



U.S. Department of Transportation
Federal Motor Carrier Safety Administration

Driver Fatigue Research

2015 Transportation Research Board 94th Annual Meeting
Federal Motor Carrier Safety Administration
Analysis, Research, and Technology Forum
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Office of Research and Information Technology

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Agenda

- Driver Fatigue Research.
- Rulemaking: Hours of Service (HOS).
 - Commercial Motor Vehicle (CMV) Driver Restart Study.
 - Flexible Sleeper Berth Pilot Program.
 - Evaluation of the Impact of Changes to the HOS Rules.

Driver Fatigue Research

Rulemaking

- Hours of Service



Education & Outreach

- North American Fatigue Management Program (NAFMP)

Safety Systems

- Fatigue Warning Device
- Fatigue Detection at Roadside

Fatigue Modeling

- Advanced Fatigue Modeling

CMV DRIVER RESTART STUDY

CMV Driver Restart Study

Background:

- The Consolidated and Further Continuing Appropriations Act of 2015 directed FMCSA to conduct a CMV Driver Restart Study.
- Study to measure and compare the fatigue and safety performance levels of drivers who take 2 nighttime rest periods during their 34-hour restart break and those drivers who use less than 2 nighttime rest periods during their restart break.
- FMCSA is working hard to meet the tight deadlines required to complete the study. In doing so we are looking for assistance in identifying carriers that would support their drivers' participation in the study.



CMV Driver Restart Study – Overview

- Compare 5-month driver work schedules to assess safety critical events (SCEs), operator fatigue, and driver health using:
 - Electronic Logging Devices (ELDs).
 - Psychomotor Vigilance Tests (PVTs) (which measure alertness).
 - Actigraph watches (which assess sleep).
 - Onboard Monitoring Systems (OBMSs).
- Study will include a sample of drivers comprised of fleets of all sizes (i.e., small, medium, and large) and operations (including long-haul, regional, and short-haul) in various sectors of the industry (including flat-bed, refrigerated, tank, and dry-van).
- During the study, participants will drive their normal revenue-producing routes.
- Data will be collected over multiple weeks in order to measure changes in performance based on changes in recovery duration.

Data to be Collected

Driving Behavior: OBMS to monitor driving behavior that might be indicative of fatigue, for example SCEs, and (if available) shifting patterns, speed variability, curve events, and lane departures.

Psychomotor Vigilance Test (PVT): PVT measures reaction times to stimuli.

Actigraph Watch: Collect actigraphy data wirelessly on sleep/wake patterns, heart rate, respiration rate, and physical activity.

Driver Survey: Identify driver opinions regarding 34-hour restart and how the study was conducted.

Data to be Collected, continued

Electronic Driver Logbooks: Drivers' logs collected with the primary purpose of tracking driver operating schedules.

Karolinska Sleepiness Scale (KSS): The KSS is a 9-point subjective sleepiness scale that has been shown to provide a good estimate of sleepiness.

Roadside Violations: Collect data on driver roadside violations.

Crashes and Incidents: Data on crashes and other incidents would be collected and would include time of day, severity, and type of crash.

Carrier/Driver Recruitment

- FMCSA is seeking drivers who routinely:
 - Drive and work approximately 60 to 70 hours per week.
 - Drive during nighttime hours.
- FMCSA is seeking a list of carriers that would support and actively recruit their drivers' to participate in this study.

Information Sources

- Web page dedicated to the study is available on the FMCSA website. The web page includes information on the study and regular status updates:
<http://www.fmcsa.dot.gov/safety/research-and-analysis/commercial-motor-vehicle-driver-restart-study>.
- E-mail mailbox dedicated to the study is available for submitting inquiries and for carriers and drivers to express interest in participation: Driver_Restart_Study@dot.gov.
- Fatigue Study e-mail list providing regular study updates. The link is available on the study web page.

FLEXIBLE SLEEPER BERTH PILOT STUDY

Flexible Sleeper Berth Pilot Study: Laboratory

- **Background:**
 - An in-residence laboratory was conducted on 53 healthy participants from January 2010 to May 2011.
 - Study evaluated split sleep versus consolidated sleep based on total sleep time, performance, subjective drowsiness, and biomedical measures that correlated with health.
 - Three group design:
 1. Consolidated nighttime sleep.
 2. Split sleep.
 3. Consolidated daytime sleep.

Flexible Sleeper Berth Pilot Study: Laboratory (cont.)

- **Findings:** The daytime consolidated sleep group slept less, had increased sleepiness, and had an increase in blood glucose and testosterone at the end of the work week.
- **Conclusion:** Results suggested that when consolidated nighttime sleep is not possible, split sleep is preferable to consolidated daytime sleep.
- http://ntl.bts.gov/lib/51000/51200/51254/12-003-Split-Sleep_Investigation-of-the-Effects-of-Split-Sleep-Schedules-on-Commercial-Vehicle-Driver-Safety-and-Health-508.pdf.

Flexible Sleeper Berth Pilot Program

- Establish a pilot program as specified in 49 CFR Section 381.400.
- A pilot program allows collection of specific data for evaluating alternatives to the regulations or innovative approaches to safety while ensuring safety goals of the regulations are satisfied.
- Study in which temporary regulatory relief from the sleeper berth provision allows some flexibility for drivers to split sleep when tired.

Flexible Sleeper Berth Pilot Program, continued

- The number of participants must be large enough to ensure statistically valid findings.
- Pilot program must include an oversight plan to ensure that participants comply with the terms and conditions of participation (study protocol) and procedures to protect the health and safety of study participants and the general public.

Study Process

- Automated data collection to reduce researcher/driver interface.

Steps	Driver	Study Agent
Application	Apply to program via website	Screen driver candidates
Fatigue Training	Receive fatigue management training; provide certificate	Verify completion of NAFMP driver training certificate
Study Protocol Instruction	Review video instruction on study protocol data collection elements	Verify driver completion and mail data collection equipment
Equipment Setup	Receive via mail study data collection equipment	Provide final conference call with drivers
Testing	Attend final conference call with study agent	Test data collection equipment
Data Collection/ Monitoring	Completion of Psychomotor Vigilance Task and Karolinska Sleepiness Scale assessments	Monitor data compliance (daily monitoring of data being collected, notifications of non-compliance)

EVALUATION OF THE IMPACT OF CHANGES TO THE HOS RULE

Impact of the HOS Rule

- **Purpose.** To determine whether changes to the HOS rule have had impacts on the U.S. economy and:
 - Safety.
 - Driver schedules and productivity.
 - The cost of trucking.
 - The U.S. highway system.
- **Methodology.** The study approach envisioned is a before-after evaluation using an advanced methodology to control for a number of confounding factors such as increasing vehicle miles traveled (VMT).
 - **Phase 1.** Investigate data sources, determine an evaluation methodology, and determine what can be accomplished in the timeframe of this study effort.
 - **Phase 2.** Execution of evaluation tasks.

Driver Fatigue Research: Summary

Research Division is working on complementary research to:

- Increase understanding of the causes of fatigue.
- Provide a data-driven foundation for Federal Rules.
- Reduce driver fatigue via driver/carrier education.

*Research without Action is time Wasted,
Action without Research just Passes Time.
Research with Action can Change the World!*



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