New Hours of Service Regulations for Commuter Rail Employees

TRB Conference: Fatigue in Transit Operations
October 12, 2011

Dr. Thomas Raslear
Human Factors Research Division
Federal Railroad Administration
• Rail Safety Improvement Act of 2008 [Sec 108 (e)]
  – Provides authority to FRA to issue hours of service rules for train employees engaged in commuter and intercity passenger rail transportation
    • First time such authority granted
    • Other FRA hours of service rules by statute
  – Provides that “...regulations ... shall consider scientific and medical research related to fatigue and fatigue abatement...”
Railroad Safety Advisory Committee (RSAC)

- Forum for developing consensus recommendations to FRA Administrator on rulemakings
- Representation for all FRA’s stakeholder groups
  - Railroads, labor organizations, manufacturers, suppliers, other interested parties
- Formed the Passenger Hours of Service Working Group
  - First meeting June 24, 2009
  - Unanimous agreement to proposed rule September 22, 2010
- RSAC unanimously accepted
• 49 CFR 228, subpart F
  – Hours of Service of Railroad Employees
  – Substantive Regulations for Train Employees Providing Commuter and Intercity Rail Passenger Transportation
  – Published in the Federal Register on August 12, 2011
  – Vol, 76, No. 156, pp. 50360 – 50401
  – Effective October 15, 2011
• Limitations on Time on Duty in a Single Tour
  – 12 consecutive hours, or 12 nonconsecutive hours if broken by interim release of at least 4 hours (split shift)

• Mandatory Off-Duty Periods
  – 8 consecutive hours (10 hours if time on duty = 12 hours)
• **Limitations on Consecutive Duty Tours**
  - 6 consecutive days that include at least one “Type 2” assignment (those including time on duty between 8 PM and 4 AM)
    - Employee must have 24 h off duty at home terminal
  - 13 or more days on duty in 14 day period
    - Employee must have 2 consecutive days off duty at home terminal

• **Cumulative Limits on Time on Duty**
  - NONE
• **Use of Fatigue Science**
  
  – Type 2 schedules (those including time on duty between 8 PM and 4 AM) must be analyzed using an FRA-approved validated biomathematical fatigue model
    
    • Fatigue Avoidance Scheduling Tool (FAST)
    • Fatigue Audit InterDyne (FAID) tool
  
  – Analysis determines fatigue risk
  
  – Excess risk of fatigue requires action
• Type 2 schedules with excess risk of fatigue must
  – Mitigate through fatigue management plan
    • Subject to FRA review

or

– Document that mitigation is not possible and that schedule is operationally necessary
  • Requires FRA approval
Fatigue risk is not only dependent on hours per day permitted to work, or required off duty time between periods of work.

- Fatigue risk also dependent on
  - Time of day of work and sleep
  - Consecutive time on duty
  - Schedule rotation
  - Consecutive days of work
  - Individual factors (age, medical conditions, etc)
• Human performance is adversely affected by fatigue
  – vigilance, reaction time, lapses, cognitive throughput, alertness, and tendency to fall asleep
• Changes in performance increase probability of errors
• Recovery from errors when fatigued is diminished
• Accidents are more likely
Fatigue Models

• Fatigue models use work schedules to predict changes in human performance and fatigue
  – Circadian rhythm and sleep opportunities
  – Supported by extensive lab studies
  – Allows quantification of a complex process that involves multiple variables

• FRA has used accident data to demonstrate that the risk of a human factors accident is related to fatigue scores for FAST and FAID
Fatigue and Accident Risk

Accident Risk

FAST Score

correlation coefficient = -0.93, p < 0.01

Neutral Risk
• Significant correlation between HF accident risk and FAST score
  – No significant relationship between non-HF accident risk and FAST score
• FAST scores range from 0 (most fatigued) to 100 (no fatigue)
• Elevated risk of HF accident at any FAST score < 90
  – FAST ≥ 90 = person who works 9 am to 5 pm, 5 days a week and gets approximately 8 hours sleep per night
FAST and Accident Risk (2)

- Risk of HF accident increases by 21% at FAST score $\leq 70$
  - Risk level is statistically greater than chance (neutral) and the mean risk for non-HF accidents
  - 23% of accidents occurred at FAST $\leq 70$
  - Accidents that might be expected of a fatigued train crew were over-represented at FAST $\leq 70$
    - Passing signals indicating stop
    - Exceeding maximum authorized speed
Average total cost of HF accident at FAST ≤ 70 is 3X average cost of all accidents

4X cost of accidents at FAST ≥ 90 (not fatigued)

Exponential increase in cost at FAST ≤ 90
For FAST, \( \geq 20\% \) of work time \( \leq 70 \)

Schedules exceeding fatigue threshold require mitigation or justification as operationally necessary
Fatigue Models As Diagnostic Tool

Proportion of Work Time

Effectiveness

≤ 50
Severely Fatigued

≤ 60
Extremely Fatigued

≤ 70
Very Fatigued

≤ 80
Moderately Fatigued

≤ 90
Fatigued

> 90
Not Fatigued

Signalmen
MOW
Dispatchers
T&E
Passenger T&E
Accidents
• Fatigue Models Validation and Calibration

• Work/Rest Diary Studies

• Economics of Fatigue
Questions?

Thomas G. Raslear, Ph.D.
Chief, Human Factors Research Division
Office of Research and Development
Federal Railroad Administration
202-493-6356
Thomas.raslear@dot.gov