

## SUPPORTING JUSTIFICATION – Part A

### The Impact of Commute Times on the Fatigue and Safety of Locomotive Engineers and Conductors

OMB No. 2130-NEW

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#### 1. Circumstances that make collection of the information necessary.

The Federal Railroad Administration (FRA) has statutory responsibility to ensure the safety of railroad operations. See the Federal Rail Safety Act of 1970 (49 U.S.C. 120103). This responsibility requires that the FRA remain vigilant for emerging risks to the public due to railroad operations, and to take steps to mitigate those risks. One such risk is fatigue. Drowsy driving and driver fatigue are well-known issues in the transportation industry. Given the operational characteristics and nature of work in this industry, which operates 24 hours a day and seven days a week to meet customer needs, these issues are not surprising. Research consistently shows that the shiftwork common in the transportation industry can cause major disruptions in sleep and circadian rhythms, resulting in reduced alertness and impaired performance (Akerstedt et al., 1987; Lal & Craig, 2001).<sup>1,2</sup> Combined with the dangers of driving a train during peak hours and the consequences of an error, these impairments could be quite serious. To mitigate the dangers of fatigue, a number of federal agencies [e.g., FRA and Federal Motor Carrier Safety Administration (FMCSA)] have implemented hours-of-service (HOS) regulations or requirements. However, the link between HOS and fatigue is not clear, and many other factors contribute to the development of fatigue.

Time-on-task and time awake are two well-known factors that contribute to fatigue. Time-on-task refers to the length of time a person has been performing a task, whereas time awake refers to the length of time since a person last slept. Both of these factors can have a detrimental effect on performance, with the risk of adverse safety events (e.g., crashes) increasing as the length of time that a person performs a task or remains awake increases. These factors also influence each other; that is, the negative effects of increasing time-on-task may become evident sooner if the person has also been awake for a long time.

These two factors contributed to a recent high-profile fatal truck crash on the New Jersey Turnpike, where the truck driver in question had been driving all night prior to the beginning of his shift and, by the time he approached the area of the crash, he had been driving in excess of 23 hours. Although extreme, this case brought attention to an issue that has been largely ignored or overlooked by the transportation industry: commuting times and the resulting impact on safety performance. As a result, the issue of commute times of commercial motor vehicle (CMV) drivers is currently under investigation by the FMCSA. Due to the similarities in the working conditions of CMV drivers and

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<sup>1</sup> Akerstedt, T., Torsvall, L., & Gillberg, M. (1987). Sleepiness in shiftwork: A review with emphasis on continuous monitoring of EEG and EOG. *Chronobiology International*, *4*, 129-140.

<sup>2</sup> Lal, S.K.L. & Craig, A. (2001). A critical review of the psychophysiology of driver fatigue. *Biological Psychology*, *55*, 173-194.

locomotive engineers, the issue of commute times should also be explored for safety-critical rail workers.

Drivers with longer commutes experience greater time awake and time-on-task than drivers with shorter commutes. A growing body of evidence from a number of industries (e.g., medical, mining, long-haul trucking) suggests the combination of long work shifts, night-time shiftwork, and long commute times increases the risk of drowsy driving, worker fatigue, and fatigue-related errors. However, the extent to which these factors impact the fatigue and safety of locomotive engineers and conductors remains unknown. With this submission, Virginia Tech Transportation Institute (VTTI) and the FRA is requesting permission to acquire the needed knowledge

**2. How, by whom, and for what purpose the information is to be used.**

The purpose of this data collection effort is to develop an in-depth understanding of the factors that contribute to fatigue in locomotive engineers and conductors, with a particular focus on commute times and the resulting impact on safety. An assessment of the important factors contributing to fatigue and the effects of these factors on safety from the perspective of the rail worker (i.e., locomotive engineers and conductors) is necessary to facilitate mutually beneficial solutions between workers and management. Oftentimes, disconnects exist between the opinions and experiences of front-line workers and management personnel, particularly when it comes to the impact of fatigue (Camden et al., 2014).<sup>3</sup> This information is a critical first step in developing effective fatigue-mitigation strategies and may also inform regulatory decision making specifically for locomotive engineers and conductors.

FRA has contracted with VTTI at the Virginia Polytechnic Institute and State University (VT) to administer this study and analyze its results. The investigators currently performing this study are Dr. Naomi Dunn, Dr. Jeffrey Hickman, Dr. Erin Mabry, and Ms. Susan Soccolich. In accordance with DOT policy on research involving human subjects, this study has been reviewed and approved by VT's Institutional Review Board (IRB Approval number 18-602).

This is a new collection of information, and is entirely voluntary. The FRA, through its contractor (VTTI), seeks to assess the opinions and perceptions of locomotive engineers and conductors using an online survey. VTTI and FRA will use the data obtained through the survey to develop recommendations on best practices for combating fatigue in the railroad industry and to assess the impact commute times have on fatigue and safety in a population of safety-critical rail workers.

**3. Extent of automated information collection.**

The majority of data collection will be via web based survey methods. All of the survey items include check boxes, multiple choice, and fill-in-the-blank responses. The VTTI

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<sup>3</sup> Camden, M.C., Medina-Flitsch, A., Hickman, J.S., Bryce, J., Flitsch, G., & Hanowski, R.J. (2014). *Environmental factors causing fatigue in equipment operators during winter operations*. St. Paul, MN: Clear Roads Pooled Fund.

research team is working with rail labor unions, such as the Brotherhood of Locomotive Engineers and Trainmen (BLET) and the SMART Transportation Division, on this data collection effort. The unions will be the key to ensure widespread distribution of the survey to locomotive engineers and conductors, and their support will also increase the likelihood union members will participate.

VTTI intends to collect 100% of the survey data electronically. Completed survey responses will be automatically entered into a secure online database. All responses will be anonymous. VTTI and FRA understands that some individuals may be more comfortable completing a paper version of the survey. The survey invitation to participate will also include information regarding how to request and complete a paper survey for those who are uncomfortable or unable to complete the survey online. Paper surveys will be returned to VTTI, where a researcher will enter the responses into the secure database. This will insure the survey participants' remain anonymous.

VTTI has identified the major barriers respondents may encounter when completing a web-based survey. Of primary concern is email and computer access. There are several web-based email clients that offer free email accounts so the ability to obtain an email address is available to any railroader who chooses to establish one. The web-based survey will be compatible with portable electronic devices (e.g., smart phones, tablets) and free Wi-Fi hotspots are available at many locations (e.g., Starbucks). Thus, even respondents without computer or internet access at home would still be able to participate in the survey if they chose to do so. However, as indicated above, participants will be given information on how to obtain and complete a paper version of the survey if they do not wish to complete the survey form electronically.

An analysis of a public opinion survey presented both electronically and through more traditional paper-based methods found no significant differences in responses (Kaplowitz et al., 2004).<sup>4</sup> The analysis also did not reveal a significant difference in response rates between those individuals responding to the survey electronically versus those who responded through the paper-based mail in survey. The analysis did uncover a difference in mean age of respondents. Respondents who returned surveys electronically tended to be younger, on average, than those choosing to mail in survey responses.

A study by Lozar, Manfreda and Vehovar (2002)<sup>5</sup> compared mail and web based survey administration. Results indicated no major differences in responses. However, data did show that the web-based survey had a higher item non-response rate. In consideration of this, FRA has designed the web survey to require answers to all questions before moving to the next section of the survey. This has been done in an effort to avoid missed responses due to carelessness, inattention, or unintentional error. Each question in the

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<sup>4</sup> Kaplowits, M.D., Hadlock, T.D., & Levine, R (2004). A comparison of web and mail survey response rates. *Public Opinion Quarterly*, 68, 94-101. (available at: [http://www.uwyo.edu/studentaff/files/docs/survey\\_calendar/kaplovitz\\_hadlock\\_levine\\_a\\_comparison\\_of\\_web\\_and\\_mail\\_survey\\_reponse\\_rates.pdf](http://www.uwyo.edu/studentaff/files/docs/survey_calendar/kaplovitz_hadlock_levine_a_comparison_of_web_and_mail_survey_reponse_rates.pdf))

<sup>5</sup> Lozar Manfreda, K. & Vehovar, V. (2002). Do mail and web surveys provide the same results? *Advances in Methodology and Statistics*, 18, 149 – 169. (available at: [http://www.websm.org/uploadi/editor/Lozar\\_2002\\_Do\\_mail\\_and\\_web\\_surveys\\_provide\\_same\\_results.pdf](http://www.websm.org/uploadi/editor/Lozar_2002_Do_mail_and_web_surveys_provide_same_results.pdf))

survey has a “prefer not to answer” option for those questions where the decision by the respondent not to respond was intentional

**4. Efforts to identify duplication.**

FRA and the VTTI research team are unaware of other research conducted currently or in the past that could be used to fulfill the research goals that this study has been designed to achieve. Previous surveys of locomotive engineers and conductors have focused on work schedules and sleep patterns using daily logs and work/rest diaries. The impact of commute times on fatigue and safety remains unexplored in the target population and in the industry as a whole.

FRA and the VTTI research team are aware of research on the effects of excessive commuting on safety and CMV driver fatigue being carried out by FMCSA, but thorough literature reviews have revealed no data focusing on the railroad industry or particular segments within it. The existing data on fatigue in locomotive engineers and conductors are largely drawn from work schedule evaluations, work/rest diaries, simulator experiments, and accident analyses in order to inform fatigue models and/or fatigue management programs. Information on commute times and their impact on fatigue and safety would be an invaluable addition to the current state of knowledge.

**5. Efforts to minimize the burden on small businesses.**

Respondents will be individual railroad employees who voluntarily participate in the survey. Individuals will be invited by the relevant railroad unions (i.e., BLET, SMART) to respond to the survey. Some individuals who respond to the survey may be employed by small businesses but this data collection will not directly impact small businesses. Therefore, the burden to small businesses should be negligible.

**6. Impact of less frequent collection of information.**

If the proposed information collection activities are not conducted, FRA will lose a unique opportunity to study the issue of fatigue from the perspective of the front-line worker and gain a better understanding of how it affects an essential segment of railroad employees, namely locomotive engineers and conductors, who play a critical part in the day-to-day safe operation of trains. Specifically, without this proposed collection of information, FRA will be unable to determine if commute times are an issue within this population of safety-critical workers and how commute times impact fatigue and safety. This means FRA would be hindered in making recommendations or suggestions to rail management and labor groups that may improve rail safety as a whole, as well as individual worker safety, by reducing the impact commute times may have on fatigue experienced by locomotive engineers and conductors.

Additionally, without this collection of information, the annual number of rail accidents/incidents and the number and severity of casualties both to railroad workers and others (passengers, train crews, motor vehicle operators, and pedestrians) might be greater than they need to be because no one considered the impact commute times has on fatigue and safety, and whether this could have been prevented if ameliorating steps had

been taken to reduce job-related fatigue.

**7. Special circumstances.**

The survey contains no special circumstances. Survey participation is entirely voluntary. Respondents will not be required to respond more than once, will not be required to provide a written response in fewer than 30 days, to submit any documentation in association with the survey, to provide confidential/proprietary information, to provide a pledge of confidentiality, or to retain any records associated with the survey. Respondents will be invited to respond via an e-mail containing a hyperlink to an electronic form. The VTTI research team is asking for response by survey respondents as soon as is convenient on receipt of the survey information as respondents may forget about the survey invitation. However, to alleviate forgetfulness, a reminder notice will be sent two weeks and four weeks after the initial information is sent. Respondents will be given the flexibility to respond at any time up to 60 days after the initial survey information is sent.

FRA and the VTTI research team will treat the source of the data as confidential. A unique ID number will be assigned automatically to each participant when they visit the secure website to complete the survey. No names or personally identifying information will be collected at any time. Only aggregate data will be reported. No data will be reported by individual or railroad or union.

**8. Compliance with 5 CFR 1320.8.**

As required by the Paperwork Reduction Act of 1995, FRA published a notice in the *Federal Register* with a 60-day public comment period (83 FR 54173) to announce this proposed information collection. As of the closing date of December 26, 2018, the agency received one comment in response to this notice.

The comment came from the Transportation Trades Department, AFL-CIO (TTD) and questioned the scope of the study due to the intent to survey locomotive engineers, whilst entirely excluding conductors, who are equally likely to suffer additional fatigue due to commute time. The commenter pointed out that, like engineers, conductors are required to perform a number of safety-sensitive functions on the job, which can be hampered by fatigue. Additionally, the hours of service statute and regulations do not differentiate between the two occupations, providing identical fatigue protections for all “train employees.” In light of this comment and the supporting arguments, the FRA has revised the scope of the study to include conductors in addition to locomotive engineers. The inclusion of conductors will enable the FRA to get the most valuable and complete results from the study on the fatigue conditions of safety critical workers.

FRA published the required 30-day notice on May 7, 2019 (84 FR 19990).

**9. Payments or gifts to respondents.**

Respondents will be given the option to enter a raffle to win one of twenty \$50 gift cards. On the final page of the survey, respondents will be asked if they would like to enter the raffle. If they choose “No, I do not want to enter the raffle” the survey will be complete and no further information will be collected from the respondent. To enter the raffle, respondents will choose “Yes, I want to enter the raffle.” They will then be taken to a separate form, where they will need to provide their name and phone number. This will insure their personal information is kept separate from their survey responses. Once data collection is complete and the survey is closed, twenty names will be randomly drawn from list of entrants in the raffle. Each winner will be contacted via phone in order to obtain an address to send the raffle prize. If the winner cannot be reached after three attempts a new winner will be drawn and the prize will be distributed accordingly.

Entry into the raffle is voluntary and provides the opportunity to compensate respondents for their time and effort in completing the survey, if respondents choose to enter the raffle.

**10. Assurance of confidentiality.**

FRA and the VTTI research team fully complies with all laws pertaining to confidentiality, including the Privacy Act of 1974. Thus, information obtained or acquired by VTTI in this proposed study will be used exclusively for statistical purposes or, in this case, to study the issue of commute times and the resulting impact on fatigue and safety of locomotive engineers and conductors. Furthermore, the design of the survey precludes any possibility of any individual being identified since no personally identifying information is being requested. This ensures confidentiality for respondents. Additionally, no individual survey responses will be released and data will only be reported as group means or aggregate summaries. Participants will be advised before commencing the survey that the survey is completely anonymous and it is impossible for responses to be traced back to an individual. The survey will not ask participants for the name of the railroad that they work for, so reporting of the data by railroad will not be possible.

**11. Justification for any questions of a sensitive nature.**

This survey will not ask respondents questions regarding sexual behavior and attitudes, religious beliefs, or other matters that would be considered private or of a sensitive nature. Participation in this proposed study by railroad employees is completely voluntary. Thus, only those consenting to participate in the survey will do so. The survey will ask respondents’ questions relating to commute times, perceptions of the contribution of commute times to fatigue and safety issues, the impact fatigue has on performance and safety, and perceptions of current fatigue mitigation strategies. Each question has a “prefer not to answer” option, so respondents may choose not to answer any questions for which they would feel uncomfortable providing information.

**12. Estimate of burden hours for information collected.**

<b>Total Population of Locomotive Engineers &amp; Conductors</b>	<b>Number of Respondents (assuming 15% response rate)</b>	<b>Number of Responses per Respondent</b>	<b>Time per Response</b>	<b>Total Burden in Hours</b>	<b>Cost*</b>
69,000	10,350	1	20 mins	3,450	\$155,250

\*Note: If the burden were calculated in terms of dollars rather than hours, the equivalent annual cost for the estimated 3,450 hours would be \$155,250 (annual hourly salary for locomotive engineers/conductors including 40 percent overhead costs is approximately \$45 per hour). Data is a single collection with no follow up in subsequent months or years. The survey should take no more than 20 minutes for a respondent to complete.

**13. Estimate of total annual costs to respondents.**

There will be no additional cost burden to survey respondents. There will be no need for respondents to keep any records associated with this data collection effort.

**14. Estimate of Cost to Federal Government.**

The total cost to the Federal Government equals \$179,000, which breaks down as follows:

Contractor Expenses

Planning	\$6,500
Initiation	\$13,500
Development	\$65,000
Data Collection	\$31,000
Data Analysis	\$16,500
Reporting	\$46,500

Total Contractor Cost      \$179,000

*Note:* The above estimate includes the following items:

Consultant fees	\$5,200
Advisory Board compensation	\$2,500
Focus group compensation	\$1,656
Travel	\$905

**15. Explanation of program changes and adjustments.**

These are new information collection requirements for a one-time survey. Therefore, there are no program changes or adjustments at this time.

**16. Publication of results of data collection.**

Plans for publication of the data have yet to be determined. At a minimum, the results of this survey will be presented in a FRA technical report. A summary of the results may also be presented at meetings/conferences, such as the annual meeting of the Transportation Research Board, and submitted for publication to an academic journal, such as Transportation Research Record.

Data collection will begin as soon as OMB approval is granted, assuming all previous planning and development tasks have been completed. Data collection will be completed within 120 days of commencement. The planned project schedule, shown below, assumes the FRA will receive OMB approval for the survey by October 2019.

<b>Activity</b>	<b>Date</b>
Planning	June 2018 – July 2018
Initiation	July 2018 – September 2018
Development	October 2018 – September 2019
Survey Data Collection	October 2019 – December 2019
Focus Groups	December 2019 – February 2020
Data Analysis	February 2020 – May 2020
Draft Final Report	August 2020
Submission of Final Report	November 2020

**17. Approval for not displaying the expiration date for OMB approval.**

Once OMB approval is received, the FRA will publish the approval number for these information collection requirements in the *Federal Register*.

**18. Exception to certification statement.**

No exceptions are taken at this time.



