



NTSB National Transportation Safety Board

Enhancing Transportation Safety: NTSB Investigations and Recommendations

Honorable Mark R. Rosekind, Ph.D.
Board Member

ISASI
San Francisco Chapter
February 24, 2012

Presentation Topics

- *NTSB overview*
- Physiological fatigue factors
- Examining role of fatigue in accidents
- Strategies to manage fatigue



UNITED STATES CODE, TITLE 49

CHAPTER 11—NATIONAL TRANSPORTATION SAFETY BOARD

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SUBCHAPTER 5—GENERAL

§1181. Definitions

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

SUBCHAPTER 6—ORGANIZATION AND ADMINISTRATIVE

§1113. General organization

(a) ORGANIZATION.—The National Transportation Safety Board is an independent establishment of the Executive Branch of the Government.

(b) APPOINTMENT OF MEMBERS.—The Board is composed of 5 members appointed by the President, with the advice and consent of the Senate. Not more than 3 members may be appointed from the same political party. The 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. An individual may be reappointed to fill a vacancy occurring before the expiration of the term for which the predecessor of that individual was appointed for the remainder of that term. When the term of office of a member ends, the successor may not be appointed until a successor is appointed and qualified. The President may remove a member for inefficiency, neglect of duty, or other cause.

(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 the duties of the office, the Vice Chairman shall perform those duties.

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



Key On-scene Events



Organizational Meeting

- Designate parties and party coordinators
- Establish and organize groups

Progress Meetings

- Summarize findings
- Info for briefings

Family Briefings

Press Briefings



NTSB Investigative Process



On-scene Investigation

- Organizational Meeting
- Groups and Parties
- Progress meetings
- Media Briefings
- Press Releases



Preliminary Report
Factual information



Public Hearing
Fact finding
Depositions
Witnesses
Docket



Board Meeting
Docket
Findings
Conclusions
Probable Cause
Safety Recommendations



Final Report

Government in the Sunshine Act

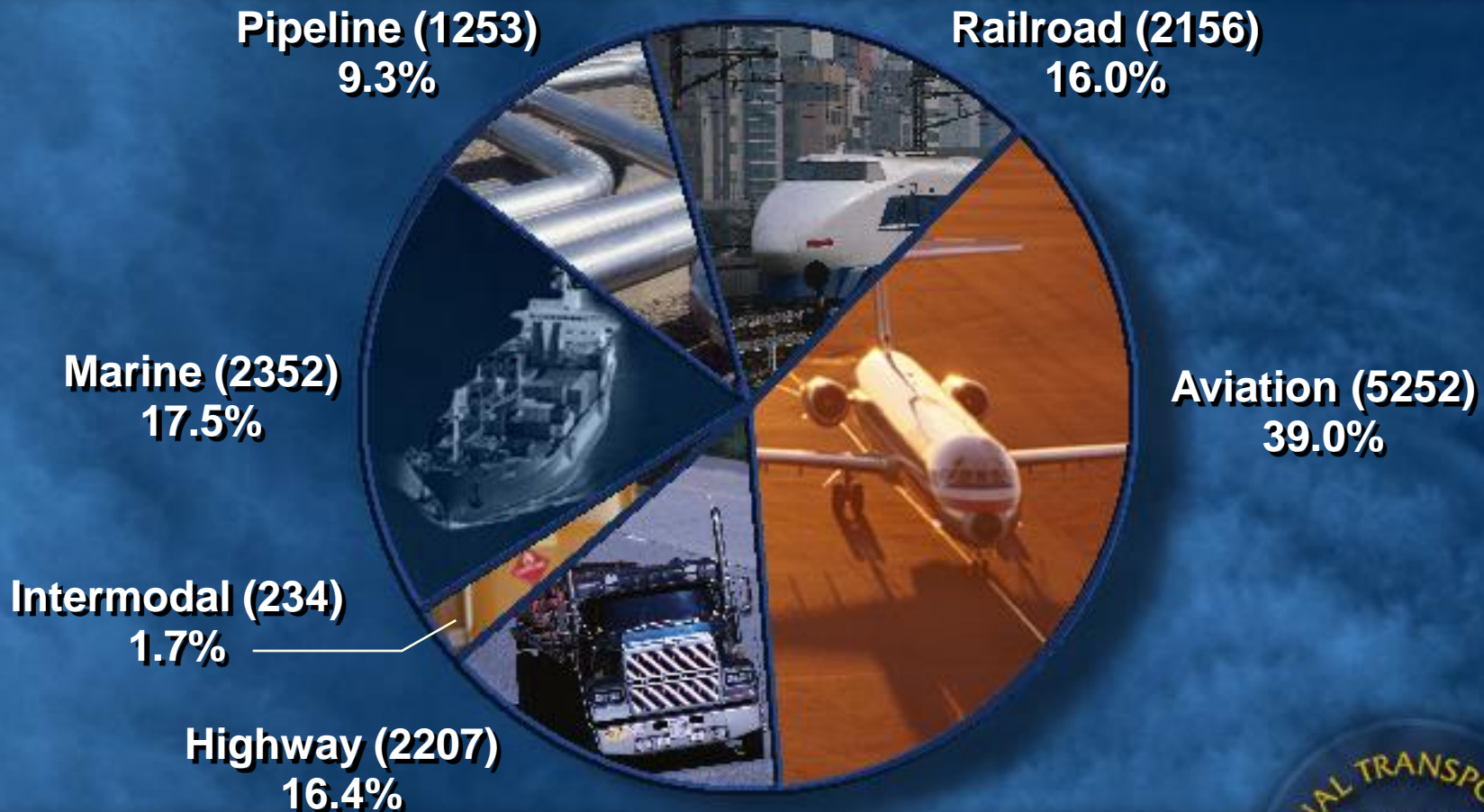
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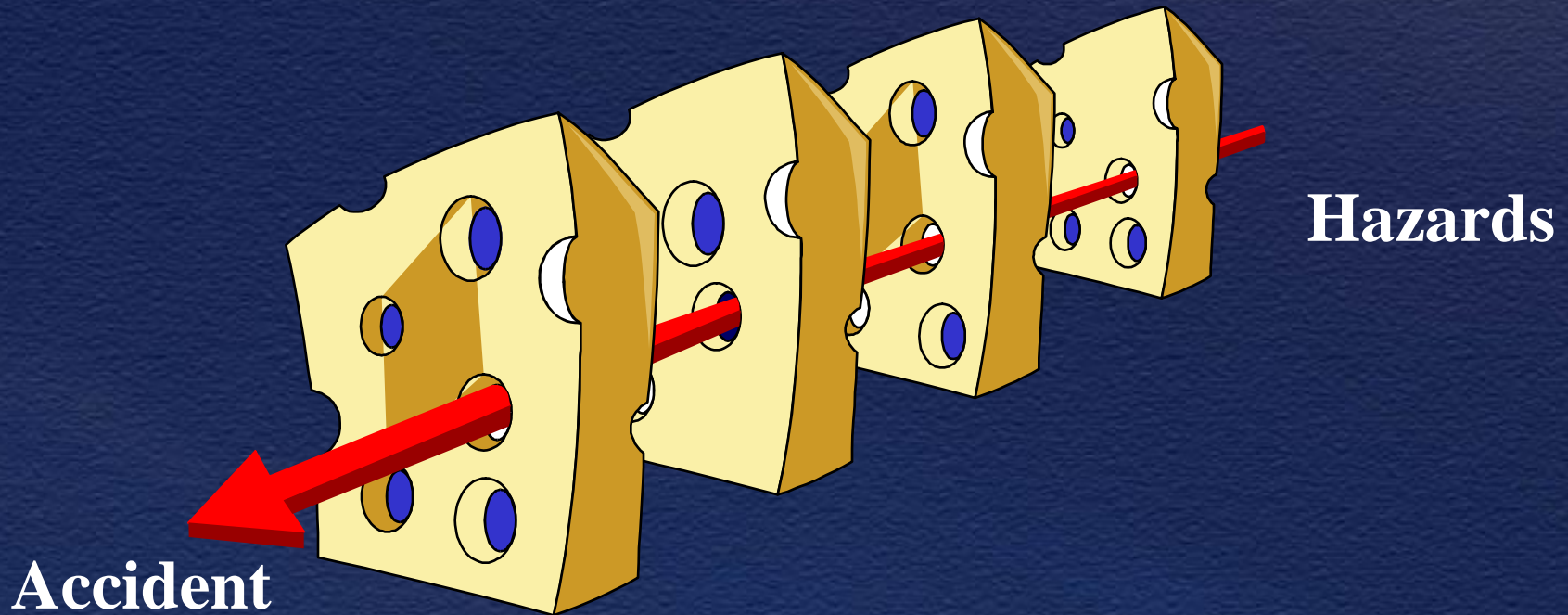


- 130,000+ accident investigations
- ~13,500 safety recommendations
 - 82% acceptance rate

13,454 Safety Recommendations issued since 1967

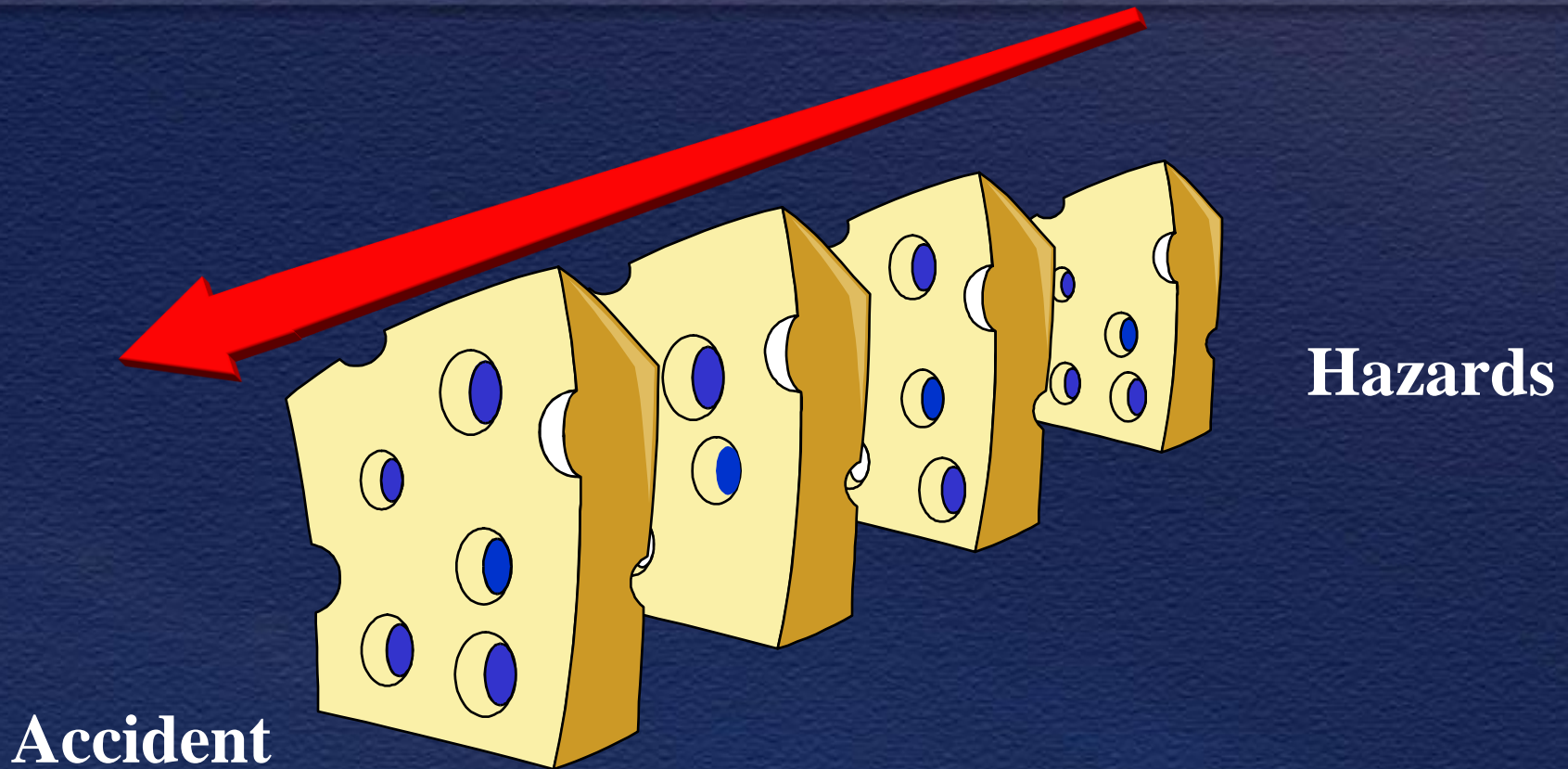


“Swiss Cheese” Model (Reason)



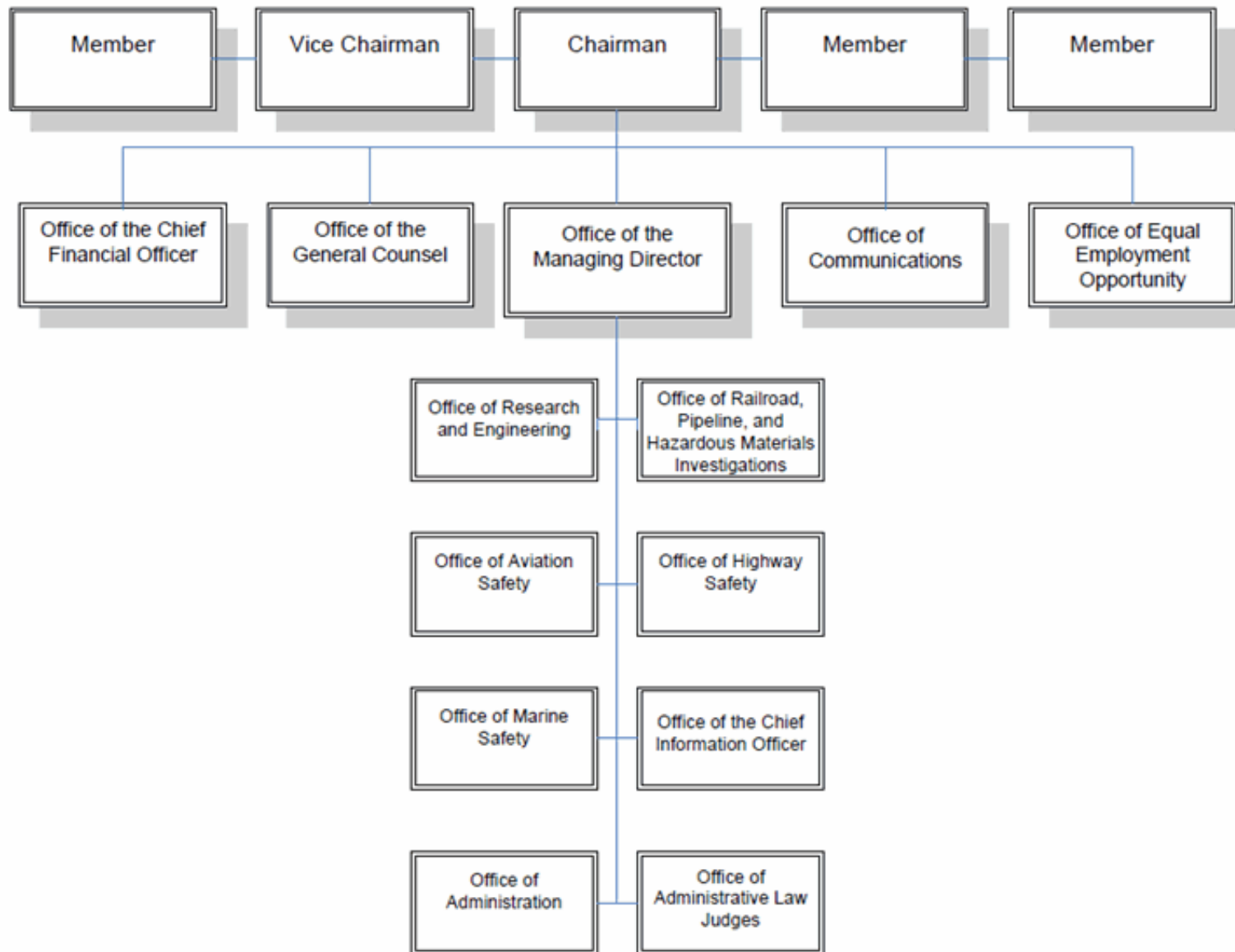
Successive layers of defenses, barriers, and safeguards

The Challenge (Haueter)



Successive layers of defenses, barriers, and safeguards

NATIONAL TRANSPORTATION SAFETY BOARD



Presentation Topics

- NTSB overview
- *Physiological fatigue factors*
- Examining role of fatigue in accidents
- Strategies to manage fatigue

Fatigue Risks

Fatigue can degrade
every aspect of
human capability.

Performance Reduced 20-50+%

Reaction time

Memory

Communication

Judgment

Attention

Mood

Impaired mood

Situational awareness

Concentration

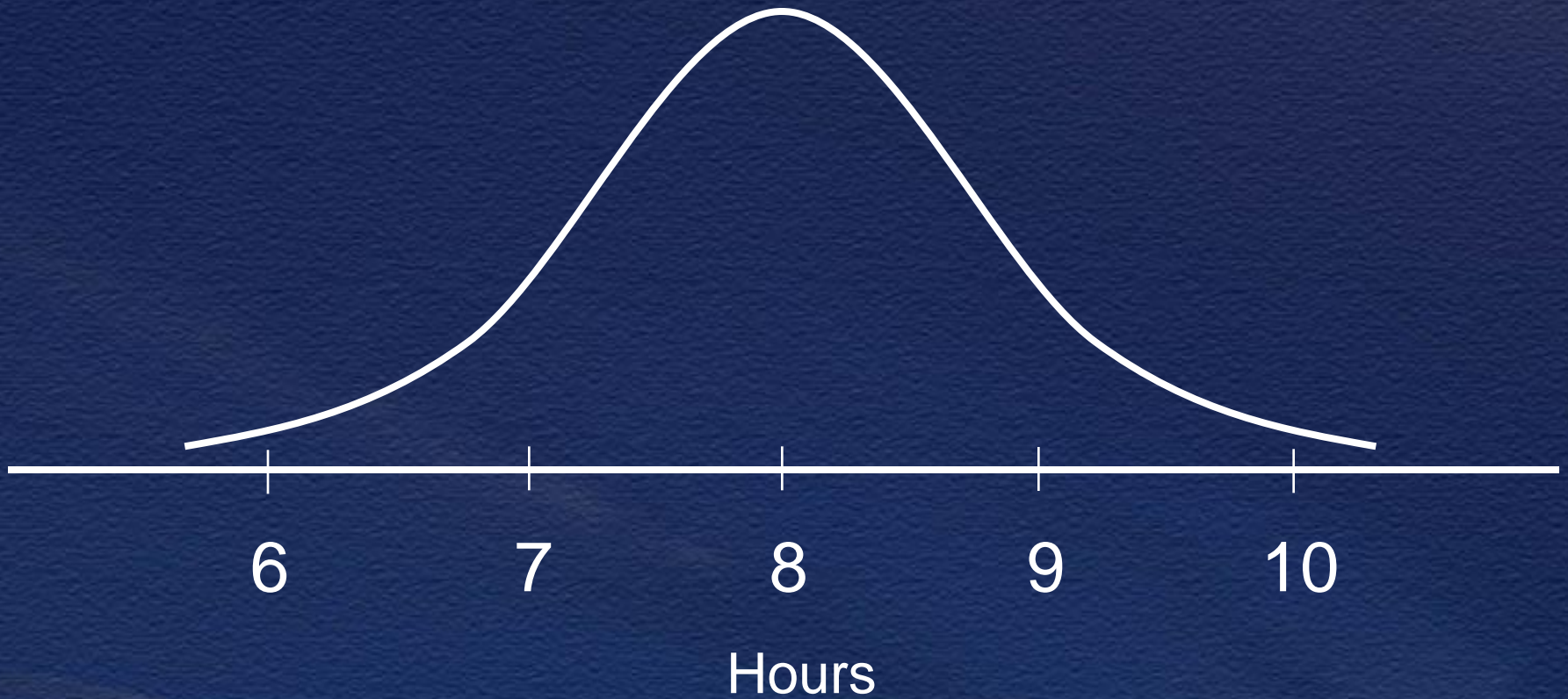
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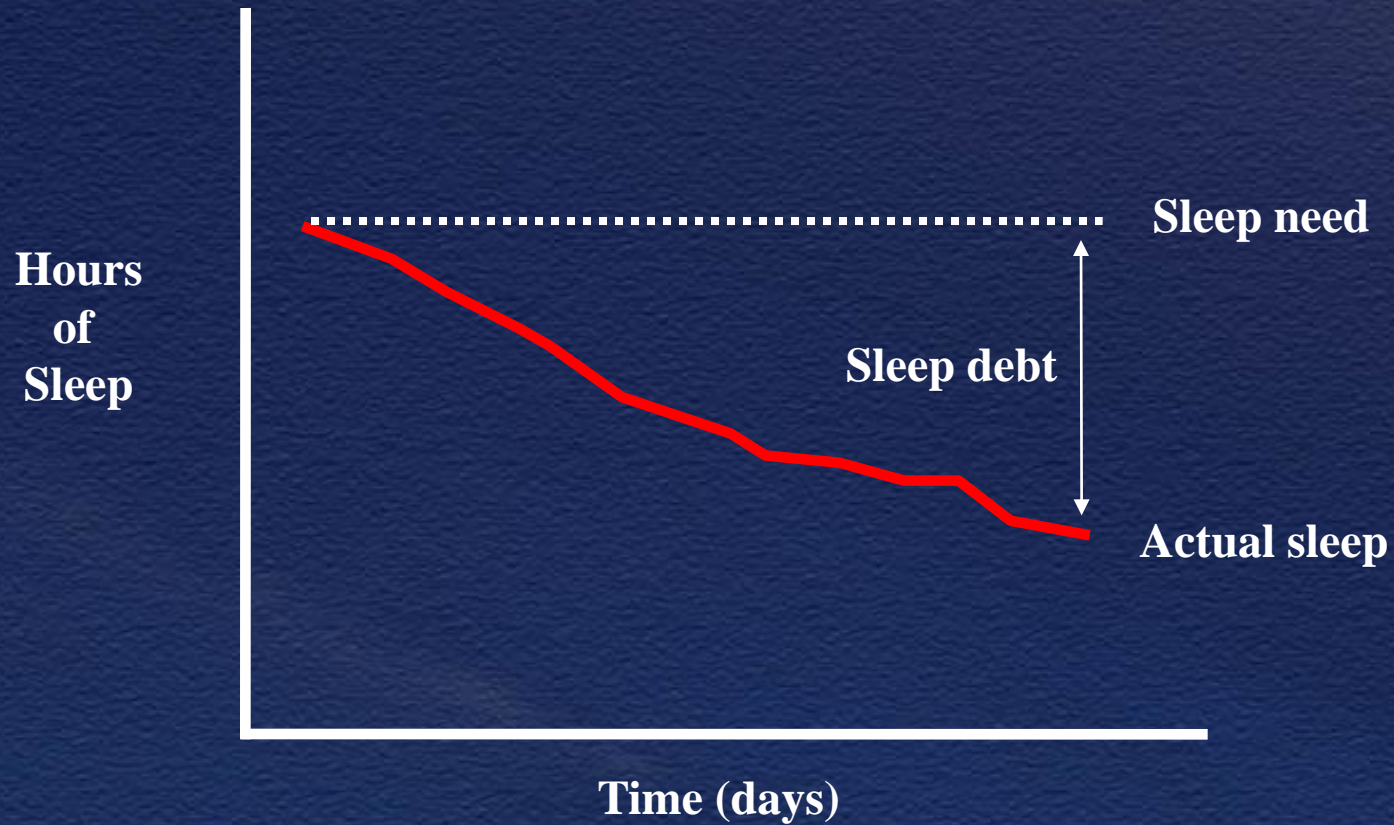
Fatigue Factors

- sleep
- circadian clock
- hours awake
- sleep disorders

Sleep Requirement



Cumulative Sleep Debt



Sleep Need – Actual Sleep = Sleep Debt

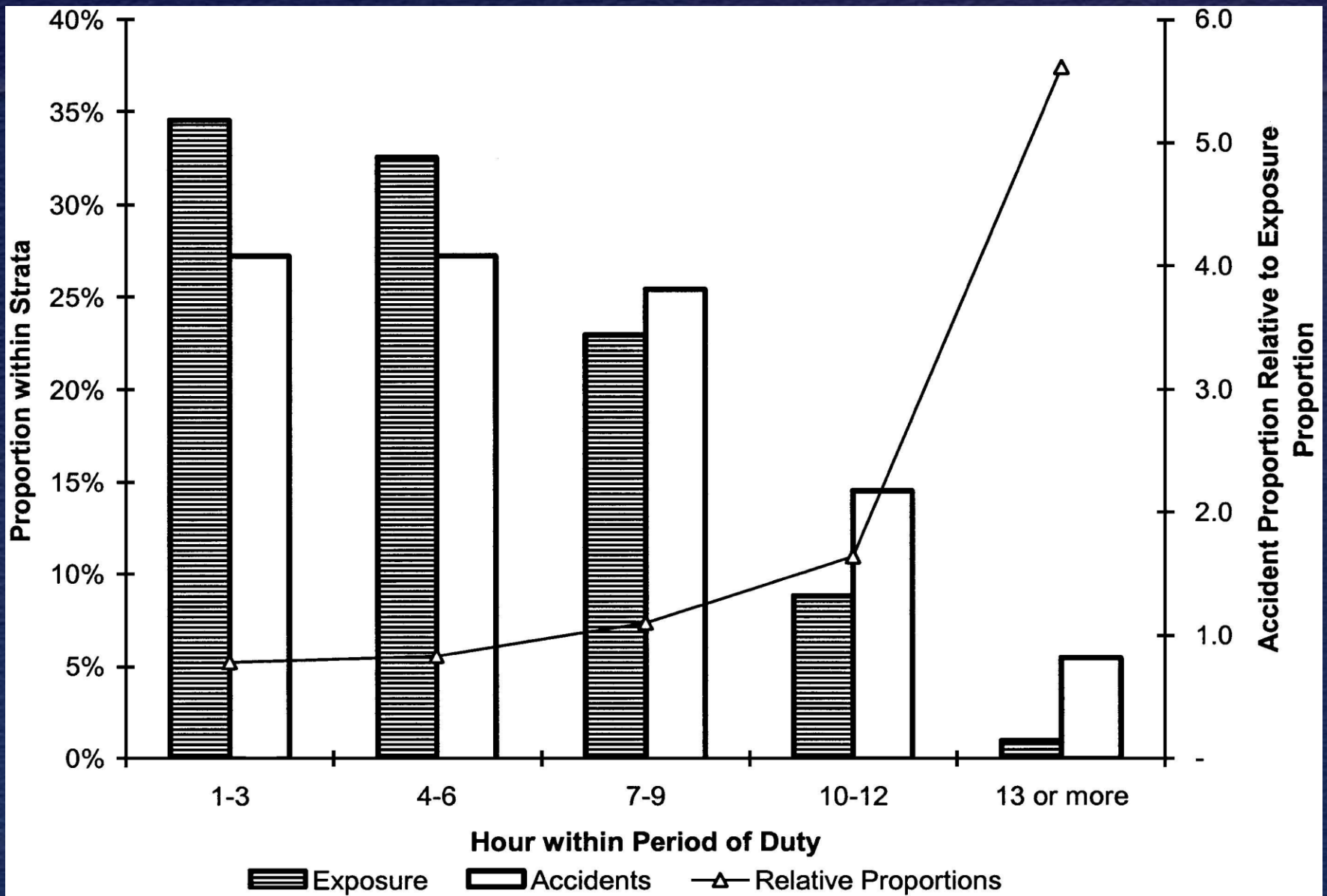
Sleep debt grows cumulatively over time

Fatigue Factors

- sleep
- circadian clock
 - 'sleepy' windows
 - 'alert' windows
 - irregular schedule
 - time zones
- hours awake
- sleep disorders

Fatigue Factors

- sleep
- circadian clock
- hours awake
 - > 12 hrs
 - > 16 hrs
 - 24 hrs
- sleep disorders



Fatigue Factors

- sleep
- circadian clock
- hours awake
- sleep disorders
 - ~ 90 sleep disorders

Presentation Topics

- NTSB overview
- Physiological fatigue factors
- ***Examining role of fatigue in accidents***
- Strategies to manage fatigue

Honorable John K. Lauber:

No Accident \neq
Safe Operation

Go! Flight 1002



- early starts, multiple segment days, sleep apnea

NTSB



Four Fatigue Factors +

- Sleep loss
- Continuous hours of wakefulness
- Circadian/time of day
- Sleep disorders
- Other considerations

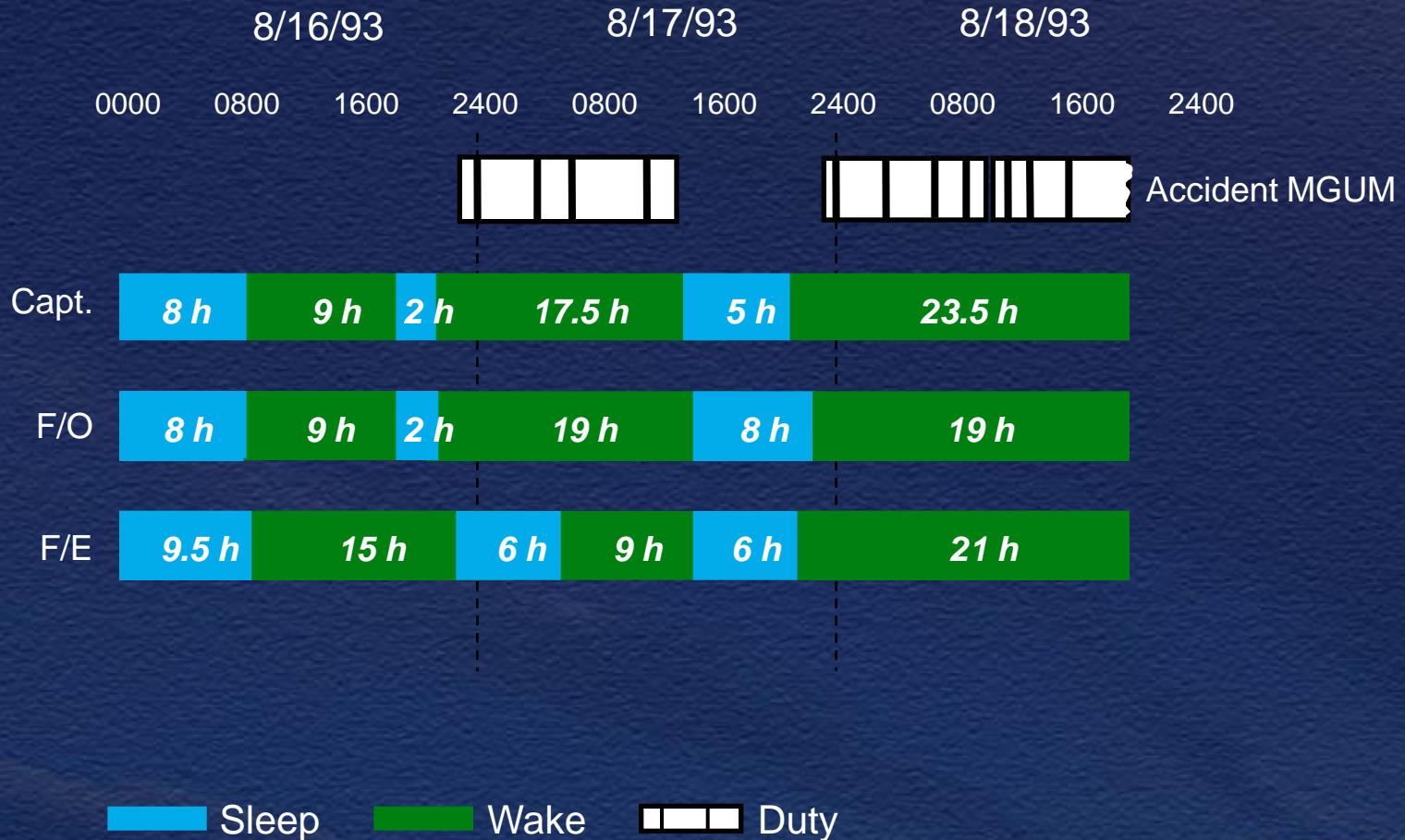
Guantanamo Bay Cuba

First NTSB aviation accident to cite fatigue as probable cause



- acute sleep loss, sleep debt, circadian disruption

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; . . .”

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

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- ***Strategies to manage fatigue***



Home > Transportation Safety > Most Wanted List

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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



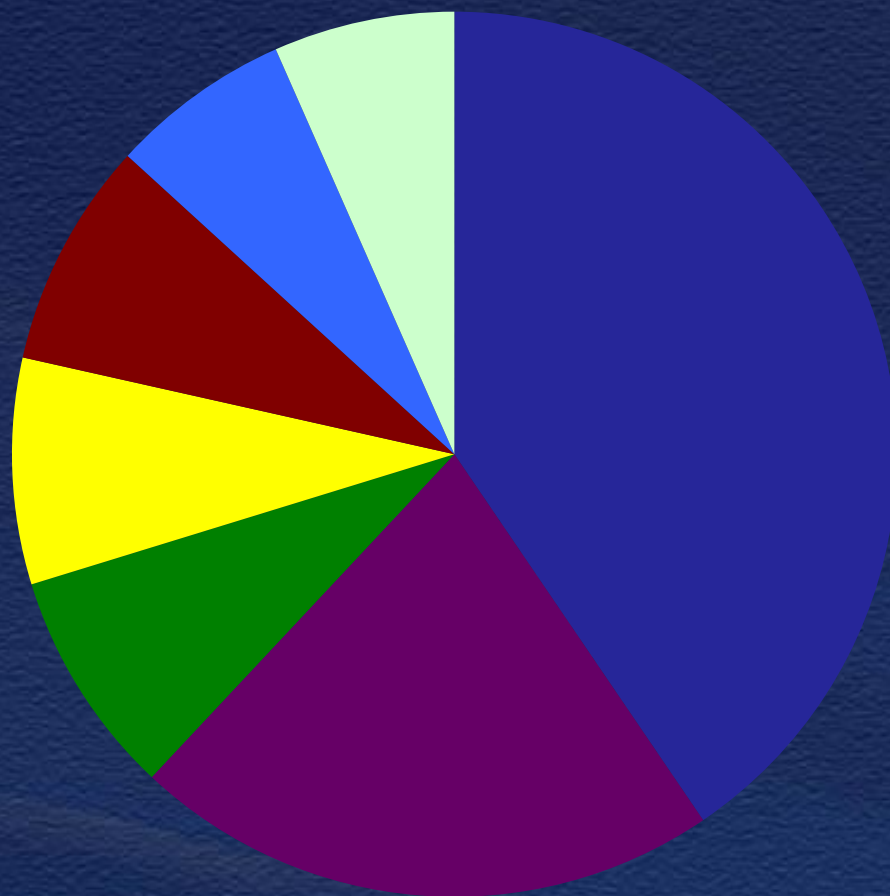
Motorcycle Safety



NTSB Recommendations

- MOST WANTED since 1990
- ~200 fatigue recommendations

Complex Issue: Requires Multiple Solutions



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

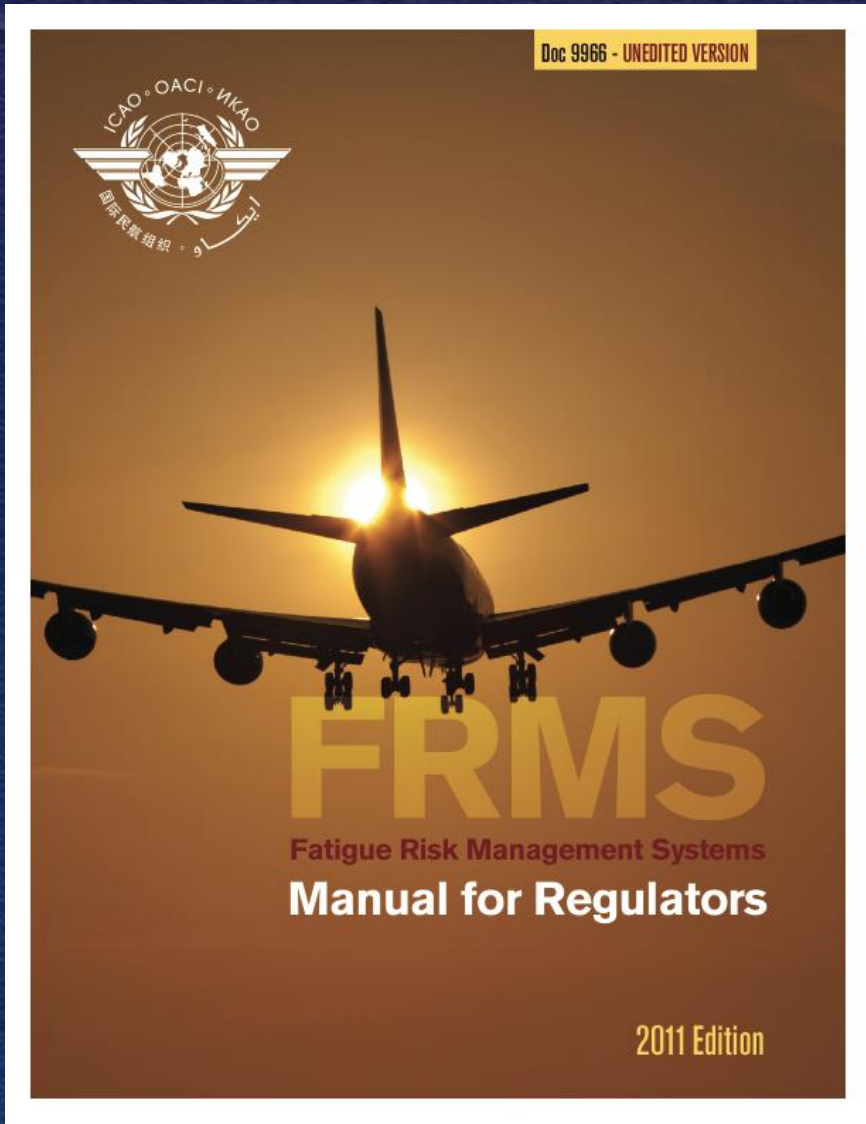
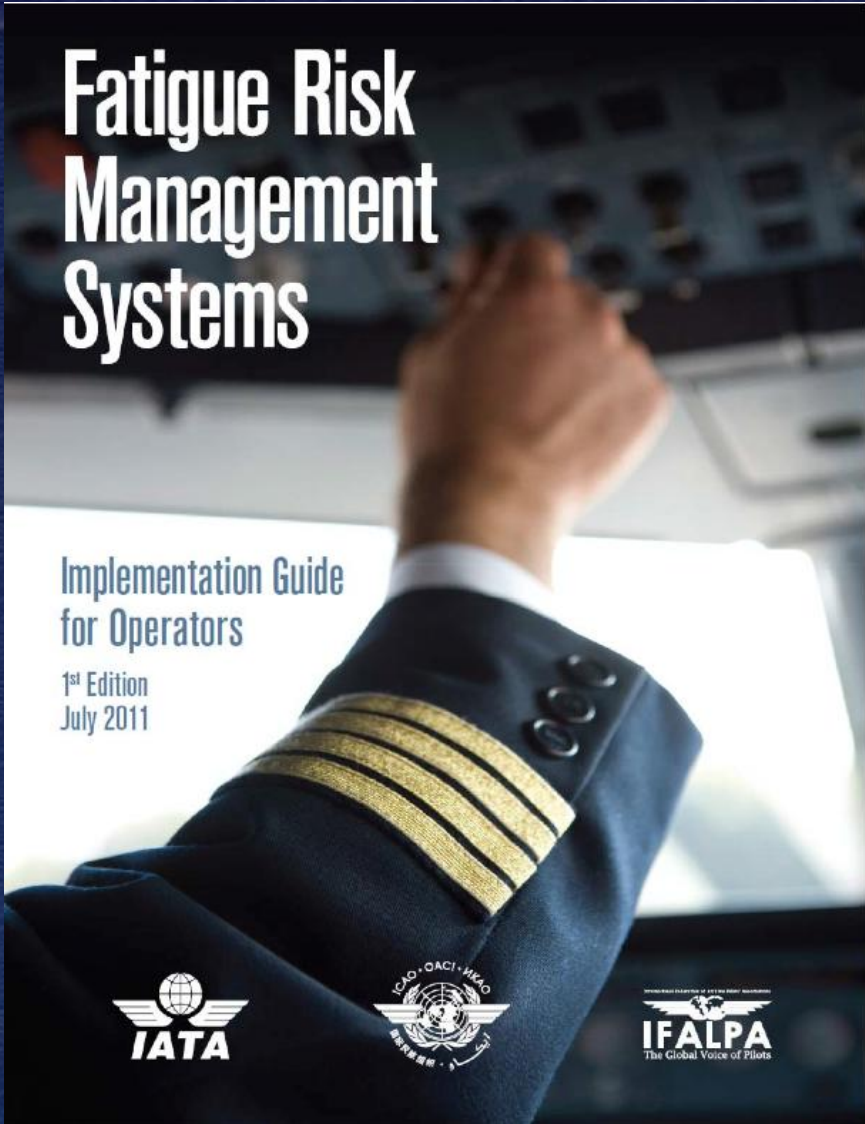
NTSB Recommendations: Hours of Service / Scheduling

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

NTSB Recommendations: 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

Example



NTSB Recommendations: 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

NTSB Recommendations: Education/Strategies

- Include information on use of strategies: naps, caffeine, etc.
- No recommendations on specific personal strategies

Changing Safety Culture

Safety goal . . .

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NTSB