FATIGUE MANAGEMENT AND TECHNOLOGY IN THE MOTOR CARRIER INDUSTRY

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SCOPE

- Driver fatigue;
- Federal mandate:
  - CMV driver fatigue;
  - HOS regulations;
  - NAFMP;
- Technology.

DRIVER FATIGUE

- Extensively studied over the past 25 years;
- Prevalence still difficult to clearly establish:
  - Conceptual issues;
  - Database limitations;
- Tends to be understated in crash databases;
- International consensus around 15-20% or crashes;
- If applied to 2015 data: 15-20% of 1870 fatalities: 280-375.

EFFECTS OF FATIGUE ON DRIVING

Fatigue involves a movement on the continuum of alertness, which creates a variety of phenomena, many of which are detrimental to driving performance:

- Subjective: boredom, lack of motivation;
- Hypovigilance: *Vigilance decrement is the most robust effect of fatigue and sleepiness* (Dinges,1995)***;***
  - Inattention errors: slowed reaction time, impaired signal detection, passive monitoring, tracking and speed management issues;
- Driver experience physical drowsiness, makes effort to stay awake and focussed on the task;
- Microsleeps, falling asleep.

FEDERAL MANDATE

- Light duty vehicle driver fatigue is under provincial jurisdiction;
- Federal mandate is focussed on commercial vehicle drivers' fatigue management;
  - Regulatory;
  - Non-regulatory;
  - R&D.

CMV DRIVERS FATIGUE

- In a recent NIOSH survey (U.S) :
  - 65% report drowsy driving at least once a month;
  - 8% every day;
  - 36% having fallen asleep at the wheel in the past;
  - 3% having fallen asleep at the wheel at least once a week in past 3 months;
- NTSB report identified fatigue as the most probable cause in 31% of fatal truck crashes.

CMV DRIVERS RISK FACTORS

Main fatigue causes	CMV risk factors
Time-of-day	Night driving
Time-on-task	Long driving time
Time-awake	Long driving time, on-duty non-driving tasks and commuting time
Acute sleep loss	May not get enough sleep in core sleep period
Cumulative sleep loss	Accumulating acute sleep loss over cycle
Sleep apnea	Gender, age, obesity
Monotonous, repetitive, low-demanding task	Long highways drives in low-demanding task conditions
Macroergonomics	Impacts of pay system.

CANADIAN HOS REGULATIONS

- 24-hours day principle (log start time fixed at beginning of cycle);
- 10 hours off-duty, 8 consecutive (+25%);
- 14 hours on-duty (-15%);
- 13 hours driving (-20%);
- 16-hours window;
- Cycle 1: 70 in 7 days (36-hours restart);
- Cycle 2: 120 in 14 days (24 hours off-duty after 70 on-duty, 72 hours restart).

ELECTRONIC LOGGING DEVICES (ELDs)

- Transport Canada is currently amending HOS regulations to mandate the use of ELDs to better track the work and rest hours of drivers;
- Connected to the electronic control module in the engine;
- Capable of automatically recording when the vehicle is started and moving;
- Will help to more accurately record the drivers' on-duty and driving time.

ELDs (CONT'D)

- Improved motor carrier and enforcement oversight;
- Better compliance by drivers;
- Potential reduction in commercial motor vehicle fatigue-related collisions;
- Currently working with our provincial partners, industry stakeholders and ELD suppliers to finalize the regulation.

HOS LIMITATIONS

- A critical component but not a comprehensive fatigue management strategy;
- Does not address all fatigue causes (time-of-day);
- Sets legal limits, not optimal scheduling practices;
- Does not provide knowledge, shape attitudes and motivations, safety culture, etc.;
- Does not provide fatigue management tools;
- Should be complemented by supplemental fatigue mitigation strategies, such as a comprehensive fatigue management program (FMP).

NORTH AMERICAN FATIGUE MANAGEMENT PROGRAM (NAFMP)

- Canada-U.S. initiative;
- Intended as a comprehensive complement to HOS;
- Evidence-based, developed over 10 years;
- Field studies: positive impacts on sleep quantity/quality, self-reported fatigue, number of self-reported safety critical events on the road;
- Launched July 2013.
- French and English.

http://www.nafmp.com

- Web-based, easy access;
- Step by step FMP implementation manual - how to develop and implement FRMS;
- 10 fatigue education modules *(introduction, executives & managers; shippers & receivers, dispatchers, sleep disorders, drivers, spouses & familly, scheduling, sleep disorders screening and treatment, fatigue management technologies, train-the-trainer)*;
- Various formats (online or download, with or without audio, LMS compatible);
- Return on investment calculator.

NAFMP (CONT'D)

- New field study planned in the U.S. to assess efficiency and provide leads for improvement;
- To be conducted by NIOSH, in collaboration with the NAFMP steering committee;
- One avenue for development is to include simplified version for smaller operations (NAFMP light);
- Spanish version.

TECHNOLOGY

- Strong potential, multiple ways technologies can help;
- A lot of R&D, many products on the market;
- Literature clearly recognizes potential but also emphasize more work still needed;
- Lack of third party field validation studies;
- We actively monitor status of the field and provide educational material with the NAFMP.

TECHNOLOGY - EXAMPLES

Pre-work cycle:

- Biomathematical models/software to produce/test schedules;
  - Interesting for motor carriers, but also for regulators;
  - Simulate schedules/sleep instead of relying only on theory.
- Snapshot alertness measurement;
  - Measures vigilance and alertness (e.g. psychomotor vigilance test - PVT).

TECHNOLOGY - EXAMPLES (CONT'D)

Online operator monitoring:

- Unobtrusive continuous performance monitoring:
  - Micro steering wheel movements and lane deviation tracking;
- Physiological indicators:
  - Oculomotor measures such as PERCLOS and Amplitude Velocity Ratio of eyelid closure;
  - Cameras, special glasses, facial recognition systems;
- Multichannel approach more robust.

TECHNOLOGY - LIMITATIONS

- No silver bullet;
  - Motor carriers: aim for systemic, multifaceted approach;
  - Drivers: proactive attitude focussed on pre-trip (sleep), more than in-transit fatigue mitigation;
- Risk of demotivation, over-reliance;
- What impact on decision to continue driving while drowsy?
- Requires training to mitigate potential adverse effects;
- Ideally part of a comprehensive fatigue management strategy such as an FMP.

THANK YOU

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