Enhancing Safety with Simulation: Lessons Learned from Transportation

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

Advanced Initiatives in Medical Simulation
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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:

Aviation, highway, rail, marine, pipeline, and hazardous material accidents
• 130,000+ accident investigations

• 13,000+ safety recommendations

• 82% acceptance rate
Major product: safety recommendations

Moral compass and industry conscience
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
Flight Simulators 1909 – France
World War I – Flight Simulation
World War II – Simulators
World War II – Simulators
World War II – Simulators
Modern Simulators
NTSB Simulator Recommendations

Aviation

First recommendation 1/10/69 to FAA:

“Set Standards and specifications and encourage the development of “realistic” low-visibility-approach flight simulators.” A-69-001
Emergency Helicopter Recommendation – Issued 9/24/09

- Conduct scenario-based training, including the use of simulators and flight training devices, for helicopter emergency medical services (HEMS) pilots, to include inadvertent flight into instrument meteorological conditions and hazards unique to HEMS operations, and conduct this training frequently enough to ensure proficiency.

- Status – Still Open
Bus and Truck Simulator
NTSB Simulator Recommendations

Highway

Recommendation to FMCSA: The NTSB recommends that the Federal Motor Carrier Safety Administration work, together with NHTSA, the American Trucking Association, the International Brotherhood of Teamsters, and the Motor Freight Carrier Association, to encourage the development and use of simulator-based training for heavy truck operations.

Status: Open Acceptable Response  H-98-008
Train Simulator
RAIL

**Recommendation:** Use locomotive engineer simulator training to go beyond developing basic skills and teach strategies for effectively managing multiple concurrent tasks and atypical situations.

Status – Closed – Acceptable Action
Pipelines

Recommendation: Require controller training to include simulator or non-computerized simulations for controller recognition of abnormal operating conditions, in particular, leak events.

Status: PHMSA – Closed- Acceptable Action - 4/28/10
Marine – Tug Simulators
Merchant Marines Cargo Ship Simulator
Lexus Driving Simulator
Aircraft Water Crash Simulator
Space Environment Simulator – Johnson Space Center
Go! Flight 1002

- early starts, multiple segment days, sleep apnea
Guantanamo Bay Cuba

First NTSB aviation accident to cite fatigue as probable cause

- acute sleep loss, sleep debt, circadian disruption
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…”
10 fatalities
3 serious injuries
2 minor injuries
5 no injuries

Source: Oklahoma State Police
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 Fatigue Recommendations

- MOST WANTED since 1990
- 190+ 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
Success requires . . .

A culture change that supports different attitudes and behaviors