Department of Transportation Office of the Chief Information Officer

Supporting Statement
Flexible Sleeper Berth Pilot Program

Part B. Collections of Information Employing Statistical Methods

This information collection request (ICR) is in reference to the Flexible Sleeper Berth Pilot Program, referred to as the study in subsequent sections.

1. CIRCUMSTANCES REQUIRING INFORMATION COLLECTION

During listening sessions for the hours-of-service (HOS) rulemaking, the Federal Motor Carrier Safety Administration (FMCSA) heard from many drivers that they would like regulatory flexibility to be able to sleep when they get tired or as a countermeasure to traffic congestion. The aim of the Flexible Sleeper Berth Pilot Program is to demonstrate how HOS regulatory flexibility in conjunction with an optional fatigue management program (FMP) could be used to improve driver rest and alertness.

Laboratory studies have demonstrated that a split sleep schedule, with the same total hours dedicated to rest divided between two periods, can result in as much or more total sleep time than a consolidated daytime sleep schedule.[(1)] Maintaining and improving driver rest and alertness is a priority of the U.S. Department of Transportation (USDOT) because it is well known that driver alertness is directly related to safety.

Changes to the FMCSA HOS regulations must be data driven and support driver safety. In order to determine whether more flexible HOS regulations improve—or at the very least do not degrade—driver rest and alertness, a study must be conducted with commercial motor vehicle (CMV) drivers. Driver fatigue depends on the interaction of many factors, including the duration and quality of previous sleep, how long the driver has been awake, and time of day. To determine the effect of regulatory flexibility on driver fatigue, drivers must be given the opportunity (temporarily) to exercise such flexibility as suits their individual needs. As driver schedules may fluctuate from day-to-day, the effects of this regulatory flexibility will also vary. To meet this research need, FMCSA has developed the Flexible Sleeper Berth Pilot Program, a research study to collect detailed data on driver sleep and performance when temporarily granted regulatory flexibility.

While enrolled in this field study, drivers will have the opportunity to divide their required hours of rest time into no more than two sleeper berth (SB) periods (each ≥ 2h) such that the total time will be greater than or equal to 10 hours. Following study enrollment, drivers will initially drive under current HOS regulations for a two-week period. After the two-week period has ended, drivers will be able to operate under the exemption or under the current HOS rules in a given duty period as they choose, while still meeting the daily minimum rest requirements. The research team will assess whether, from a safety, sleep, and fatigue perspective, this approach is "as safe as" or "safer than" operating under the current HOS regulations, which require a single daily consolidated rest period of 10 hours, or a SB period of 8 hours with an additional 2 hours off-duty (per the current "8 + 2" SB provision).

2. DESCRIBE POTENTIAL RESPONDENT UNIVERSE AND ANY SAMPLING SELECTION METHOD TO BE USED

The potential respondent universe is interstate truck drivers with a Class A commercial driver's license (CDL). There are approximately 3.8 million interstate CMV drivers[(2)] in the United States. While there is no estimate on the number of Class A CDL holders, a rough estimate of the number of Class A CMV drivers was developed by identifying the number of drivers in FMCSA's Motor Carrier Management Information System (MCMIS) who drive beyond a 100-mile radius. This identified approximately 2 million potential Class A CMV operators. Based on our power calculation (see below) and the stated purpose of the study, we will need to study 200 drivers, which, given the size of the respondent universe, should pose no problem for recruitment. As drivers will inevitably leave their companies (and thus exit the study), and some may choose to leave the study voluntarily, we expect an attrition rate of up to 20 percent and will recruit up to 240 drivers. In order for the study to capture a variety of driver types, we will recruit sub-populations from the following categories: drivers from small carriers (2–50 trucks), drivers from medium carriers (51–500 trucks), drivers from large carriers (> 500 trucks), owner-operators, and team drivers. Table 1 shows the approximate universe, by carrier size. There is no way to estimate the universe of team drivers and owner-operators, other than identifying these are sub-populations of the universe identified in Table 1.

Table 1. Approximate sample universe by carrier size.

Population Category	CMV Operators Driving in a > 100-mile Radius[(3)]
Drivers from Small Carriers (2–50 trucks)	939,867
Drivers from Medium Carriers (51–500 trucks)	567,633
Drivers from Large Carriers (501 or more trucks)	562,363
Total	**2,069,863**

Drivers will be enrolled in the study that volunteer, are eligible, regularly use their SB, and provide written informed consent. Because of budgetary and travel constraints, drivers will be primarily recruited from the geographic areas where the research teams are located (i.e., Blacksburg, VA and Spokane, WA). There will be a Web site where drivers can apply to participate. All drivers will need permission from the carrier because of the data requirements for the study (defined in Part A). In statistical terms, our sample will consist of drivers who, from the perspective of the investigators, form a statistically random sample, stratified by the categories listed above. We will recruit from each stratum until we have reached the required quota (50 drivers from small carriers, 50 drivers from medium carriers, 50 drivers from large carriers, 25 owner-operators, and 25 team drivers; see Table 2). The research team estimates that approximately 1,000 drivers will need to complete the online application in order to recruit sufficient drivers for the study.

Table 2. Desired sample size by category.

Population Category	Required Minimum Sample Size
Drivers from Small Carriers (2–50 trucks)	50
Drivers from Medium Carriers (51–500 trucks)	50
Drivers from Large Carriers (501 or more trucks)	50
Owner-Operators	25
Team Drivers	25

On the application Web site, drivers who are interested in participating in the study will be asked to provide the following information:

- Full name.
- Phone number and preferred time of day to be called.
- E-mail address.
- Medical Examiner's Certificate (MEC) expiration date.
- Whether they have a valid CDL.
- Current company (or status as an owner-operator).
- Name and phone number of a supervisor.
- Whether they operate as a solo, team, or slip-seat driver.
- Whether their vehicle is privately owned or company-owned.
- USDOT number on their vehicle.
- Home terminal.
- Regions in the United States where they drive.
- Whether they drive outside of the United States.
- Whether their truck is equipped with a SB.
- If equipped with a SB, whether they regularly use it and whether it is a single or double SB.
- Whether they have completed modules 3 and 8 of the North American Fatigue Management Program (NAFMP) online training.
- What system they use to log their duty status and driving hours (paper or electronic log; type of electronic log system).
- Whether or not they typically operate the same tractor each day.
- The make, model, year, and vehicle identification number (VIN) of their tractor.
- Existing safety systems (if any) and associated vendor currently in their truck.

The research team will determine each driver's eligibility for the program based on responses to the online application. Driver eligibility requirements are as follows:

- Must have a valid CDL.
- Must have a valid MEC throughout the period of participation.

- Must have company approval for participation in the study (if applicable).
- Must not be a slip-seat driver.
- Must not drive outside of the United States.
- Must drive a vehicle equipped with a SB.
- Must report using the SB regularly.
- Must report typically operating the same tractor each day.

3. DESCRIBE PROCEDURES FOR COLLECTING INFORMATION, INCLUDING STATISTICAL METHODOLOGY FOR STRATIFICATION AND SAMPLE SELECTION, ESTIMATION PROCEDURES, DEGREE OF ACCURACY NEEDED, AND LESS THAN ANNUAL PERIODIC DATA CYCLES.

3.1 HYPOTHESIS

Drivers will be required to follow the current HOS regulations for the first two weeks of the study. After this period, drivers will be free to choose whether to operate within the study-granted SB exemption or within the current HOS regulations during each duty period. Each individual duty period will be defined as:

Split sleep: in which a driver uses the study-granted SB exemption and takes two SB periods, each ≥ 2h and for a total duration ≥ 10h.

Consolidated sleep: in which a driver uses their SB for either 10 consecutive hours or 8 consecutive hours (as part of an 8 + 2 pairing).

After the baseline period, each driver may contribute data to one or both of these categories. As drivers may use the exemption during duty periods in which they deem it to be advantageous, they may not have an equal number of duty periods contributing to each category; there is no a priori expectation that drivers will contribute equally to the categories. Our statistical methods (outlined in section 2.4) are robust and account for this potential imbalance.

Our primary focus is on safety outcomes. Thus, our first objective must be to ascertain that the regulation of sleep opportunity translates into an actual advantage in terms of reduction of negative safety outcomes. We recognize that the flexible sleeper berth allowance may also lead to equivalence, rather than an improvement in safety performance, and it is also possible, at least in principle, that the allowance would lead to a deterioration in safety performance. Ultimately, equivalence and improvement in safety performance are both considered beneficial, as there will be no increased safety risk to drivers or the general motoring public as currently experienced and drivers will have added flexibility in their schedules to allow for unforeseen circumstances. Hence, our primary hypothesis is framed as:

$$H_o\text{: safety outcome rate} \mid \text{split sleep} \geq \text{safety outcome rate} \mid \text{consolidated sleep}$$

$$H_a\text{: safety outcome rate} \mid \text{split sleep} < \text{safety outcome rate} \mid \text{consolidated sleep}$$

Here, split sleep is defined as periods were the driver is operating under the flexible sleep schedule (i.e., shifts were the driver has utilized the spilt sleep provision) and consolidated sleep includes the baseline period and other periods where the driver operated under consolidated sleep.

3.2 INFORMATION COLLECTION TOOLS

By study design, the dependent variables of the study relate to sleep, fatigue, safety, and driving performance. These variables will be measured by means of correlates that have been documented in the scientific literature.

For measuring sleep, drivers will wear an unobtrusive wrist activity monitor (called an actigraph) throughout their participation in the study. Wrist activity, analyzed in conjunction with the records from a sleep log, is a valid and sensitive methodology for measuring sleep and is the methodology of choice for field studies because it is non-invasive.[4] A smartphone application will be used for the sleep log, in which drivers will indicate when they were going to sleep, when they woke up, and whether they were using their SB. Additionally, they will record whether they chose to use the flexible SB allowance and, if so, why they chose to split their sleep in the manner that they did.

For measuring fatigue, the study will use a smartphone version of the psychomotor vigilance test (PVT). The PVT is a serial reaction time task which is sensitive to fatigue and considered a gold standard for measuring the cognitive/behavioral impact of fatigue.[5,6] It has demonstrated sensitivity to fatigue from sleep loss and circadian misalignment—the key mediators of fatigue as demonstrated by sleep science.[7] The 3-minute PVT (or PVT-B) has been shown to be suitable for use in field studies and has been used successfully in earlier studies of CMV drivers.[8,9] Subjective sleepiness will be reported by drivers with the Karolinska Sleepiness Scale (KSS). The KSS, also administered via smartphone application, is the most well-validated self-report scale of sleepiness, scored on a scale from 1 to 9, where 1 represents extremely alert and 9 represents extremely sleepy.[10] Also related to fatigue, drivers will use a smartphone application to log their caffeine consumption.

For measuring safety and driving performance, data collection instruments include an onboard monitoring system (OBMS) and an electronic logging device (ELD). The research team will collect data on road crashes; however, such events are rare, and the research team does not expect to have sufficient power to detect any effects related to flexible SB use. Therefore, the study will also use the OBMS to measure near-crashes and other safety-critical events (SCEs), which reflect safety hazards and are precursors to potential road crashes.[11]

The OBMS will be provided by SmartDrive. The SmartDrive telematics device has two camera views (i.e., a 160-degree view of the cab centered on the driver's face and a 120-degree view of the forward road), one audio channel, global positioning system (GPS) data, and various data elements from the vehicle network (J-1939 or J-1708), including data from active safety systems if currently installed on the truck (e.g., forward collision warning, headway monitoring, lane departure warning, rollover protection, stability control, etc.). The system records speed, acceleration, and vehicle network data, and provides immediate driver feedback (the latter will be disabled in the study). The recorder has three accelerometers (y-, x-, and z-axes) that trigger when a potential SCE is to be recorded. If a forward and/or lateral criterion is met or surpassed (i.e., greater than or equal to $|0.28\ g|$ and $|0.30\ g|$, respectively) the OBMS saves 30 seconds of video (15 seconds before the trigger threshold is exceeded and 15 seconds after), which is then reviewed to determine the nature of the event.[i] These are the standard thresholds set by SmartDrive for "semi-tractor trailer" vehicles. Triggers include hard brakes, hard accelerations, swerves, active safety system activations, and contact with other objects, vehicles, people, and animals (i.e., crashes). These triggered events will make up the safety outcome dataset.

The OBMS also has a speed trigger that uses the vehicle's current speed, obtained from the vehicle network and GPS, and compares the current speed to a preset threshold (to be determined later with input from FMCSA and the peer review panel). A speeding event is triggered when the vehicle is traveling 10 miles per hour (mph) or more over the pre-determined speed threshold for 10 consecutive seconds. Random baseline periods will also be recorded approximately once every 400 minutes while the vehicle is in motion.

The research team will use an ELD to monitor the times when drivers report being off duty, being on duty, and driving. This will be used to compare average daily duty and driving times between duty periods in the baseline period and the flexible option period, as well as duty periods within the flexible option period in which drivers used the flexible sleeper berth allowance (split sleep duty periods) and duty periods in which drivers complied with the current HOS regulations (nighttime or daytime sleep duty periods).

The research team has specific requirements for the degree of accuracy and other (psycho) metric properties of the data to be collected. For time-based variables such as duty schedule, time of day, and sleep duration, a resolution of approximately 10 minutes will be needed; however, these variables are routinely recorded at 1-minute intervals, so the research team will use the resolution provided by the available technology, since it exceeds the minimum required resolution. For fatigue, a wide metric range is needed to capture fatigue levels ranging from well rested to highly sleep-deprived. The PVT has been validated by the research team and others to have this metric range—up to at least 38 hours of total sleep deprivation.[(12)]

SCEs are discrete events that occur naturally during drives, depending on a variety of factors both related and unrelated to the research questions (e.g., both related to fatigue and to traffic density). To be able to construct 24-hour frequency distribution profiles for statistical analysis (see Section 2.4), SCE data will be collected continuously throughout each driver's period of participation and pooled (not averaged) across conditions.

The study will be conducted through all months of the year. As subjects will be compared to themselves during duty cycles when they use the flexible SB option versus when they comply with the current HOS regulations, seasonal changes will cancel out of the statistical analyses automatically.

In addition to the electronic data collection tools related to the sleep, fatigue, safety, and driving outcomes, several paper-based and survey data collection instruments will be used. These

[i] The OBMS will always be recording, but not always saving, so when an event is triggered, the system will have a buffered recording and will be able to save the 15 seconds prior to the trigger and the 15 seconds after.

include an online driver application (described in Section 1), background questionnaire, weekly phone briefing, and debriefing questionnaire. The driver application will be used to collect driver contact information and determine eligibility (see Attachment H). The background questionnaire, administered during the briefing session, will provide additional information about the drivers to be used in secondary analyses and to enhance the public-use data set. Drivers will be asked to provide information such as their age, gender, height, weight, years of commercial driving experience, driving type (local/regional/over-the-road), and typical caffeine and nicotine use. See Attachment I for the complete questionnaire. During the weekly phone briefing, a member of the research team will ask the driver about their driving and sleeping in the past week, including their use of the flexible SB exemption, and their completion of study procedures (see Attachment L). The weekly phone briefing will also provide the drivers a regular opportunity to ask questions or voice concerns, and the researchers the opportunity to address any compliance issues noted. The debriefing questionnaire (Attachment M), administered in-person or over-the-phone at the end of the driver's period of participation, will provide drivers a way to offer general opinions of the study, study procedures, and the flexible sleep exemption.

3.3 INFORMATION COLLECTION PROCEDURES

Information collection procedures will be divided into the following phases:

- An **online application** will be used for driver recruitment. This will be open to all drivers interested in participating in the study. The research team estimates that approximately 1,000 drivers will need to complete the online application in order to recruit sufficient drivers for the study. The online application form will be used to determine drivers' eligibility for the study.
- A **briefing session** will be conducted by the research team individually with eligible drivers. During the briefing session, drivers will review the informed consent form and complete two forms required for payment: a State of Washington Tax Invoice Voucher and a Request for Federal Tax Identification Number and Certification (Form 1099) form. Upon signing the informed consent form, drivers will be enrolled in the study. Digital photographs will be taken of the driver's face and CDL (only if enrolled). The research team will enroll up to 240 drivers, with a minimum of 50 drivers from small carriers (2–50 trucks), 50 drivers from medium carriers (51–500 trucks), 50 drivers from large carriers (501 or more trucks), 25 owner operators, and 25 drivers who work as team drivers.
- As part of the **field study**, drivers will participate in a data collection period for up to 90 consecutive days. The first 14 consecutive days, drivers will be instructed to continue using the current HOS regulations. For the remaining days in the study following this period, drivers will be allowed an exemption to the current HOS SB provision, found in 49 CFR Part 395; they may choose to split their required 10 hours of rest into two SB periods, so long as they total a minimum of 10 hours. Information collection during both study periods will involve:
    - An OBMS (for monitoring driving performance and SCEs).
    - A smartphone application, including:
    - › PVT (a 3-minute serial reaction time task).

- KSS (a self-report of fatigue).
- A sleep log (for reporting sleep and wake times, SB use, flexible SB exemption use, and sleep quality.)
- A caffeine log (for reporting the time and source of caffeine consumption).
- An ELD (for measurement of duty and driving times).
- Wrist actigraphy (non-invasive measure of sleep and wake activity).
- Weekly telephone briefing sessions.
- Collection of roadside violations via the driver and carrier, verified using the Motor Carrier Management Information System (MCMIS).

- During a **debriefing session** in-person or over the phone, drivers will complete a final debriefing questionnaire concerning their involvement in the study, with questions about when they chose to use their split sleep option and how they felt when they did so.

The study's sampling methodology aims to capture the essential independent and dependent variables that will allow the research team to investigate the impact of a flexible SB provision on sleep, fatigue, and safety. Sleep science has shown that the key independent variables that determine fatigue are sleep/wake schedule (which determines sleep homeostatic state) and time of day (which determines circadian rhythm state). A driver's duty schedule and decision of whether to use the flexible SB option will determine these variables. Thus, this study will record the following key independent variables: duty schedule, sleeper berth use, and time of day.

3.4 ANALYSIS METHODOLOGY

Our statistical analysis approach involves using multiple regression models to estimate the effects of consolidated or flexible sleep, and any additional covariates, on study measures (e.g., safety outcome rate, total sleep during duty period, SCE rate, etc.). The multiple regression models would follow the general structure of the example below. Covariates are included for day and night sleep periods and driver subsample of carrier size as examples of how additional covariates might be included.

$$Y_{ij}=\beta_0+\beta_1 X1_{ij}+\beta_2 X2_{ij}+\beta_3 X3_{ij}+\ldots+\alpha_i+\epsilon_{ij},$$

where:

- Y_{ij} is the j^{th}observed safety outcome rate for i^{th}driver
- $X1_{ij}$ is an indicator variable for sleep type, $X1_{ij}=\begin{cases}1 & \textit{Split sleep}\\ 0 & \textit{Current rule}\end{cases}$. β_1 is the corresponding regression parameter.
- $X2_{ij}$ is an indicator variable for day and night, $X2_{ij}=\begin{cases}1 & \textit{Day}\\ 0 & \textit{Night}\end{cases}$. β_2 is the corresponding regression parameter.
- $X3_{ij}$ is a variable placeholder for incorporating driver subsample of carrier size. β_3 is the corresponding regression parameter.α_i is a random effect term to incorporate the correlation among observations from the same driver i.

- ϵ_{ij} is random error.

The regression model can include interaction terms. For example, an interaction term can be used to evaluate whether an interaction exists between day or night sleep and consolidated or split sleep. An important interaction to study is that between carrier size and consolidated or split sleep. Additional covariates, such as demographic information or trip characteristics, can be included in the same model.

The model can be used to assess the effect of a flexible sleep option on an outcome measure. A regression parameter β_1 greater than zero ($\beta_1 > 0$) indicates safety outcomes rate during duty period is greater for flexible split sleep. Conversely, a regression parameter β_1 less than zero ($\beta_1 < 0$) indicates safety outcome rate during duty period is reduced for flexible split sleep. A Wald test will be used to test the regression parameter for statistically significant effects. This same procedure will be done for any regression parameter and outcome measure.

Multiple regression models will be used to estimate effects of regression parameters on driver sleep and performance. Measures of driver sleep and performance include, but are not limited to, PVT lapses, SCE rate, subjective sleepiness, roadside violation rate, and total sleep duration. Depending on the type of response variable, the model will be a mixed effect linear model, logistic regression model, or Poisson regression model, as appropriate. This holds true for all response variables, including safety outcomes. Statistical analyses will be conducted using SAS (SAS Institute Inc., Cary, NC).

3.5 POWER CALCULATION

The current study is the first of its kind to assess the effects of split sleep on several safety-related variables, including OBMS safety outcomes and SCEs, as well as driver alertness and sleep variables. Although there are many factors in play determining sleep duration in the real world, previous field research has shown that the biological factors of circadian rhythm and sleep homeostasis are the dominant drivers of sleep duration, both in the laboratory and in the field.[(13)] Thus, while it is not a foregone conclusion that the flexible sleeper berth allowance will also be dominated primarily by biological principles of sleep regulation, we can rely on the laboratory investigation of split sleep by Jackson and colleagues as a guide for our power calculation.[(14)]

Our study's primary focus is on safety outcomes. There are several assumptions being made in the power analysis. First, we are assuming the effect size for safety outcomes in the current study will be similar to that found for sleep duration in Jackson et al. (2014). The power analysis also does not fully capture the important considerations included in the proposed model, such as the inclusion of a driver random effect term or additional covariates found to be important to include.

In Jackson et al. (2014), for a nighttime sleep condition in this study, sleep duration (mean ± SE) was reported as 8.4 h ± 13.4 min (n = 18). For a daytime sleep condition in this study, sleep duration was reported as 6.4 h ± 15.3 min (n = 17). Of interest is the split sleep condition as compared to the nighttime and daytime sleep conditions. For the split sleep condition, sleep duration was 7.2 h ± 14.2 min (n = 17), which is approximately halfway between the nighttime and daytime conditions. The least advantageous scenario from a statistical power perspective, and thus the most conservative, would be the consolidated sleep condition was found to be an exact average of the nighttime and daytime sleep condition (i.e., at 7.2 h).That would make it the least likely that a difference can be demonstrated between the split sleep condition and consolidated sleep condition (any other alignment of the nighttime and daytime sleep conditions on would increase the absolute difference of the average consolidated sleep condition and the split sleep condition). It follows that we must have enough statistical power to demonstrate a difference between conditions of at least 0.2 h. From the reported standard errors in Jackson et al. (2014), using the sample sizes, we find that the pooled standard deviation is no greater than 1.0 h. Thus, the expected effect size is Cohen's d = 0.2 (small).

A multiple regression power analysis, executed in R, using a small effect size for multiple regression model, type I error threshold of $\alpha = 0.05$, and power to be 0.80, found a sample size of 400 to be sufficient (which assumes drivers will contribute 2 observations, on average). Given the duration of the study and the number of drivers, this value should be well within the final observation count. In the current study, analysis will also consider driver strata (large carrier, medium carrier, etc.), where the smallest sample size for each stratum is n=25 drivers. Given the length of the study, it is reasonable to expect drivers to contribute an average of 16 observations, which would give a total of 400 observations to meet the power value of 0.8.

In the study pre-test, five drivers had between 8 and 14 days to use the flexible SB allowance if desired. Of these days, drivers used the flexible SB allowance for 18.36% duty periods, on average (range of 0% to 40.00%). These same drivers used the current HOS regulations for 48.22% of duty periods, on average (range of 25.00% to 78.57%). Drivers also took longer restart breaks during their time in the study. Using these numbers, we can estimate how many days of the 90 day study drivers might use the flexible SB allowance or current HOS regulations. If drivers used the flexible SB allowance for 18.36% of the 90 days, on average, drivers would contribute an average of approximately 16 observations in this condition alone. With at least this number of observations per each of the 200 drivers, power is estimated to exceed 99 percent. Of course, the pre-test did not suffer attrition, which is expected to occur in a longer, 90 day study. However, given the number of drivers and duration of the study, we believe we will have ample observations and power to address both our primary and our secondary aims in this study.

4. DESCRIBE METHODS TO MAXIMIZE RESPONSE RATE AND TO DEAL WITH THE ISSUES OF NON-RESPONSE.

To increase response rate in the online application, the research team will approach carriers to support the study, as needed. Companies supporting the study may be asked to distribute brochures or other study-related recruitment information. Once drivers are enrolled in the study, an intensive approach will be adopted to maximize participant retention and compliance with study protocols. Most study measures will be collected in near-real-time and reviewed daily to detect missing, spurious, or corrupt data, or device hardware or software failures. When a protocol deviation is detected, a member of the study team will contact the participant to understand the source of the problem and provide corrective feedback. Immediate feedback is key to setting consistent demand characteristics throughout the entire data collection phase of the study.

Subject to Institutional Review Board (IRB) approval, participants will receive modest monetary compensation for study participation based on the completion of individual portions of the study, and care for and return of study equipment. Drivers will receive payment for attending the briefing session and for each month of participation, with an additional bonus for completing the full 90 days of the study. Drivers will receive their payments via check mailed directly to the address they provide, at the end of month 1, at the end of month 2 and at the end of month 3 (end of participation).

During the study recruitment and data collection phases, investigators will prepare written reports on carrier recruitment and data collection, including the number of drivers participating in the study and the status of the data generated by each driver, and provide to FMCSA on a weekly basis.

The research team will perform data quality assessments on a daily basis and will have weekly telephone conversations with each participating driver to answer questions and discuss study progress. Drivers will be asked to call a member of the research team weekly so that the briefing takes place when the driver is not on duty or trying to sleep. If a driver forgets to call, the driver will be reminded by his or her preferred method (e-mail, phone call, or text message). During their weekly briefing, participants will receive feedback relative to adherence with study protocols and compliance with study measures. The research team will inquire about, document, and seek to rectify any data anomalies detected during the quality control process. Based on previous experience by the research team, this frequent communication between drivers and researchers helps build a rapport that is beneficial for driver retention.

5. DESCRIBE TESTS OF PROCEDURES OR METHODS TO BE UNDERTAKEN.

A pre-test of all research procedures described in Section 2.3 was conducted with five drivers for two weeks each. These drivers, who were all from the same, medium-sized carrier, completed the online application, briefing session, 2-week field study participation, and debriefing. At the conclusion of the pre-test, qualitative data was gathered through individual telephone interviews, so that the drivers who participated in the pre-test had an opportunity to voice ideas and suggestions regarding the key elements of the study in a controlled setting. The goal of this pre-test was to evaluate the study design to identify opportunities to optimize the study protocols when the Flexible Sleeper Berth Pilot Program is launched.

The pre-test helped to identify several technical issues, which will be remedied before the full field study. In two instances, the ELD did not properly recalculate the available duty/driving hours after a driver used the flexible SB allowance. The ELD programmers have identified and corrected a programming error that occurred when drivers used the “yard move” status. One OBMS stopped recording during the pre-test due to a short in the wiring. This wiring issue was identified during the deinstallation of the equipment and will be remedied for future installations in the field study. One wrist actigraph also stopped recording during the pre-test. The cause for this is unknown, although it may have been due to water damage or might be a faulty device. When drivers are trained on actigraph use during briefing sessions for the field study, the research team will further emphasize the need to fully seal the charging port on the actigraph, where water can enter the device.

During the exit interviews, drivers provided other helpful suggestions to improve study procedures. For example, two drivers requested that entry of an email address should not be a mandatory field in the online application, as they did not have an email address. The study website and online application has been updated so that this field is no longer mandatory. Drivers suggested some design modifications to the ELD app, such as larger font size for one of the lines of text. These updates are in-process. Drivers also recommended including a reference guide for the ELD with their study materials so that they would not need to call with simple questions.

The feedback received during the pre-test has helped inform the final design of the full pilot program and has confirmed data collection methods will be successful.

6. PROVIDE NAME AND TELEPHONE NUMBEER OF INDIVIDUALS WHO WERE CONSULTED ON STATICTICAL ASPECTS OF THE INFORMATION COLLECTION AND WHO WILL ACTUALLY COLLECT AND/OR ANALYZE THE INFORMATION

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