

December 3, 2013

Administrator Anne Ferro
FMCSA
1200 New Jersey Ave
Washington DC 20590

Administrator Ferro,

The purpose of this letter is to transmit a proposed sleeper berth pilot program being submitted jointly by the American Trucking Associations and the Minnesota Trucking Association.

The program, if initiated, will help both government and industry translate scientific findings from the laboratory to real world trucking operations by providing data and information on the relationship between sleeper berth flexibility for off-duty rest and safety outcomes. It will also investigate the role of recent technological advances in monitoring driver alertness and behavior. We believe this program will expand our collective knowledge of fatigue management and driver alertness, with the goal to improve driver alertness and highway safety.

ATA and MTA share FMCSA's goal of improving safety of the highways for all users. We look forward to a productive, collaborative effort on a flexible sleeper berth pilot program with the longer term goal of safe and appropriate regulatory flexibility for professional truck drivers.

Sincerely,

Dave Osiecki
Senior Vice President
American Trucking Associations

John Hausladen
President
Minnesota Trucking Associations

Proposed Flexible Sleeper Berth Pilot Program

Submitted Jointly by the

American Trucking Associations & Minnesota Trucking Association

December 2013

Introduction

Through the mechanism specified by 49 CFR Section 381.400, the American Trucking Associations (ATA), in conjunction with the Minnesota Trucking Association (MTA), requests the initiation of a pilot program with an exemption from 49 CFR Section 395.3 (a)(2) to work collaboratively with FMCSA to conduct a sleeper berth-related study to assess the safety impacts of increasing off-duty time flexibility for professional commercial motor vehicle (CMV) drivers using sleeper berth-equipped trucks.

49 CFR Part 395.3 (a)(2) states that a driver may drive only during a period of 14 consecutive hours after coming on duty following 10 consecutive hours off duty, and that a driver may not drive after the end of the 14-consecutive-hour period without first taking 10 consecutive hours off duty. A growing body of scientific studies suggests that increasing flexibility in off-duty time for CMV drivers may result in improved safety outcomes by improving or sustaining driver alertness.

There are five goals of ATA's and MTA's proposed pilot program:

1. Translate scientific findings regarding the benefits of off-duty time flexibility from controlled laboratory settings to the field in order to examine whether these findings can be replicated in a realistic setting.
2. Protect the health and safety of the motoring public and of participants through a strict screening procedure and monitoring of program participants and other company personnel.
3. Provide statistically reliable and valid evidence of the relationship between the degree of sleeper berth flexibility and safety outcomes.
4. Investigate the role of recent advances in on-board truck technology in managing and monitoring commercial motor vehicle driver alertness, driving behaviors, and compliance with safety rules and regulations.
5. Improve the overall knowledge base regarding fatigue management and alertness of CMV drivers.

1. Assessment of Safety Impacts Pilot Program Exemption May Have

Because a principal aim of hours-of-service regulations is to protect the safety of the motoring public, including the drivers themselves, determining the safety benefits of flexible off-duty time and elucidating the optimal off-duty configurations to ensure that drivers are alert when operating a commercial vehicle is in the spirit of these regulations. The proposed pilot program would seek to produce statistically reliable evidence of the relationship between the degree of sleeper berth flexibility (consolidated vs. split off-duty rest time) and safety outcomes. The findings pertaining to safety outcomes obtained through this study can provide guidance for future rulemaking aimed at improving safety and providing regulatory flexibility in the trucking industry. Further, the findings of this study will improve overall knowledge base regarding fatigue and alertness management of CMV drivers.

A principal goal of the proposed pilot program is to mitigate any potential negative safety impacts throughout its duration. Advances in technology, including Fleet Management Systems and Electronic Logging Devices, have enabled trucking companies to monitor drivers in ways that are unprecedented, and these technologies have become commonplace throughout the industry, including in the safety operations of many companies. In the proposed pilot study, these technologies could be utilized to evaluate the safety and compliance of participants to assure that drivers are not operating vehicles while fatigued.

2. Recommendations on how Safety Measures in Pilot Program Would Achieve Level of Safety Equivalent to or Greater than Compliance with Regulation

Through careful planning and conscientious implementation, it is anticipated that the proposed pilot program will achieve a level of safety for its participants and the motoring public that would be equal or greater than that of drivers who comply with the current regulation.

Prior to implementation, an initial effort could be made to identify appropriate pilot study protocols and to conduct a preliminary evaluation of the study design to identify opportunities to optimize safety when the pilot program is launched. Sharing these protocols will provide an opportunity for the participating companies to identify data collection methods and driver monitoring methods, as well as offer an authentic training opportunity for company personnel who will be involved with the program. Further, at the conclusion of the pilot program, qualitative data could be gathered through focus groups, as the drivers who participated in the pilot will have an opportunity to voice ideas and suggestions regarding the key elements of the pilot program in a controlled setting.

Safety standards will further be maintained through careful selection and monitoring of drivers. Drivers who elect to be participants in the program will be screened for any medical conditions which may place them at additional risk if they were to participate in the pilot program. Of particular importance will be screening for sleep disorders, and no drivers with diagnosed sleep disorders will be admitted into the

program. Once drivers are admitted in the program, they would receive special training on fatigue, alertness and sleep. They would also be monitored on a regular basis by company personnel. Monitoring could occur at multiple levels of influence beyond the drivers themselves and will include monitoring company personnel to ensure that they are fulfilling their responsibilities in satiating the safety requirements of the proposed pilot program. Additionally, an Industry/Government Oversight Committee will be formed. Further details of the monitoring procedures described above are provided in Section 7: Monitoring Plan to Protect Participants and Public.

3. Scientific Justification: Estimate of Potential Benefits and How Estimate was Developed

An accumulating body of evidence in the scientific literature suggests that statutory or regulatory limitations on hours of work may not be sufficient to prevent worker fatigue (Raslear et al, 2013).

More flexible sleeper berth rules may help to better maintain performance (Belenky et al, 2008). Experience teaches us that humans have different sleep habits and regulatory limitations do not always address them adequately. For example, when provided with sample driver logs for various driving scenarios, Circadian/Sleep experts on 100% of occasions and truck drivers on 73% of occasions selected the Non-Compliant option as most likely to enable better sleep, alertness and safety (Moore-Ede, 2007).

In the past under prior hours of service rules, many professional drivers operating sleeper berth-equipped trucks followed a polycyclic sleep-wake cycle with multiple sleep and waking periods during a 24 hour period. This concept is explained in Chapter 4 of the book, “The Promise of Sleep” (Dement, 1999).

Implementing a split-sleep off-duty schedule option seems to be a viable option to improving or sustaining driver alertness. The majority of sleep studies to date demonstrate that well timed split-sleep either had a positive effect or no effect on subsequent neurobehavioral performance, supporting the hypothesis that the restorative effects of sleep on performance may be maintained when splitting the overall sleep episode into multiple naps (Ficca et al, 2010). Further, splitting sleep does not negatively affect daytime neurobehavioral performance compared to a consolidated sleep period of the same total duration (Mollicone et al, 2008; Mollicone et al, 2007). Consolidated sleep periods also seem to be adaptable. The adaptable range of safe sleep for human adults is approximately between 6 and 8 hours per day (Horne, 2011), meaning that adding off-duty flexibility to allow for naps is not likely to create cumulative fatigue.

Napping has been established in the scientific literature as being critical to safety. Napping may assist to maintain safe driving performance (Milia & Kecklund, 2013). Literature on shift workers shows that the alertness- and performance-enhancing effects of naps during both night and afternoon shifts can be quite dramatic – for example, a

daytime nap as short as 10-min can improve alertness and performance for about 2.5h in the face of prior sleep loss, and for almost 4h if preceded by normal sleep (Ficca et al, 2010). Because of the circadian 'dip' in the early afternoon, a short nap at this time is as effective in maintaining alertness throughout the rest of the day as is extending night-time sleep by an hour (Horne, 2011). Indeed, extending night sleep by 15 min is less effective than a similar sleep period in the afternoon (Horne, 2011).

4. Estimated Amount of Time Needed to Conduct Pilot Program

To properly conduct the proposed pilot program, 24 months of exemption from 49 CFR Part 395.3 (a)(2) is requested. This time will be divided into two distinct phases. The first phase will encompass the first six months and will consist of preparation for the pilot study. Several tasks will be accomplished during this time, including: identification of appropriate study protocols; formation of an industry/government oversight committee; formation of the intra-company oversight committees; integration of data collection and driver monitoring technologies; recruitment of participants; and participant and dispatcher training. The next 12-18 months will be implementation of the pilot program.

5. Regulations From Which Participants Must Be Exempted

ATA and MTA, for the purposes of conducting the pilot program, request exemption from 49 CFR Part 395.3 (a)(2) for the participating carriers and professional drivers. This rule states that a driver may drive only during a period of 14 consecutive hours after coming on duty following 10 consecutive hours off duty. This rule further states that the driver may not drive after the end of the 14-consecutive-hour period without first taking 10 consecutive hours off duty.

6. Method of Comparing Safety Performance with Those that Comply with Regulation

This pilot program seeks to evaluate the safety impacts of allowing off-duty time to be split for both solo and team drivers. The study design below will apply to both solo and team drivers.

Participants

Participant selection will be on a volunteer basis. Participants will be randomly assigned to one of two groups. The first group, the control group, will conform to current HOS regulations and use a 10-hour consolidated off-duty schedule. The second group, the exemption group, will be exempt from current HOS regulations and use a more flexible, split off-duty schedule.

The number of participants recommended for this study, prior to oversampling based on some expected attrition, is 200. This number is derived from the recommendations for generating statistically valid results using the data analysis procedures described below. These participants will be divided as follows: 40 drivers

for each control group (20 solo and 20 team drivers); and 160 drivers for the exemption group (80 solo and 80 team drivers).

To achieve necessary sample sizes to ensure statistically valid findings, participating companies will oversample based on projected turnover rates during the course of the exemption period. Oversampling will also be necessary in terms of monitoring, as it is possible that drivers may have to be removed from the program for the reasons described in Section 7: Monitoring Plan to Protect Participants and Public.

A. Data Collection

Data could be collected for the pilot program from a number of sources including: driving behavior using fleet management systems, Psychomotor Vigilance Task (PVT), the Karolinska Sleepiness Scale (KSS), crashes and incidents, and electronic driver logbooks.

1. Driving behavior: fleet management system technology could be used to monitor four driving behaviors that might be indicative of fatigue. These four behaviors are shifting patterns, speed variability, curve events, and lane departures. Data on these driving behaviors could be aggregated to develop a composite score for each driver.
2. Psychomotor Vigilance Task (PVT): The PVT measures reaction times to stimuli. Increased reaction times may be indicative of fatigue. Drivers could be required to perform the PVT when coming off of off-duty time and at the start of off-duty time.
3. Karolinska Sleepiness Scale (KSS): The KSS is a 9-point subjective sleepiness scale that has been shown to provide a good estimate of sleepiness. KSS data could be collected daily through the use of a fleet management system, or through a downloadable smartphone application. As with the PVT, drivers could be required to complete the KSS when coming off of off-duty time and at the start of off-duty time.
4. Crashes and Incidents: Data on crashes and other incidents would be collected and include time of day, severity, and type of crash.
5. Electronic driver logbooks: Drivers' logs could be collected for both the control and exemption group drivers, with the primary purpose of tracking how they are splitting their off-duty time (if in the exemption group).

The statistical analyses may require collecting additional data to isolate the effect of the manipulated variable (consolidated versus split off-duty time). Additional data could also be collected on covariates to rule out other explanations for group differences: Age, experience, and average miles driven daily.

B. Data Analysis

Separate Multivariate Analysis of Covariance (MANCOVA) analyses could be performed for solo and team drivers. MANCOVA seeks to determine whether there are statistically significant mean differences among groups after adjusting the newly created dependent variable for differences on one or more covariates. If a significant multivariate effect found in the MANCOVA, separate analyses of variance (ANOVAs) could be conducted for each type of split break configuration (5 + 5, 6 + 4, 7 + 3, and 8 + 2) to determine the impacts on safety of each of these individually. The significance level could be adjusted using Bonferroni Correction, which calls for dividing the significance level by the number of dependent variables being tested. This would avoid finding differences between these groups by chance that don't really exist (a Type I error).

MANCOVA offers several advantages which could be particularly useful for this type of study. For one, there is an improved chance of discovering what it is that changes as the result of different treatments and their interactions. There is also a decreased likelihood of finding differences between groups that don't really exist (Type I error). MANCOVA may also reveal differences between groups not shown using other analyses, such as an ANOVA. Finally, MANCOVA can serve as a noise-reducing device, where variance associated with the covariates is removed from error variance.

To increase the sensitivity of the analyses, and thus increase the likelihood that differences between groups that may exist will be found, the dependent variables will be adjusted for differences associated with covariates. Covariates are variables that are measured before the dependent variables and are correlated with it. Because they may create variance between groups that is not associated with the focus of the study (split versus consolidated off-duty time), three covariates should be included in the analyses:

1. Age - Normative declines in cognitive and motor performance with increased age, and sleep efficiency (percentage of time actually spent asleep) declines with age (Mollicone et al, 2007).
2. Experience – Lower levels of driving experience are related to higher incidence of the driving behaviors and may be misattributed to fatigue
3. Average miles driven daily – The more miles driven, the higher the potential fatigue level for the driver and the higher the exposure to accidents, measured driving behaviors, etc.

C. Calculating Effect Size

Because statistical significance simply states the odds of the findings of a study occurring by chance, calculating effect size is critical. Effect sizes establish the degree to which the independent variables and dependent variables are related; in other words, it tells how much association there is between division of off-duty time (consolidated vs. split) and safety outcomes, or, if there is a significant multivariate effect found, the degree of association of each type of split break configuration (5 + 5, 6 + 4, 7 + 3, and 8 + 2). For this study, the eta-squared (η^2) statistic could be used to calculate effect sizes. Effect sizes range from 0 to 1, but there are no firm rules regarding magnitude; however, Cohen (1988) suggests that .01 is considered small, .09 is considered medium, and .25 is considered large. Calculating eta-squared involves the Wilks'

lambda (Wilks' Λ) statistic, which essentially explains the amount of variance not explained in the experimental manipulation. To calculate the effect size, the following formula should be used:

$$\eta^2 = 1 - \Lambda$$

If there is a large standard deviation ($s > 1$), an alternative formula should be used to calculate effect size:

$$\text{Partial } \eta^2 = 1 - \Lambda^{1/s}$$

D. Addressing Threats to Validity

Addressing potential threats to the validity of this pilot study is essential in ensuring that, to the greatest degree possible, the causal relationship between modifying split-break sleep schedules and safety performance can be inferred in the current proposed pilot program.

Validity concerns the ability to approximate, to the greatest extent possible, the truth or falseness of suggested causal relationships. There are four types of validity relevant to this study: Statistical conclusion validity, internal validity, external validity, and construct validity. To ensure validity in this proposed pilot program, the research design should be adapted to address each of the threats to validity to the greatest degree possible.

7. Monitoring Plan to Protect Participants and Public

Effective evaluation of those involved in the proposed pilot program is essential to assuring that safety is not compromised during its duration. Monitoring could occur at multiple levels. At the most proximal level is monitoring of the drivers who are participating in the program. Advances in on-board truck technology allow for monitoring of program participants. Beyond using this technology for the data collection needs for data analysis for the study itself, it will also be used to evaluate drivers who are participating in the program. Composite scores could be generated on an ongoing basis to monitor driver fatigue as a part of the ongoing safety monitoring process. Each driver's electronic driving logs should be monitored as part of this process.

To best utilize these data and establish continuity in the monitoring process, drivers could be specially assigned to dispatchers with training in the pilot program, and they should regularly communicate with their dispatchers and other company personnel to evaluate their performance under program. In cases of noncompliance, drivers should be considered for removal from the program. In the event of a crash, the driver could be suspended from program until a determination is made of whether the crash was fatigue-related. If the crash is found to be fatigue-related, the driver should be removed from the program.

Monitoring at the company level beyond the drivers themselves is also integral. Within each participating company an Oversight Steering Committee could be formed,

consisting of five groups of intra-company stakeholders: Drivers from all four experimental groups, as well as control group; safety department leadership; dispatchers of drivers that are participating in program; senior corporate leadership; and representatives of on-board truck technology providers. Policies should also be created, implemented, and enforced within participating companies, which will emphasize safety as the primary focus in all endeavors related to the proposed pilot study. These policies should set standards for monitoring the various types of data collected, including driver logs, driver behavior, PVT, KSS, and crashes, on a regular basis as a preventive measure against safety risks. Specialized training of dispatchers for monitoring drivers who are participating in the program should also take place, and dispatchers should be monitored and evaluated on an ongoing basis by senior safety department personnel.

Finally, an Industry/Government Oversight Committee should be formed. This committee should consist of representatives of key stakeholders within the government and trucking industry. This committee should supersede both the company- and driver-level and hold final decision-making power regarding the design, administration, continuance, and outputs of this pilot study. As part of the ongoing monitoring process, participating companies should be required to report the performance of participating drivers on an ongoing basis to this committee.

Respectfully Submitted By:

David J. Osiecki
Senior Vice President
American Trucking Associations

John Hausladen
President
Minnesota Trucking Association

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