



**National  
Transportation  
Safety Board**

# From Bench to Planes, Trains, and Automobiles: How Sleep Science can Enhance Transportation Safety

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Board Member

APSS  
June 11, 2012



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



All Modes



# Independent Federal Agency: Created in 1967

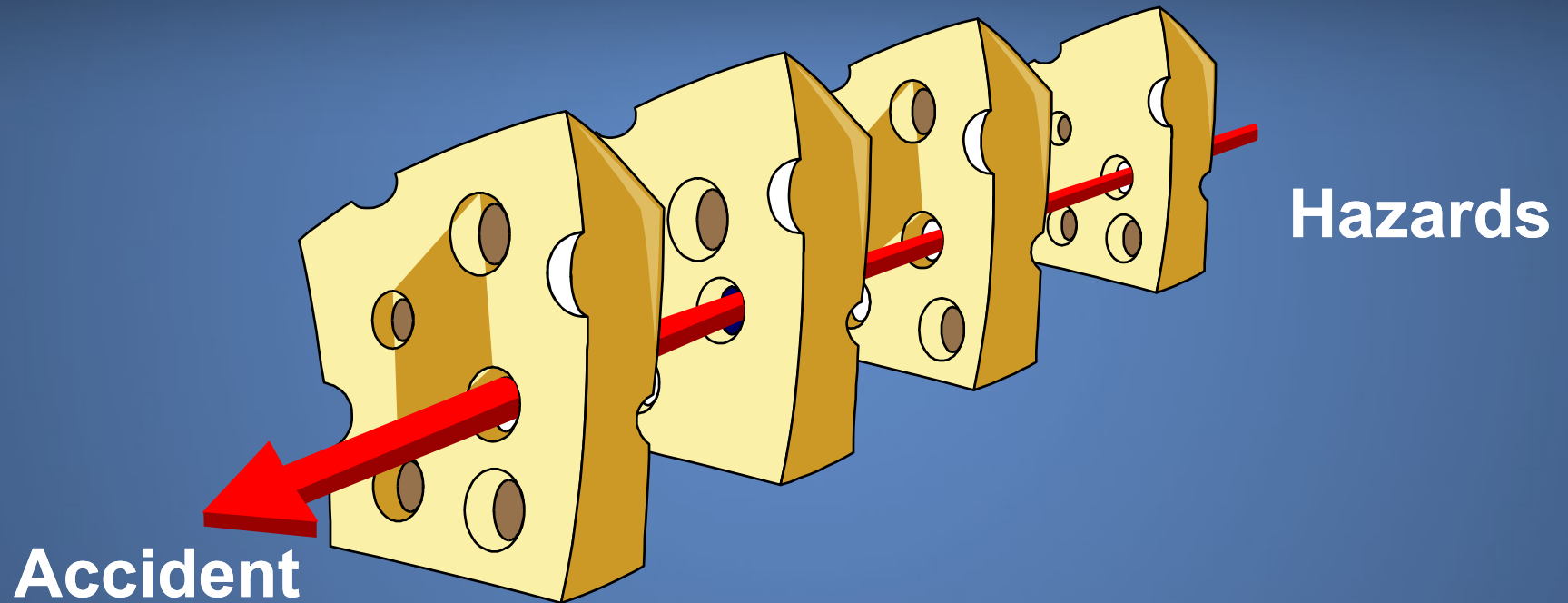
- ~ 132,000 accident investigations
- 13,500+ safety recommendations
- ~ 2,500 organizations/recipients
- 82% acceptance rate

# NTSB Characterized as:

‘moral compass and industry conscience’

NTSB Chairman Deborah A.P. Hersman

# “Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards

# #1: Sleep science has established that . . .

- sleep loss, circadian disruption, fatigue
  - create safety risks
  - cause accidents, fatalities, injuries

# Guantanamo Bay Cuba

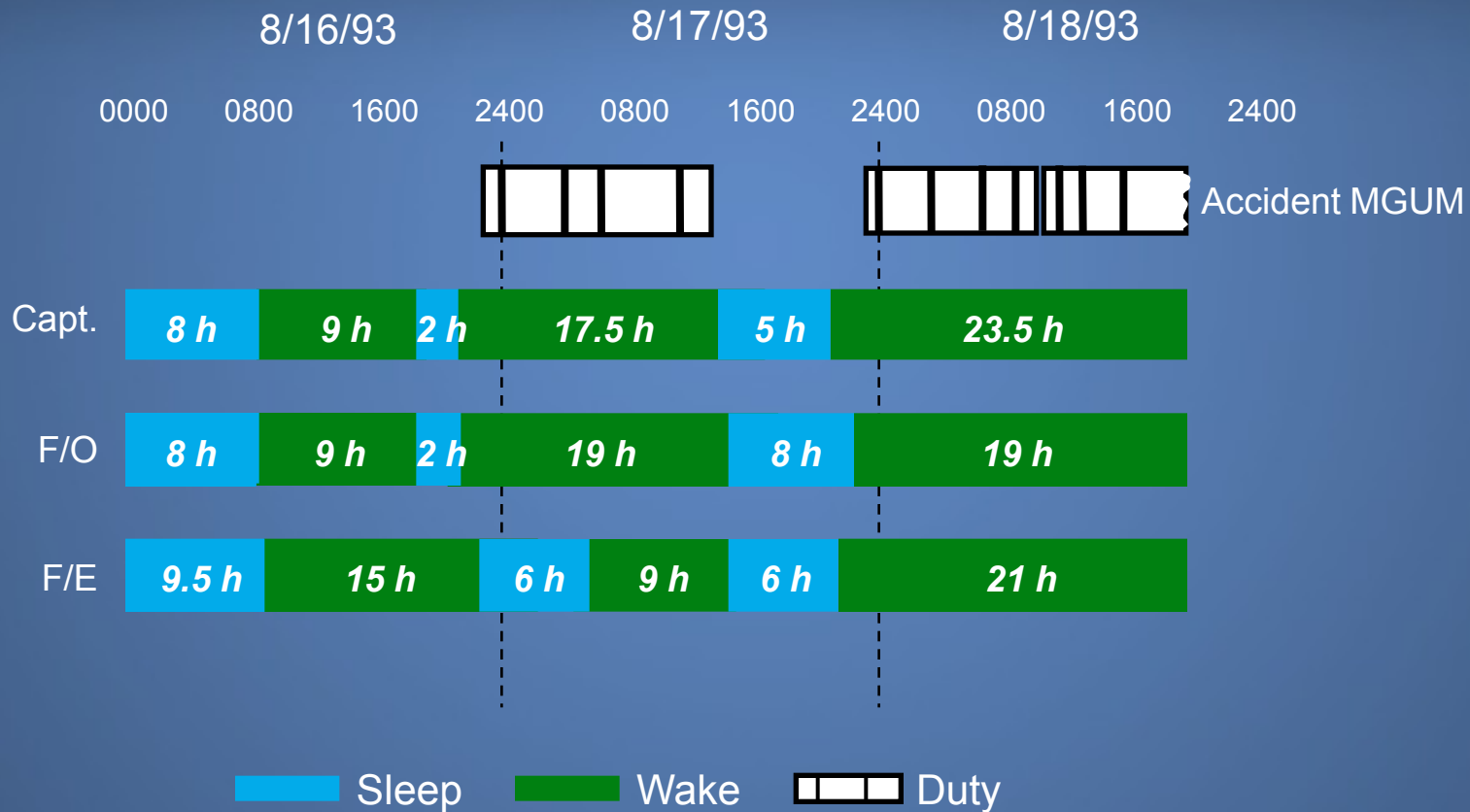
First NTSB aviation accident to cite fatigue as probable cause



- acute sleep loss, sleep debt, circadian disruption



# Crew Sleep History



# Observed Performance Effects

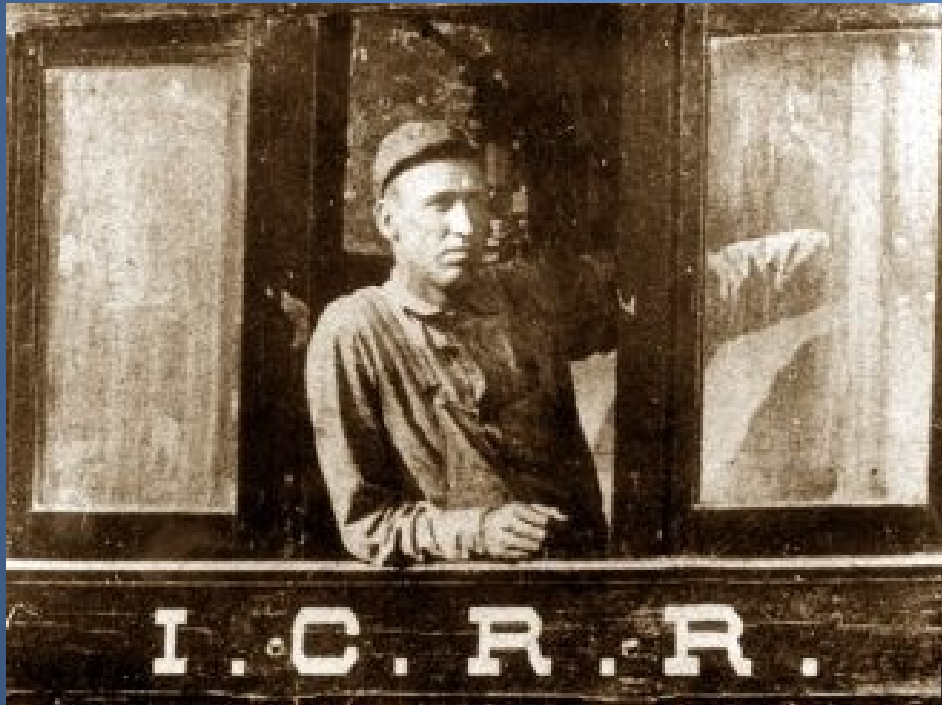
- Degraded decision-making
- Visual/cognitive fixation
- Poor communication/coordination
- Slowed reaction time

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...”

# Casey Jones: Famous Railroad Engineer

Fatal accident on April 30, 1900 at 3:52 AM



"Engineer on No.1 failed to answer flagman who was out proper distance. It is supposed did not see the flag."

'impossible to believe that an engineer of Jones's experience would have ignored a flagman and fuses (flares) and torpedoes exploded on the rail to alert him to danger.'



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## **Track Path Animation**

Collision Between Two BNSF Railway Freight Trains

Red Oak, Iowa

April 17, 2011

DCA11FR002



**NTSB**

# Probable Cause (fatigue)

“ . . . failure of the crew of the striking train to comply with the signal indication requiring them to operate in accordance with restricted speed requirements and stop short of the standing train because they had fallen asleep due to fatigue resulting from their irregular work schedules and their medical conditions.”

# Miami, OK (June 26, 2009)

10 fatalities  
3 serious injuries  
2 minor injuries  
5 no injuries

**Ford  
Windstar**



**Hyundai  
Sonata**

**Kia  
Spectra**

Source: Oklahoma State Police

# 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. . . . ”





# National Transportation Safety Board

## **Animation of Accident Reconstruction**

### **Motorcoach Run Off Road-Collision with Bridge Signpost**

Interstate Highway 95 Southbound  
New York, New York  
March 12, 2011

HWY11MH005



**NTSB**

# 'Bronx Bus', New York, NY (March 12, 2011)



15 fatalities  
17 injuries



# Probable Cause

“The National Transportation Safety Board determines that the probable cause of the accident was the motorcoach driver's failure to control the motorcoach due to fatigue resulting from failure to obtain adequate sleep, poor sleep quality, and the time of day at which the accident occurred.”

## #2: Sleep science is a foundation for . . .



- safety recommendations
- regulatory changes
- operational practices

# NTSB Safety Recommendations: Fatigue

- 40 years ago: May 10, 1972
- “Revise FAR 135 to provide adequate flight and duty time limitations.” (A-72-55)
- Classified “Closed-Unacceptable”



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

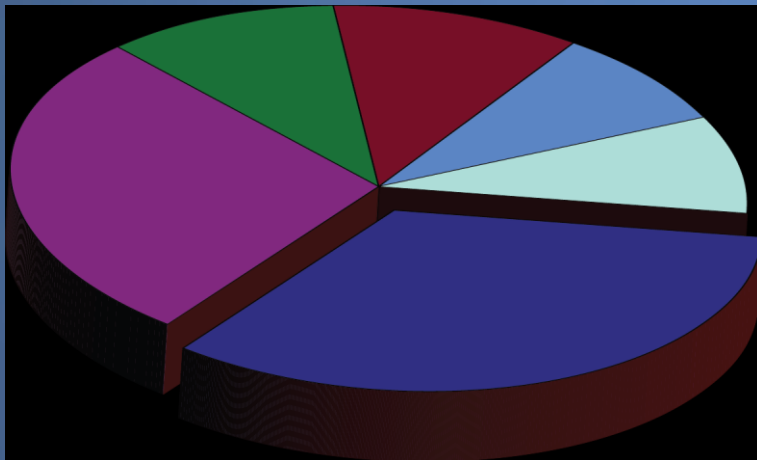


# NTSB Safety Recommendations: Fatigue

- MOST WANTED since 1990
- ~200 fatigue recommendations

# Complex Issue:

## Requires Multiple Solutions



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



# NTSB Safety Recommendations: Fatigue Status (May, 2012)

- Total: 194
- Open: 48
- Closed: 146
- CUN\*: 26

CUN = closed unacceptable

# New Hours of Service Regulations In 2011: Rail, Aviation, and Trucking

**brisbane**  
times

**Train drain: new rules fight driver fatigue**

February 8, 2012

**The Dallas  
Morning News**

**FAA issues rules to ensure that pilots get enough rest**

22 December 2011

THE  
HUFFINGTON  
POST

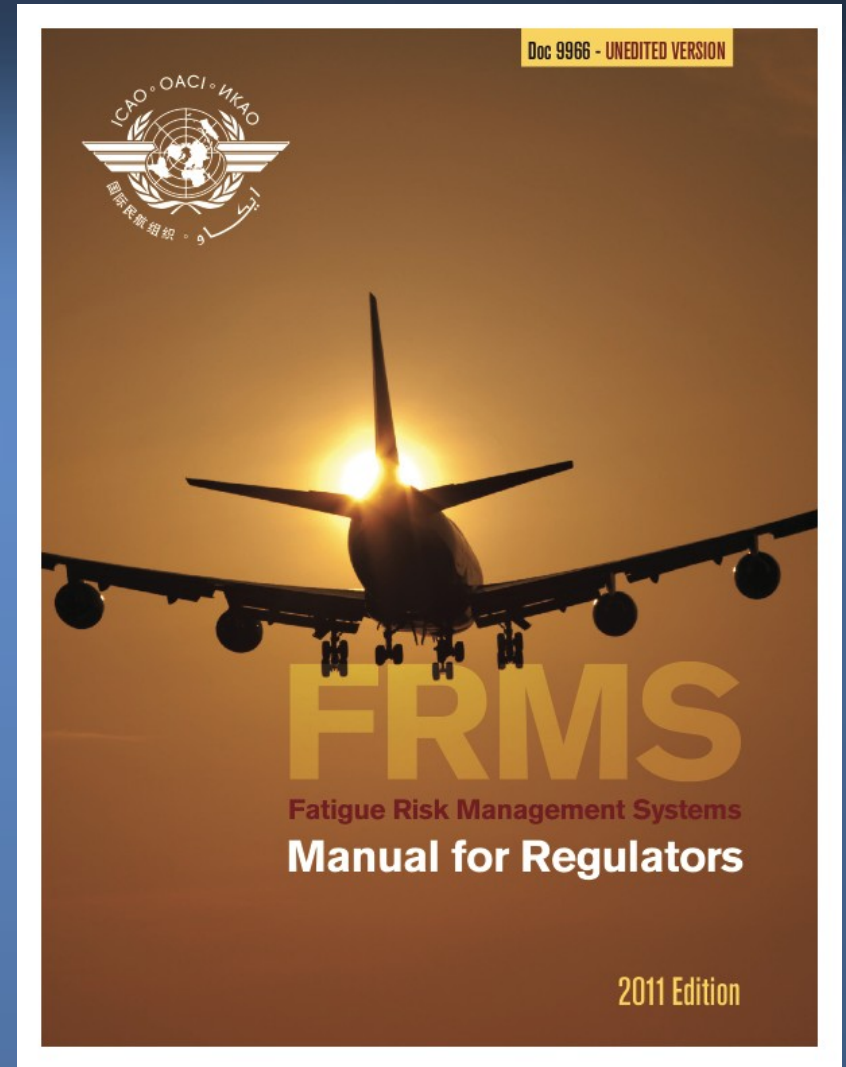
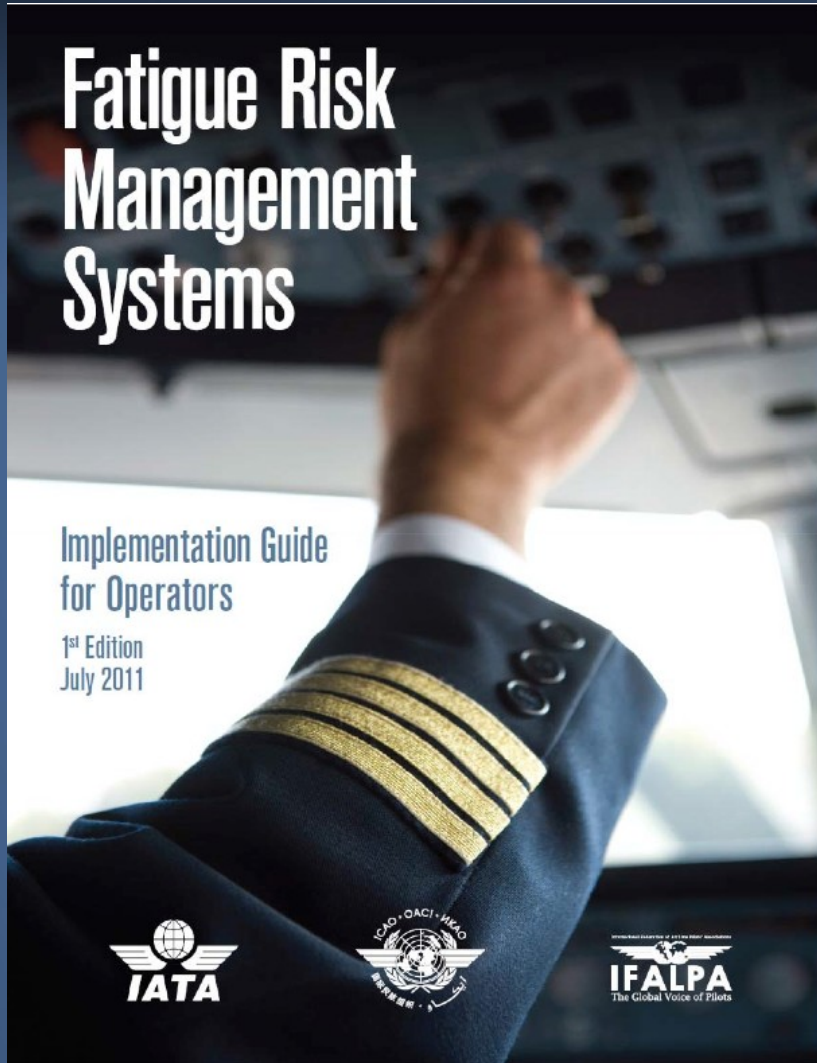
**FMCSA Sets New Rules To Encourage Truck  
Drivers To Get Enough Rest**

01/20/12



**NTSB**

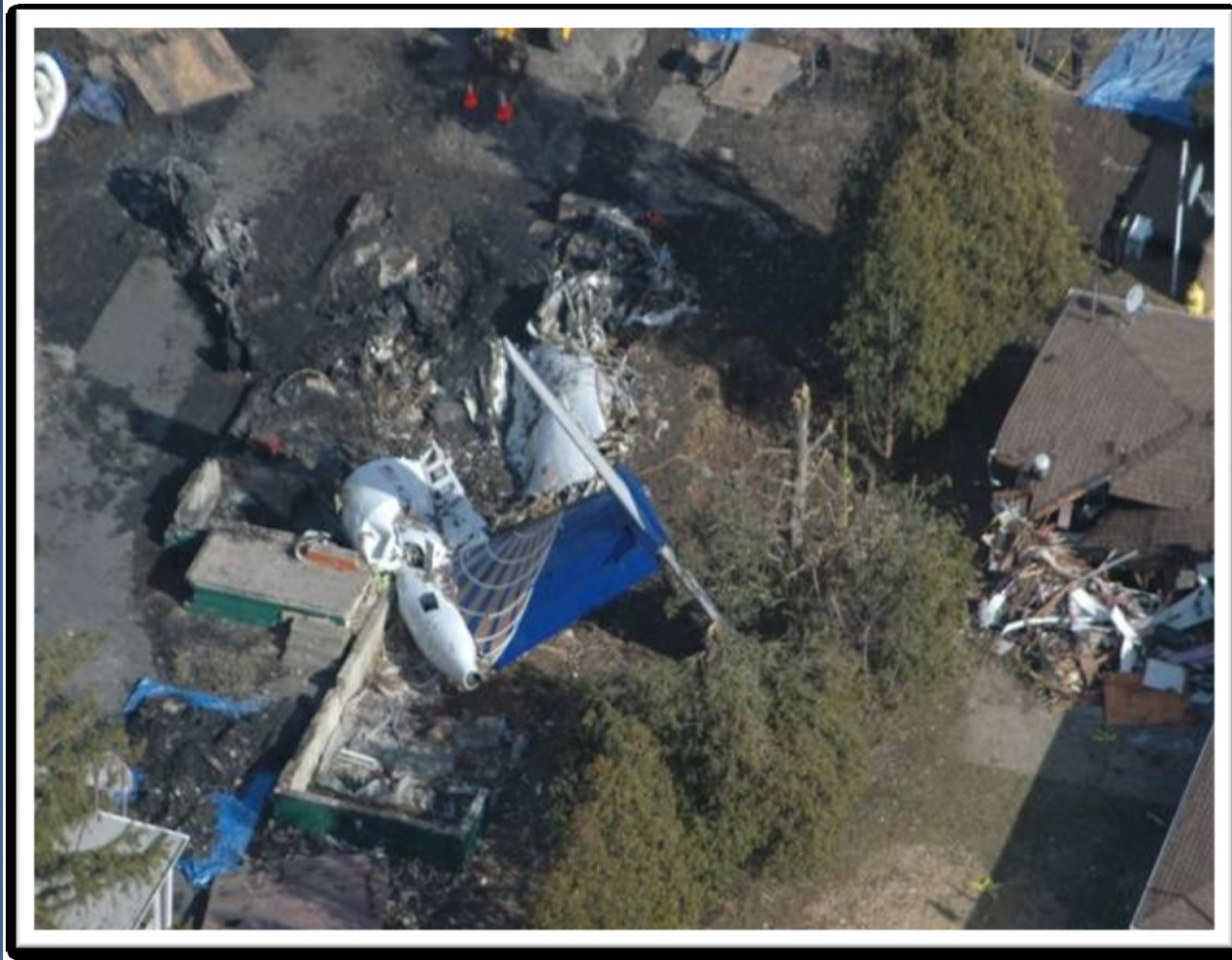
# Fatigue Risk Management Systems



# #3: Sleep science disregarded . . .

- two examples:
  - pilot commuting
  - air cargo operations

# Continental Connection (Colgan Air) Buffalo, NY (February 12, 2009)



- 50 fatalities; commuting, acute sleep loss



NTSB

# Geographic Distribution of Colgan Air Pilots Based at Newark, NJ 68% Commuted



# Air Cargo Operations Excluded in New 2011 Pilot Rules

FOR IMMEDIATE RELEASE

Date: December 21, 2011

**FAA Issues Final Rule on Pilot Fatigue**

**WASHINGTON, D.C. –**

“Covering cargo operators under the new rule would be too costly compared to the benefits generated in this portion of the industry.”

# How Sleep Science can Enhance Transportation Safety

- Opportunities
  - operationally relevant research
  - translate/communicate findings
  - your personal role/responsibility



# Your Personal Role/Responsibility

Be an educator

Challenge attitudes

Enact change

Personal life

Family

Workplace

Organization

Model good sleep behavior

Good sleep, safe travels.



# National Transportation Safety Board