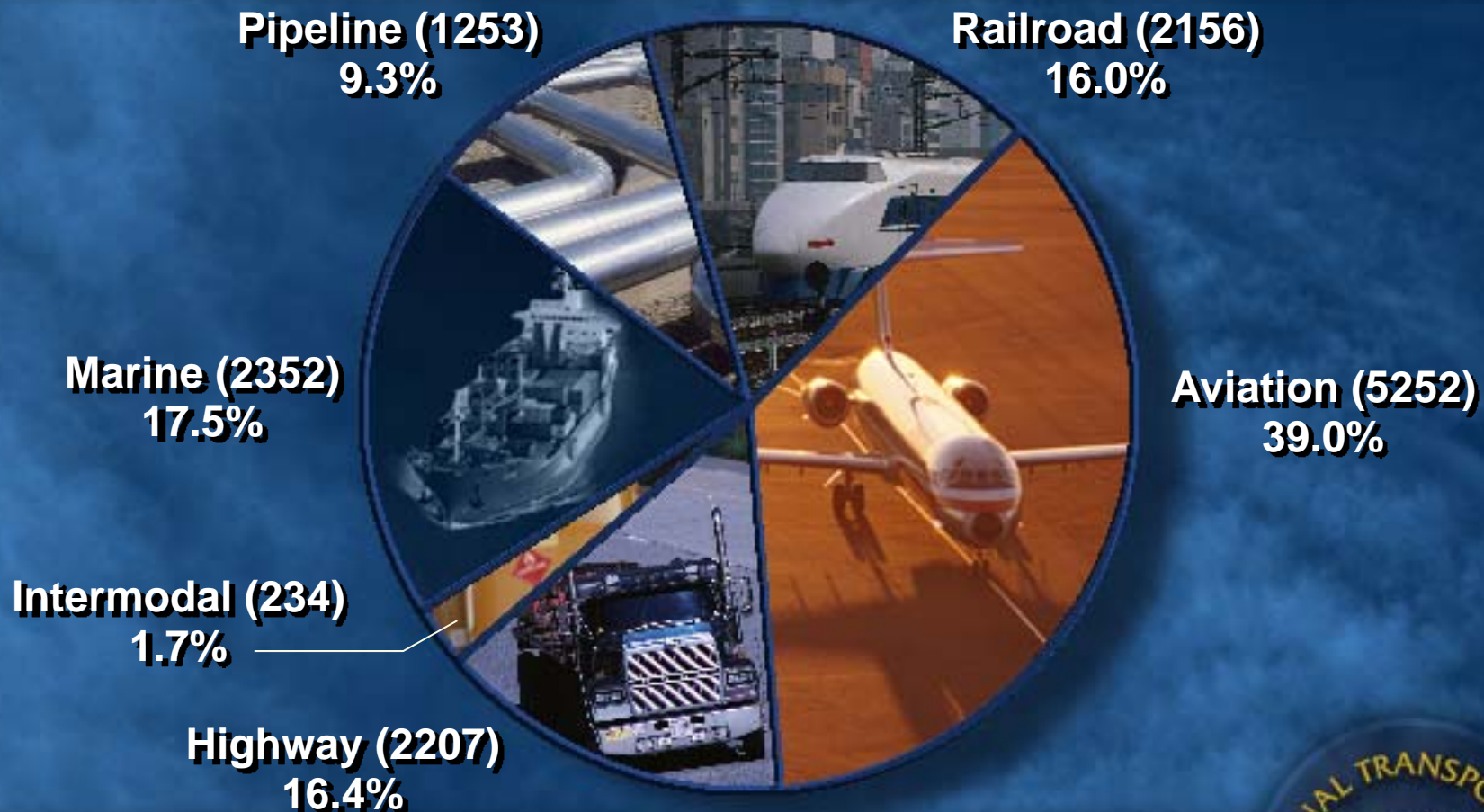
PG&E/San Bruno Gas Pipeline Explosion



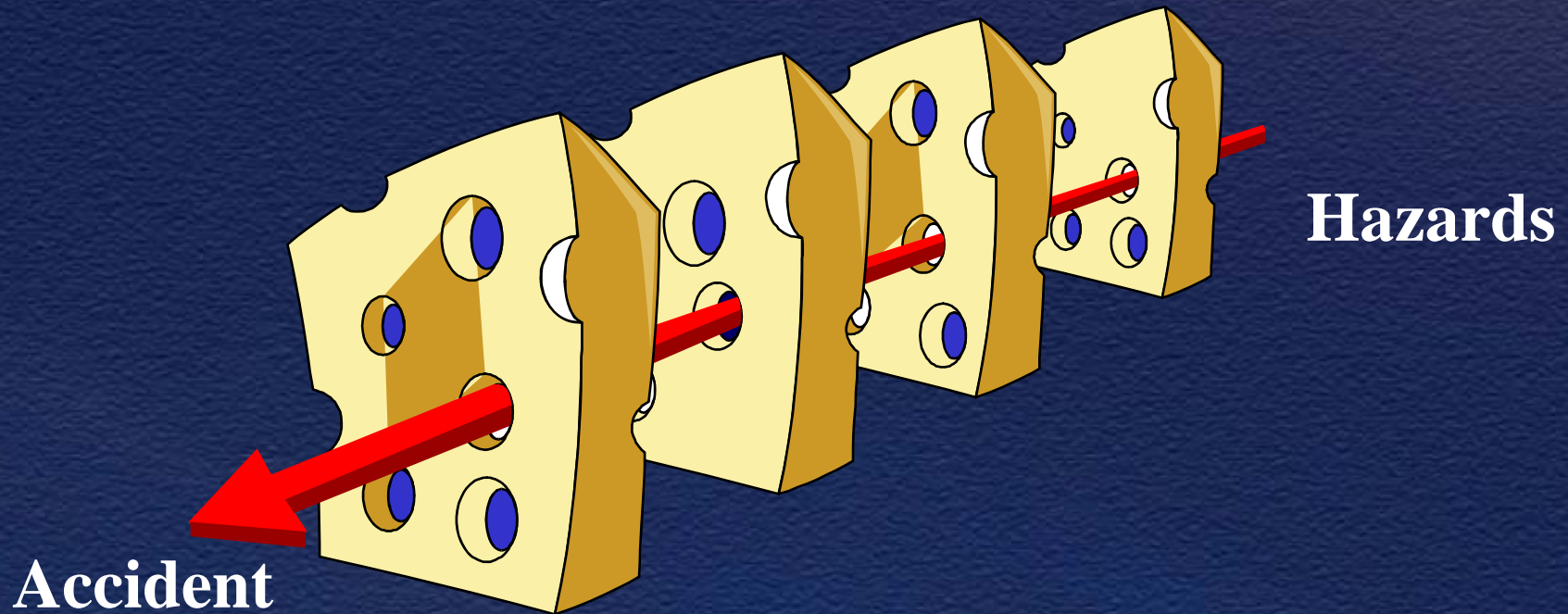


- 130,000+ accident investigations
- 13,000+ safety recommendations
 - 82% acceptance rate

13,454 Safety Recommendations issued since 1967

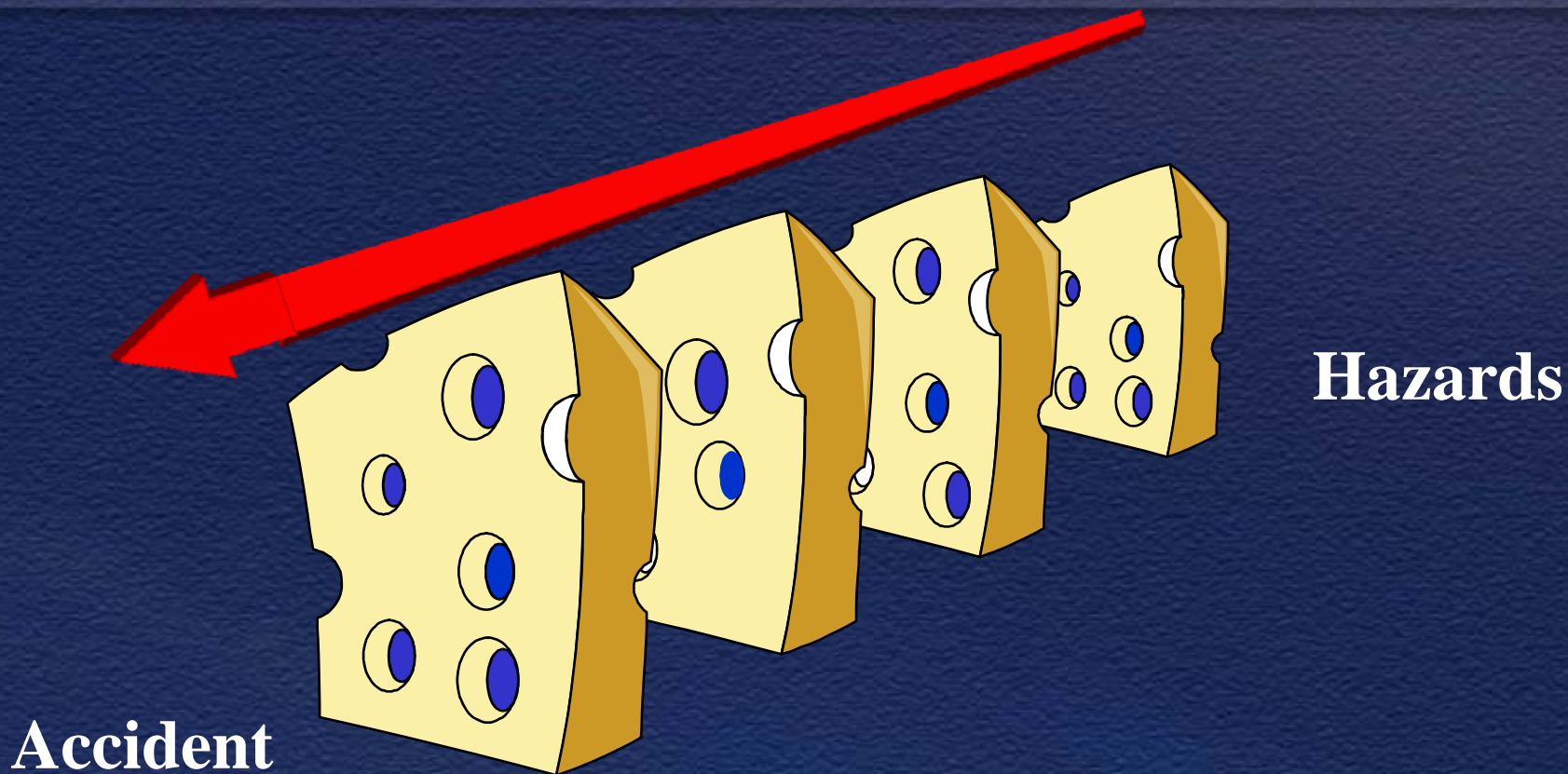


“Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards

The Challenge (Haueter)



Successive layers of defenses, barriers, and safeguards

Go! Flight 1002



- early starts, multiple segment days, sleep apnea

NTSB



Guantanamo Bay Cuba

First NTSB aviation accident to cite fatigue as probable cause

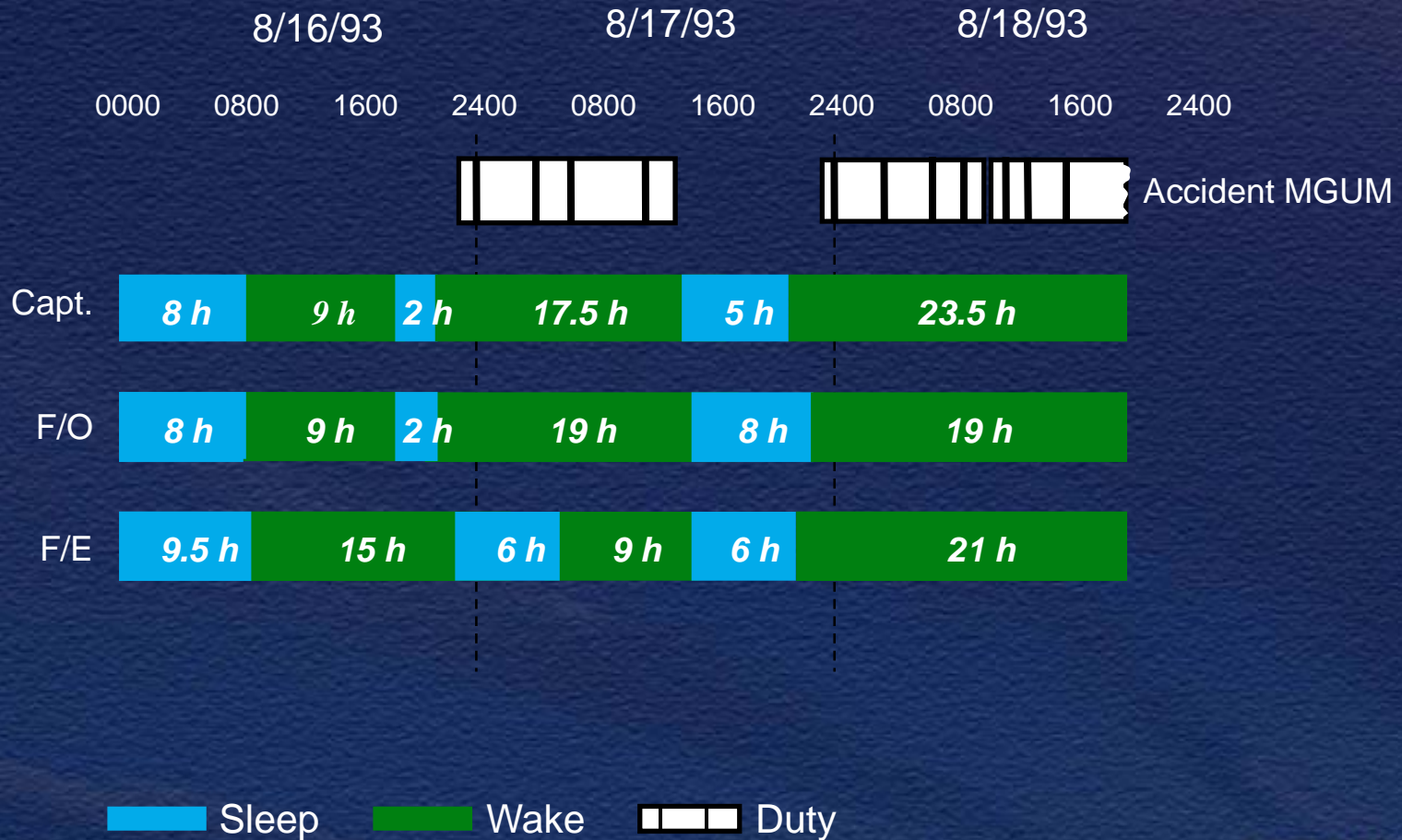


- acute sleep loss, sleep debt, circadian disruption

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Crew Sleep History



Observed Performance Effects

- Degraded decision-making
- Visual/cognitive fixation
- Poor communication/coordination
- Slowed reaction time

**Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993**

“The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision making, and flying abilities of the captain and flight crew due to the effects of fatigue...”

Owatonna, MN (July 31, 2008)



8 fatalities

NTSB



Owatonna Crew Fatigue Factors

- acute sleep loss (Capt/FO)
- cumulative sleep debt (FO)
- early start time (Capt/FO)
- excessive sleep need (Capt)
- insomnia (FO)
- self-medicate/prescription sleep med (FO)

Probable Cause/Contributing Factors

“Contributing to the accident were . . .
(2) fatigue, which likely impaired both
pilots’ performance; . . .”

Lubbock, TX (January 27, 2009)



2 injuries

NTSB



Probable Cause/Contributing Factors

“Contributing to the accident were . . .

4) fatigue due to the time of day in which the accident occurred and a cumulative sleep debt, which likely impaired the captain’s performance.”

Fatal Airline Accidents (Examples) (fatigue cited)

- 8/97 Guam: 228 fatalities
- 6/99 Little Rock AK: 11 fatal
- 10/04 Kirksville MO: 11 fatalities
- 8/06 Lexington KY: 49 fatalities
- 7/08 Owatonna MN: 8 fatalities
- 2/09 Buffalo NY: 49 fatalities

10 fatalities
3 serious injuries
2 minor injuries
5 no injuries

**Ford
Windstar**



**Hyundai
Sonata**

**Kia
Spectra**

Fatigue Factors

- Off work for 3 weeks
- Kept day active/night sleep schedule when off
- Had one work day prior to accident
- 3am to 3pm shift work/drive schedule (since 1997)
- Obtained min 3 hrs/max 5 hrs sleep prior to accident
- Early bedtime (2 hr phase advance in sleep time)
- Subsequently diagnosed with mild sleep apnea

Probable Cause (fatigue)

“ . . . driver’s fatigue, caused by the combined effects of acute sleep loss, circadian disruption associated with his shift work schedule, and mild sleep apnea, which resulted in the driver’s failure to react to slowing and stopped traffic ahead by applying the brakes or performing any evasive maneuver to avoid colliding with the traffic queue. . . . ”

NTSB Most Wanted List

Critical changes needed to reduce transportation accidents and save lives.



NATIONAL TRANSPORTATION SAFETY BOARD

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Home > Transportation Safety > Most Wanted List

SHARE   

MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives. The following are ten of the current issues.



Addressing Human Fatigue



General Aviation Safety



Safety Management Systems



Runway Safety



Bus Occupant Safety



Pilot & Air Traffic Controller Professionalism



Recorders



Teen Driver Safety



Addressing Alcohol-Impaired Driving



Motorcycle Safety

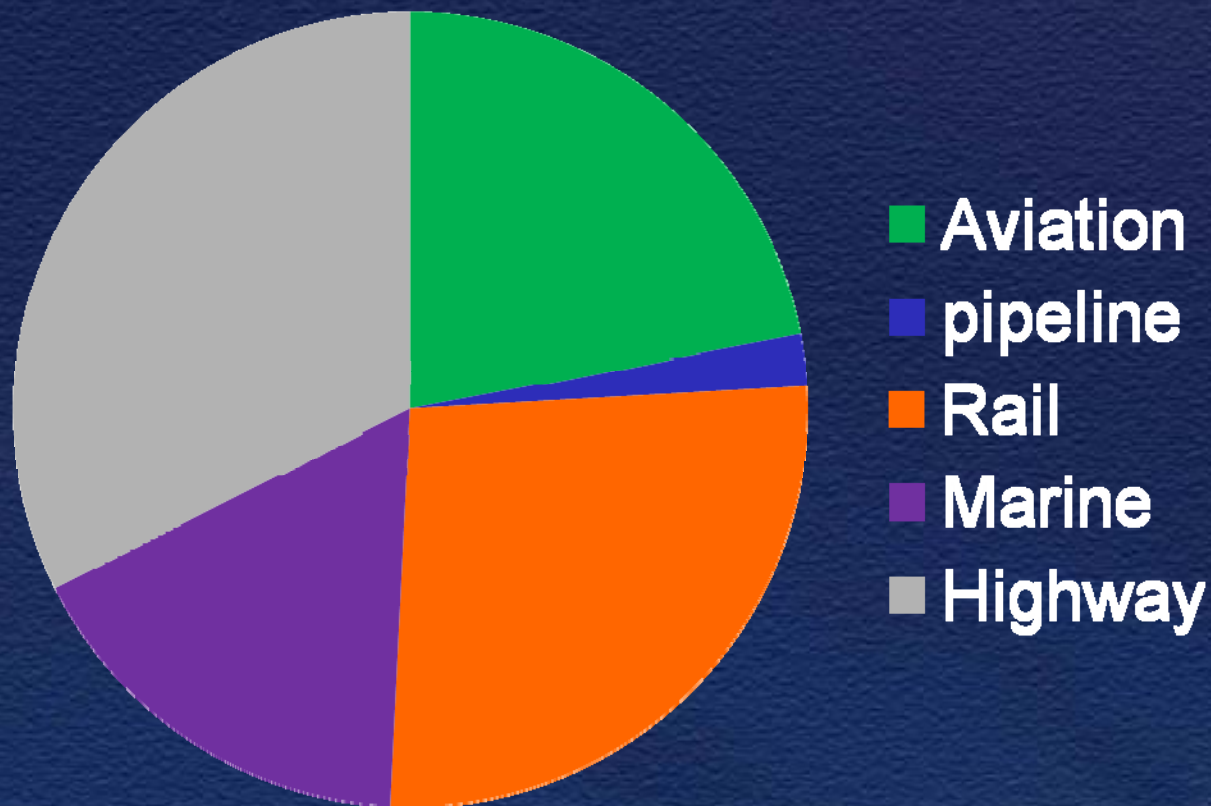


NTSB Recommendations

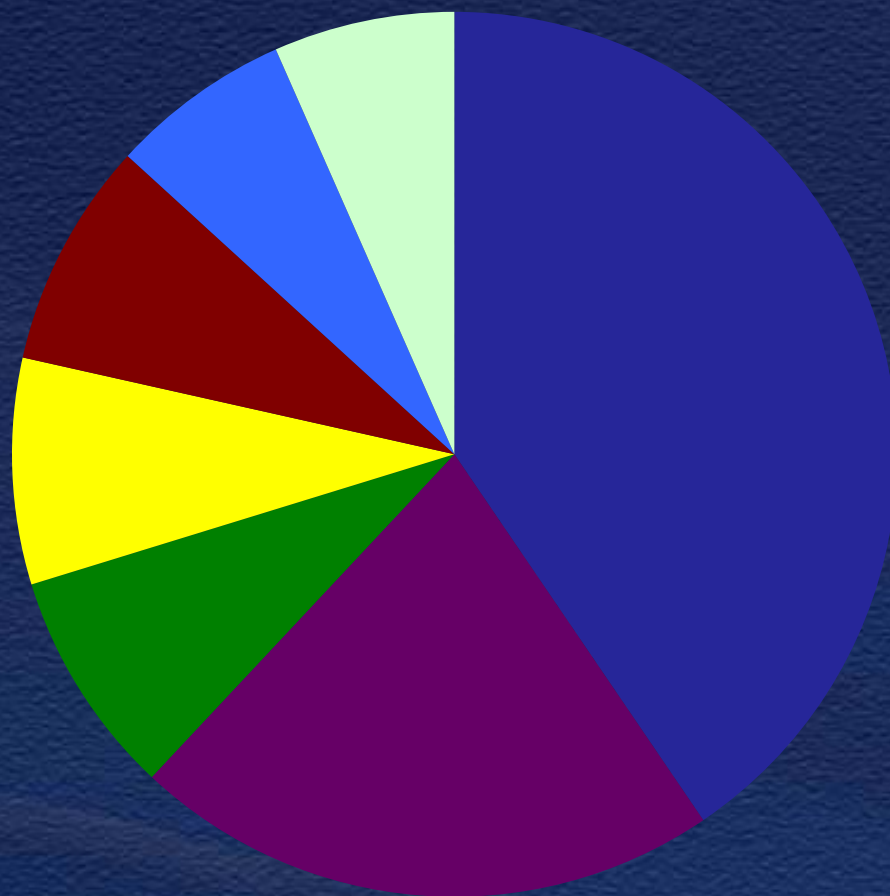
- MOST WANTED since 1990
- ~200 fatigue recommendations

NTSB Fatigue Recommendations by Mode

~ 200 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

Scheduling Policies and Practices

Victoria, Texas, January 2, 2008



Victoria, Texas Fire Department

- 1 fatality, 47 injuries; day sleep, night drive, ~ 4 am WOCL

NTSB



Hours of Service / Scheduling

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

Healthy Sleep

Mexican Hat, UT, January 6, 2008



- 360 rollover, 50/53 ejected, 9 fatalities; OSA (-CPAP)

NTSB



Health Related Recommendations

- Develop standard medical exam to screen for sleep disorders; require its use
- Educate companies and individuals about sleep disorder detection and treatment, and the sedating effects of certain drugs
- Establish a system to track prescription and OTC drug use of operators

Owatonna, MN (July 31, 2008): Safety Recommendations

7. Revise regulations and policies to permit appropriate use of prescription sleep medications by pilots under medical supervision for insomnia.
8. Require 14 Code of Federal Regulations Part 135 and 91 subpart K pilots to receive initial and recurrent education and training on factors that create fatigue in flight operations, fatigue signs and symptoms, and effective strategies to manage fatigue and performance during operations.
9. Review the policy standards for all common sleep-related conditions, including insomnia, and revise them in accordance with current scientific evidence to establish standards under which pilots can be effectively treated for common sleep disorders while retaining their medical certification.
10. Increase the education and training of physicians and pilots on common sleep disorders, including insomnia, emphasizing the need for aeromedically appropriate evaluation, intervention, and monitoring for sleep-related conditions.

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

Future Needs . . .

- Operationally relevant science
- Implement science-based strategies
- Continuing evaluation/evolution
- A culture change that supports different attitudes and behaviors



NTSB