

Electronic On-Board Recorder Adoption in the Trucking Industry: Issues and Opportunities

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ABSTRACT

Discussions surrounding a possible Electronic On-Board Recorder (EOBR) mandate have been increasing at the same time that time-on-task monitoring technologies have matured and the Hours-of-Service regulations are being revised. Although certain safety advocacy groups have petitioned for an EOBR mandate since their initial use in 1985, there is still a shortage of carrier-oriented research on the factors and impediments associated with EOBR usage. This study identifies the primary barriers to expanded utilization of EOBRs and appropriate methods for mitigating those motor carrier concerns.

The American Transportation Research Institute (ATRI) undertook the research by cataloging and analyzing FMCSA docket responses, and conducting a series of surveys and interviews with vendors and motor carrier EOBR users and non-users. These analyses provide insight into the different perceptions and expectations that exist among the various sectors and stakeholders. For instance there are considerable differences in perceived versus real system costs as well as “reasonable” unit costs by users and non-users. The actual experiences of motor carriers that use EOBRs also show that driver retention has not been negatively impacted by adoption. These two issues demonstrate the lack of familiarity and accurate information within the motor carrier community. Clarification and/or promulgation of the purpose of EOBRs, system costs, and actual impacts on driver retention may relieve many concerns.

However, there are other issues that will need to be addressed before EOBRs receive greater acceptance, namely the lack of clear standards and research demonstrating the relationship between EOBRs, Hours-of-Service and safety.

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Section 1 Introduction

In September, 2004 the Federal Motor Carrier Safety Administration (FMCSA) released an Advance Notice of Proposed Rule Making (ANPRM) requesting stakeholder comments on new regulations relating to the use of Electronic On-Board Recorders (EOBRs) for monitoring driver Hours-of-Service (HOS). In addition to a variety of other topics, the FMCSA requested comments on whether EOBRs should be mandated. The responses received described a general lack of adequate benefit-cost information; a need for EOBR technical specifications; and an increased nexus between EOBR usage and safety. The Notice of Proposed Rule Making (NPRM) is expected to be published in 2006¹.

In preparation for the 2006 NPRM and in response to the anticipated role of EOBRs in future HOS monitoring, ATRI was commissioned by its Board of Directors to conduct an analysis of factors relating to EOBR adoption and a potential EOBR mandate. This study includes an examination of the costs and functionalities of current or emerging EOBR technologies, a determination of motor carrier willingness / ability to purchase EOBRs and the impact of various non-technical factors.

Background

Hours-of-Service

In the 1930s, the Interstate Commerce Commission passed the first hours-of-service (HOS) regulation as part of the Motor Carrier Act of 1935, limiting driver on-duty time to 15 hours in every 24-hour period. In the 1960s the 24-hour time limit rule was replaced with a minimum off-duty time of 8 hours after every 15 hours a driver spent on duty. These HOS rules remained largely unchanged until the 2003 changes².

In June 2003, highway safety advocacy groups filed a petition with the U.S. Court of Appeals to review the new rule. The court issued the opinion that the existing rule was “arbitrary and capricious because the agency failed to consider the impact of the rules on the health of drivers....” Although FMCSA related driver fatigue to safety implications when developing the new HOS rules, the court opinion stated that vehicle safety and driver health had to remain distinct and separate considerations. Other weaknesses highlighted by the court included: lack of justification for an increase in the maximum allowable driving time; lack of justification for allowing drivers using sleeper berths to split the mandatory ten-hour off-duty periods into two separate breaks; lack of analysis of costs and benefits associated with EOBRs; and lack of an explanation for how the 34-hour restart provision justified an increase in maximum allowable driving time².

The result was a rulemaking process that commenced in January 2005, with the publication of new HOS rules that went into effect in October of 2005. FMCSA made a strong effort to base this rule on scientific information, starting with modification of a

contract with the Transportation Research Board (TRB) to review all relevant literature relating to HOS regulation impacts on driver health. The new rule did not change the maximum number of allowable driving hours or the maximum number of hours a driver could remain on-duty, and did not mandate the use of EOBRs³. However, the new rule substantially altered the sleeper berth provisions affecting drivers' ability to split sleeper berth time. Under the old rules, drivers using a sleeper berth had to take 10 hours off duty, but could split the time into two periods provided neither was less than two hours. Under the new rules, drivers are required to take at least eight consecutive hours in the sleeper berth, plus two consecutive hours either in the sleeper berth, off duty, or any combination of the two.

Electronic On-Board Recorders

The use of EOBRs for monitoring HOS dates back to 1985 when the Federal Highway Administration (FHWA)^{*} granted a waiver allowing Frito-Lay Corporation to use on-board recorders instead of handwritten Records of Duty Status. Soon after the waiver was granted, the Insurance Institute for Highway Safety (IIHS) petitioned FHWA to require all motor carriers to use on-board recorders. Although this petition was denied, FHWA revised the HOS rules in 1988 to allow carriers the option of using automated on-board recorders to track driver HOS.

Since the initial adoption of the rules allowing the use of *automatic* on-board recorders[†], the available technology has evolved, necessitating revisions to the original rules. FHWA released a notice of interpretation on Global Positioning System (GPS) technologies in 1998 and began a pilot study with Werner Enterprises to develop a GPS-based EOBR system. In 2003, FMCSA published an exemption allowing Werner to solely rely on the GPS-based system they developed for HOS tracking. The necessity for the exemption underscored the need to revise the on-board recorder rules to account for technological innovations that had occurred since the original rules were written.

While the GPS-based EOBR systems were being developed, FHWA received additional petitions from safety organizations to mandate on-board recorders for HOS compliance. The National Transportation Safety Board (NTSB) recommended a mandate in 1990 and IIHS teamed with other safety advocacy groups to submit another petition to require EOBRs in 1995. The Office of the Inspector General encouraged FMCSA to consider an EOBR mandate in the revised HOS rules published in 2003. However, FMCSA felt that EOBRs could not be mandated at that time due to insufficient economic data, lack of technical system standards, an unpopular phase-in plan and concerns over legal

^{*} The FHWA Office of Motor Carriers regulated truck safety prior to the establishment of the Federal Motor Carrier Safety Administration in 2000.

[†] Automatic On-Board Recording Devices were originally defined by FHWA as "electric, electronic, electromechanical, or mechanical devices capable of recording driver's duty status information accurately and automatically as required by Sec. 395.15."

uses of the HOS data collected. FMCSA's 2004 ANPRM was an effort to solicit important feedback regarding some of these issues.

Secondary Functions

The rulemaking thus far has strictly addressed EOBRs for HOS record-keeping compliance. However, many vendors have developed products that perform a number of additional functionalities as well.

International Fuel Tax Agreement

Although mandatory electronic record-keeping has not been proposed for compliance with the International Fuel Tax Agreement (IFTA), this is another area where On-Board Computers (OBCs) acting as EOBRs could potentially reduce other non-HOS compliance costs and improve adherence to the regulations. Unlike passenger vehicle drivers, commercial vehicle drivers must keep records of travel routes and ensure that fuel taxes are paid to the states through which travel occurs. Fuel taxes are paid at the pump when drivers fuel up and then paperwork is submitted to determine where accrued taxes will be allocated. Certain OBCs/EOBRs can be used to automatically track truck routes to determine the allocation of state fuel taxes accordingly. The technical requirements of EOBRs currently require the collection of information that could be used to calculate IFTA-related data.

Cost Management

A number of motor carriers have purchased OBCs/EOBRs that provide information on fuel economy and consumption. This is a primary function for which vendors currently market OBC/EOBR systems. By tracking the quantity of fuel that is consumed in various operating scenarios, carriers are able to better manage fuel consumption through reduced idling times and other driver behavior changes. This can lead to significant cost savings for the carriers, as well as additional environmental benefits.

Business Management

Certain carriers also use OBC/EOBR devices for business management purposes such as driver load assignments and automatic payroll. Much of the information collected for the HOS requirements can relate to these purposes as well, so it may be a natural progression to combine these functionalities and capabilities.

Vehicle Maintenance Management

Since EOBRs are generally connected to the engine control module, several OBC/EOBR devices can be used to alert drivers and carriers to malfunctions with the truck or engine. EOBRs can also be used to track regular maintenance appointments and tune-ups.

Real-Time Communication

One of the most basic added functionalities of OBC/EOBR devices is the ability to communicate with drivers in real-time. Dispatchers are able to access real-time HOS information and driver locations, and contact the driver quickly to alert him to schedule or route changes. Among on-board technology systems, real-time communication has the greatest market penetration.

Problem Statement

Based on industry and government interviews as well as historical events, some form of EOBR mandate is a real possibility. As documented in the 2004 ANPR-filed comments, many motor carriers have concerns with this prospect. It is the goal of ATRI's research to identify the primary barriers to industry utilization of EOBR devices and document countermeasures for resolving the issues in the likely case of an EOBR mandate.

Previous Research

In 1998, the University of Michigan Transportation Research Institute (UMTRI) released a study on the costs and benefits of EOBRs for HOS compliance⁴. Of the carriers that participated in the research[†], nearly 15 percent had electronic recorders installed, but only about a fourth of those carriers used EOBRs as the primary method of monitoring HOS. Sixty percent of those that used EOBRs reported that the system cost \$2,000 or less. The primary reasons carriers chose to use EOBRs were cost management, communication, HOS compliance, vehicle maintenance and business management purposes. Due to the variety of functions for which EOBRs were used, the UMTRI researchers noted the difficulty in assessing the actual cost of the HOS recording components of the system.

The study authors determined that EOBR benefits were equally "difficult to assess..." This is likely due to the lack of empirical data correlating the use of EOBRs with reduced driver fatigue, which is a primary basis for IIHS and other advocacy groups to advocate for the technology mandate. However, UMTRI researchers were able to quantify benefits related to reductions in the amount of time drivers spent filling out paper logs and fleet managers spent reviewing paper logs.

This study determined that drivers who used EOBRs to record HOS saved an average of 20 minutes a day versus drivers that filled out paper logs. This cannot be translated into an average dollar figure since many factors impact how fleet managers determine the value of a driver's time. Sixty percent of solo drivers and 82 percent of team drivers are paid on a per-mile basis⁵ as opposed to hourly rate compensation, so carriers may not directly benefit financially from this time savings. Comparisons of administrative

time spent reviewing HOS information for companies using and not using EOBRs revealed that 80 percent of the carriers using EOBRs spent less than the median time reported by companies using paper logs; the actual time savings is approximately 20 minutes per vehicle per month. This did not include benefits associated with increased ease of record retrieval, less storage space, ease of HOS data collection or any logistical benefits.

The study determined that for small carriers, EOBR usage is generally not cost-effective. Although the carrier sample used by UMTRI was not representative of the industry at large, it supports other data that indicates EOBR acceptance and use increases with fleet size.

Cambridge Systematics completed a study on EOBR usage for HOS compliance in 2002⁶. This study found that there were few systems in the marketplace designed to record HOS information, although there were many that track HOS as a function of other services. Additionally, vendors did not actively market the HOS capabilities of the products due to political sensitivities and a low demand for HOS functionality.

Cambridge Systematics reviewed relevant literature, completed assessments of currently available market technologies and interviewed key FMCSA officials. As a result of these efforts, Cambridge Systematics composed a series of recommendations for moving forward with an EOBR mandate. The recommendations include:

- Obtaining feedback from motor carriers on current and future EOBR use for HOS record-keeping;
- Using a combination of GPS and engine monitoring technologies to electronically record drivers' HOS;
- Improving communication between FMCSA and potential EOBR technology vendors;
- Revising Section CFR 395.15 to provide performance standards for EOBR use; and
- Investigating the training needs for enforcement and compliance review personnel.

A significant limitation of the Cambridge study is that no direct motor carrier input was included in the analysis. EOBR vendors, truck and engine manufacturers and government officials were interviewed, with the only carrier information coming indirectly through interviews with FMCSA officials who received earlier motor carrier feedback from the GPS-based EOBR pilot project.

ATRI's research is an attempt to address these issues and data gaps through a holistic approach that includes the collection and analysis of carrier feedback on decisions to use or not use EOBR technologies for HOS record-keeping. It has also generated an initial scan of the EOBR technologies that are currently available in the marketplace or are on the verge of being available, provided there is a demand for the technologies. Although the ATRI research itself does not involve the development of system performance standards, the American Trucking Associations' (ATA) Technology &

Maintenance Council (TMC) Task Force for Electronic On-Board Recorders has initiated this task. ATRI's efforts are filling significant gaps in past studies and could be valuable as FMCSA continues the dialogue on EOBR mandates (see Figure 1). Nevertheless, there is still a considerable dearth of research and data scientifically linking the various components of the EOBR-to-safety continuum. Ultimately, these research gaps form the underlying basis for most industry concerns.

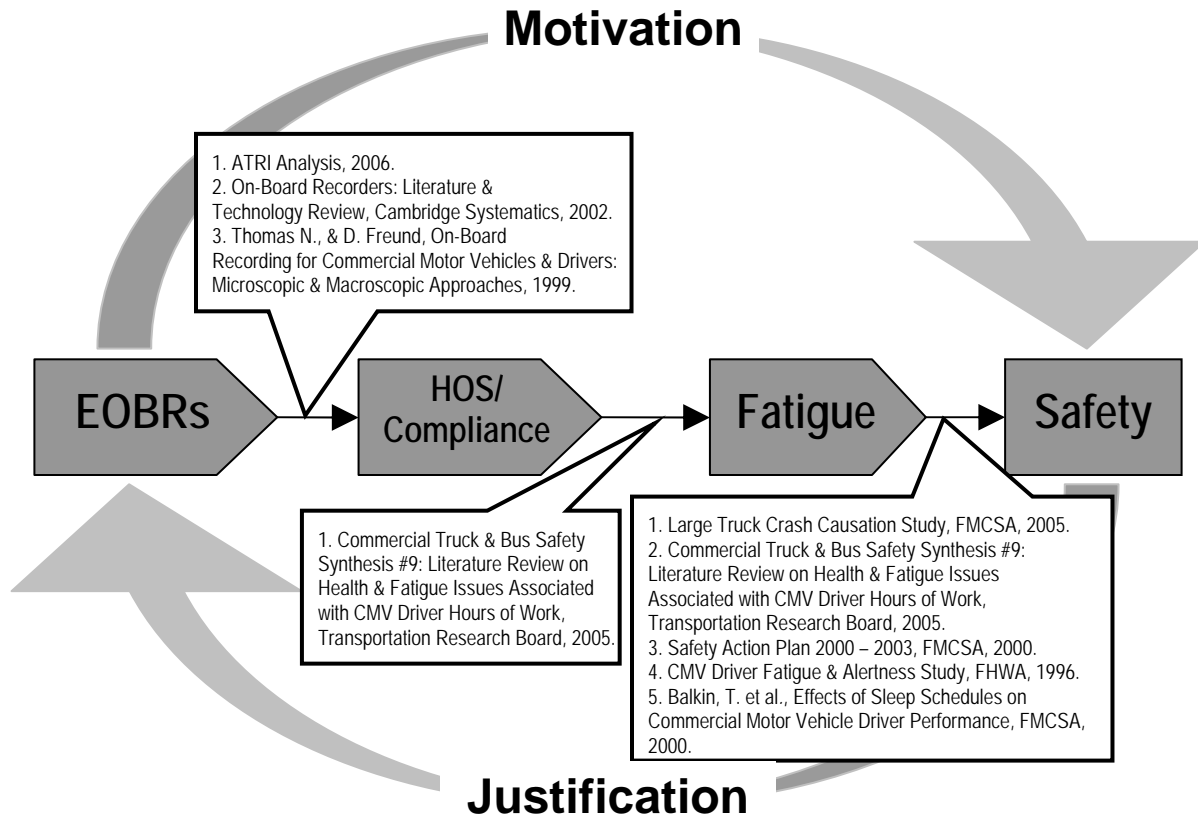


FIGURE 1. Documentation of research linking EOBRs to HOS and HOS compliance, fatigue and safety.

Section 2 Research Methodology

ATRI utilized a number of research techniques and tools to gain a thorough understanding of the key concerns impeding industry adoption of EOBRs, and perceptions on the impact of a possible mandate. To better understand the fundamental issues, ATRI conducted a review of available research, reviewed the comments submitted in response to FMCSA's 2004 ANPRM, attended industry policy forums and spoke with key stakeholders. ATRI then used this information to develop a series of surveys focused on: a) motor carriers currently using EOBRs for HOS record-keeping; b) motor carriers not currently using EOBRs; and c) system vendors. The purpose of the carrier surveys was to understand the reasons carriers chose to use or not use EOBRs. The non-user concerns and perceptions data were then compared and related to the actual experiences of carrier users. The vendor surveys: a) helped identify additional features that might make EOBRs more appealing to carriers; b) created a cost baseline used to determine carriers' willingness to pay for EOBRs (for different capabilities); and c) provided more accurate information about available products and associated functionalities. ATRI then conducted a number of post-survey interviews to further clarify industry and vendor responses on EOBR usage and the potential EOBR mandate. Finally, research data and findings were reviewed by a group of industry stakeholders. A flow chart depicting the research methodology is shown in Figure 2.

Literature Review

ATRI conducted a thorough literature review to identify the currently available body of knowledge regarding EOBRs and to determine the areas where additional research was needed. ATRI utilized industry and academic contacts, government databases and online search engines to identify applicable resources.

Docket Review

FMCSA solicited and maintained a docket of more than 300 responses to the 2004 Advanced Notice of Proposed Rulemaking. ATRI conducted a docket analysis separate from that of FMCSA's. The docket responses were reviewed and categorized by the respondents' affiliation (when known), "attitude" towards a potential EOBR mandate and rationale given to support that position. The responses were analyzed within the context of each affiliation, and later aggregated for an overall analysis.

The first factor documented and analyzed by ATRI was the respondents' "attitude." The categories used were:

- *In Favor*. The respondent clearly expressed that he or she was in favor of a mandate or indirectly expressed that he or she was in favor of a mandate through clearly positive EOBR comments.

- *Opposed*: The respondent either overtly expressed that he or she was opposed to a mandate or indirectly expressed that he or she was opposed to a mandate through negative comments and concerns.
- *Mixed*: The respondent commented on both the positives and negatives of an EOBR mandate or the respondent supported an EOBR mandate with a number of provisions.
- *Neutral*: The respondent clearly stated that he or she was not taking a position on the EOBR mandate.

Although the “attitudes” of most respondents could be easily grouped into one of these categories, several did not provide any indication of a position or specific attitude (about an EOBR mandate) and were therefore not assigned a grouping. It is also important to note that the attitude recorded was towards the mandatory use of EOBRs and not necessarily the attitude towards voluntary EOBR use.

The respondents’ affiliation was then documented. The categories used were:

1. Drivers, including driver trainers and driver representatives;
2. Individuals that did not identify their affiliation;
3. Transportation-related Associations and Organized Labor;
4. Safety Advocates and Insurance;
5. Motor Carriers, including fleet managers and owner-operators;
6. EOBR Vendors; and
7. Others, meaning the respondents identified an affiliation, but the affiliation did not clearly fit into any of the above categories (i.e. consultants).

Finally, the rationale provided by respondents to support individual “attitudes” was entered into the spreadsheet for analysis.

Pre-Survey Interviews

A number of EOBR stakeholders, including carriers, association staff and vendors, were interviewed to provide feedback to the survey design and distribution plans. Trucking industry representatives and vendors provided key insight into the information collection and processing approaches.

Surveys

ATRI conducted three separate online stakeholder surveys to better understand EOBR options that are currently available and ascertain factors impacting motor carrier decisions regarding EOBR use. The three surveys – which targeted motor carriers currently using EOBRs, motor carriers not currently using EOBRs and EOBR vendors – were designed to provide complete anonymity for respondents to ensure adequate response rates and candor when answering questions. Motor carriers and vendors were directed to the online surveys via electronic news alerts sent to key industry

mailing lists, publications like Transport Topics and Fleet Owner Magazine, and state trucking association newsletters and links. Surveys were reviewed to remove duplicative responses. Print versions of the surveys are located in the Appendix. The survey questions were derived from past research studies, comments received in response to the 2004 ANPRM, and the previously described pre-survey interviews with industry stakeholders.

Post-Survey Interviews

As a follow-up to the surveys, ATRI conducted telephone interviews with motor carrier users, non-users and EOBR vendors. The interview questions were developed to supplement the surveys previously conducted and to provide further insight into industry perspectives on EOBR usage issues.

Lastly, a small group of industry stakeholders was asked to review the final draft report for clarity and accuracy.

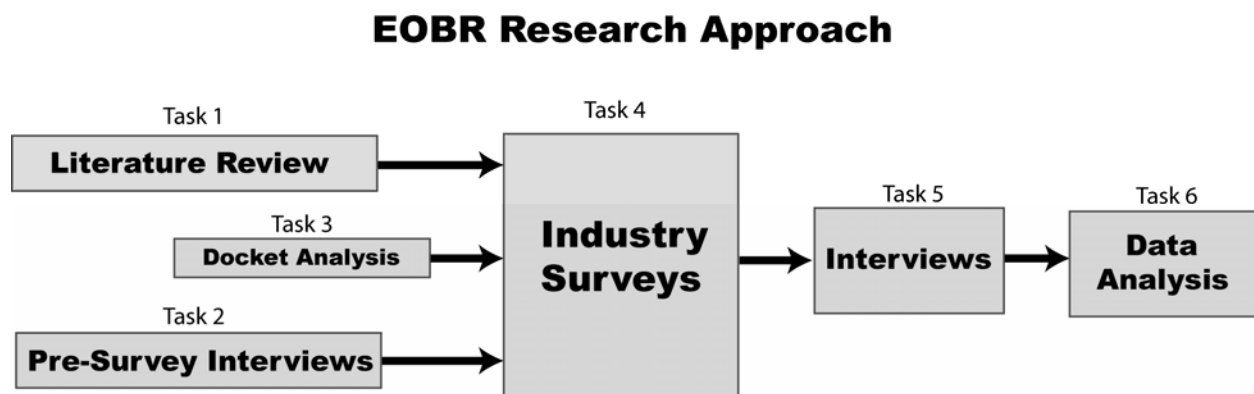


FIGURE 2. The progression of the EOBR research and analysis process.

Section 3 Research Results

Literature Review

The University of Michigan Transportation Research Institute (UMTRI) study and the Cambridge Systematics report previously were the two most significant studies completed analyzing non-technical issues associated with EOBRs. The UMTRI study was largely inconclusive based on its response rates, but did determine that EOBRs were not cost effective for small carriers. The Cambridge Systematics study consisted of a very thorough literature review, interviews with key government officials and an assessment of currently available technologies. One of the research gaps that this study identified was a need for motor carrier feedback on the use of EOBRs for HOS record-keeping. One of the primary objectives of ATRI's EOBR research is to fill this gap in the existing research.

ATRI Docket Analysis

The extent and complexity of EOBR issues is well captured by the docket submissions. After reviewing the docket comments for the ANPRM in 2004, the overwhelming response (73.0%) to mandated EOBRs was negative. Many of the respondents were small carriers or owner-operators concerned with driver privacy issues and costs. However, this may not be a representative sample from which to draw conclusive information on industry opinions of EOBR use for HOS record-keeping; this is a self-selected population motivated by strong feelings (either positive or negative) towards EOBRs. In addition, it is clear from reviewing the docket that there is a great deal of confusion over the purpose of EOBRs. In the case of the FMCSA ANPRM, EOBRs are strictly being considered for HOS record-keeping purposes; however, many respondents expressed concerns that related to the use of EOBRs for event data recording ("black boxes").

Nevertheless, the docket responses can provide some insight into the reasons motor carriers and drivers are reluctant to use EOBRs. The most common responses included concerns regarding equipment, maintenance and operational costs as well as concerns over driver privacy (see Figure 3). Other responses included comments such as:

- Truck drivers are not at-fault for most of the accidents that occur between commercial and passenger vehicles;
- EOBRs will encourage drivers to drive recklessly or drive when they are tired to maximize the miles traveled in their allowable driving hours (based on per-mile or per-load driver compensation);
- EOBRs will do little or nothing to actually improve safety;
- EOBRs could compromise data security and privacy; and
- Some drivers admit to "fudging" logbooks in order to rest when tired and not have the rest period count against allowable driving hours. Although the drivers

recognize that this is in violation of the HOS rules, they feel that the HOS rules are not well constructed and that the use of EOBRs will ensure that the poor HOS rules are rigidly followed.

**Common Docket Responses Opposing an EOBR Mandate
Based on the ATRI Analysis**

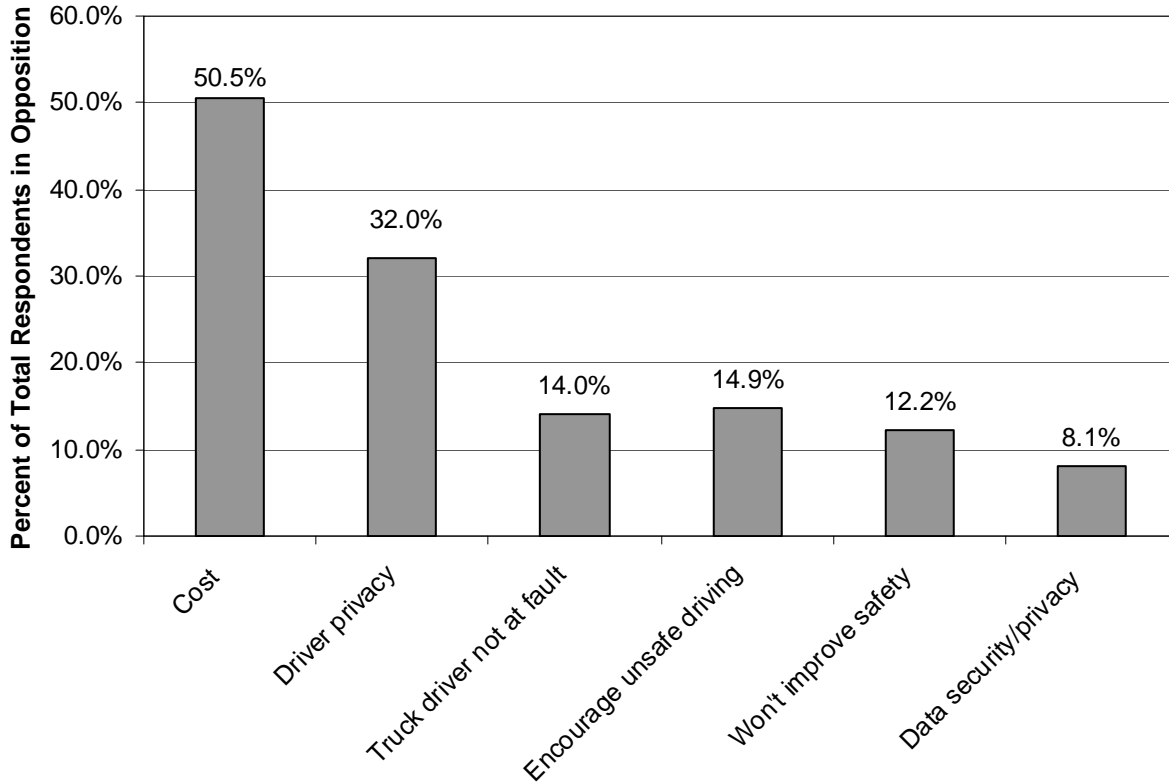


FIGURE 3. The most frequently referenced reasons provided in the docket responses for opposition to EOBRs and a possible mandate.

Overall, 89.8 percent of the respondents could be categorized in one of the “attitude” groups. Table 1 summarizes the attitudes by affiliation category as documented by ATRI. The ATRI analysis determined that there were 304 total unique respondents. Individuals that either identified themselves directly as drivers or indicated indirectly they were drivers made up the largest category, followed by motor carriers and individuals that did not identify an affiliation. Overall, 73.0 percent of respondents were opposed to an EOBR mandate and 11.2 percent were in favor.

TABLE 1: Docket responses organized by respondent “attitude” and affiliation.

Affiliation	Number (% of total)	Number in Favor (%)	Number Opposed (%)	Number Mixed (%)	Number Neutral (%)
Motor Carrier	89 (29.3)	7 (7.9)	74 (83.1)	2 (2.2)	2 (2.2)
Associations & Organized Labor	27 (8.9)	0 (0.0)	23 (85.2)	2 (7.4)	1 (3.7)
Driver	108 (35.5)	8 (7.4)	78 (72.2)	4 (3.7)	3 (2.8)
Individuals	54 (17.8)	8 (14.8)	45 (83.3)	2 (3.7)	1 (1.9)
Safety Advocate / Insurance Provider	6 (2.0)	4 (66.7)	0 (0.0)	1 (16.7)	0 (0.0)
EOBR Vendors	15 (4.9)	5 (33.3)	1 (6.7)	0 (0.0)	1 (6.7)
Other	5 (1.6)	2 (40.0)	1 (20.0)	0 (0.0)	0 (0.0)
Total	304	34 (11.2)	222 (73.0)	11 (3.6)	8 (2.6)

In late 2005, FMCSA completed an analysis of the docket respondents as well. Although the full results of the FMCSA analysis were not available at the time this report was written, information presented by FMCSA at the ATA Technology & Maintenance Council Annual Meeting in February 2006 revealed that FMCSA’s results varied from the ATRI study findings. Table 2 shows the comparison between the ATRI analysis and that of FMCSA. Although the differences in methodology cannot be determined until the release of the full FMCSA analysis with the NPRM, the difference in the total number of respondents is most likely due to the treatment of respondents that made multiple submissions. At this point, the research discussion will be based on the results of the ATRI analysis.

TABLE 2: A comparison of the results of the ATRI analysis and the preliminary FMCSA analysis of docket responses.

Affiliation	FMCSA Analysis	ATRI Analysis
Motor Carrier	70	89
Associations & Organized Labor	25	27
Driver	148	108
Individuals / Private Citizens	35	54
Safety Advocate / Insurance Provider	6	6
EOBR Vendors	15	15
Other	N/A	5
Total	307	304

Due to the fact that a majority (73.0%) of the respondents oppose mandating the use of EOBRs, this discussion will primarily focus on the underlying basis for this opposition. The primary reasons given for opposing the mandate differed only slightly among the affiliation categories. The most frequently referenced rationale of the four affiliations that expressed strong opposition are listed below with the corresponding number of respondents that raised that issue.

Motor Carriers:

- Not cost effective (53)
- Data privacy (22)
- Truck drivers not main cause of accidents (11)
- Shipper-related conflicts (9)
- Won't improve carrier safety (8)

Associations & Organized Labor:

- Not cost effective (20)
- Won't improve carrier safety (8)
- Data privacy (8)
- Not sufficient data to show safety improvements (5)

Drivers:

- Driver privacy (32)
- Shipper-related conflicts (23)
- Pressure drivers to drive when tired (21)
- Not cost effective (20)
- Truck drivers not main cause of accidents (13)

Individuals, no affiliation identified:

- Not cost effective (16)
- Driver privacy (13)
- Pressure drivers to drive when tired (7)
- Truck drivers not main cause of accidents (6)
- Shipper-related conflicts (6)

The similarities across groups are evident, but there are also some noteworthy differences. The cost of the EOBR devices was the top concern for all the groups opposed except drivers, although it was one of the top five concerns for the drivers. This difference most likely arises because drivers do not typically bear the direct cost of purchasing, installing and maintaining the devices. The top concern for drivers was that EOBRs are an invasion of privacy, which was also a top-five concern for motor carriers and individuals that did not identify themselves as drivers. Many motor carriers referenced the AAA Foundation study that found that 75 percent of the crashes that occurred between a truck and a passenger vehicle were primarily the fault of the passenger vehicle driver⁷. Statistically similar findings of crash causes were found in independent studies conducted by U.S. DOT⁸ and Transport Canada⁹, so the basis for this perspective has some empirical support. Other major concerns were lost productivity due to shipping schedules that could not be made up if EOBRs were mandated, along with the concern that such rigid enforcement of HOS regulations would encourage drivers to drive longer and faster, despite being tired, to maximize productivity during the allowable driving period.

This last point is important to emphasize. The purpose of mandating EOBRs is to improve motor carrier safety by ensuring compliance with HOS rules. One of the concerns voiced by several drivers is that this strict compliance will actually result in negative safety impacts. EOBRs could create disincentives for drivers to rest when feeling fatigued for fear of not meeting delivery times within allowable driving hours. Similarly, the EOBRs could create an incentive for drivers to speed in order to meet delivery schedules or to maximize compensation (since many are paid per mile and/or will lose the 15-minute buffer that drivers now have with paper log book documenting requirements).

The only affiliation with a majority of respondents in favor of mandatory EOBRs was the group composed of safety advocates and insurance providers. Reasons for supporting EOBR mandates had less variability than the opposition comments. Five of the six respondents in the safety advocates and insurance provider group referenced improved compliance with hours-of-service rules as a major factor supporting an EOBR mandate. Other reasons given include the cost-effectiveness of the devices (2 respondents), safety improvements (2), and easier enforcement of hours-of-service rules (2). The small percentage of respondents in the other affiliations expressing support for an EOBR mandate is also included below. For the most common docket responses (N=34) in favor of an EOBR mandate, see Figure 4.

EOBR Vendors:

- Helps ensure driver HOS compliance (3)
- Improves safety (2)
- Used for other purposes in addition to HOS (2)

Motor Carriers:

- Levels playing field (5)
- Helps ensure driver HOS compliance (2)

Drivers:

- Helps ensure driver HOS compliance (6)
- Levels playing field (4)
- Used for other purposes in addition to HOS (3)
- Cost effective (2)
- Improvements to driver health (2)
- Identifies amount of time drivers spend waiting on shippers (2)

Individuals, affiliation not known:

- Helps ensure driver HOS compliance (3)
- Improves safety (2)

**Common Docket Responses Supporting an EOBR Mandate
Based on the ATRI Analysis**

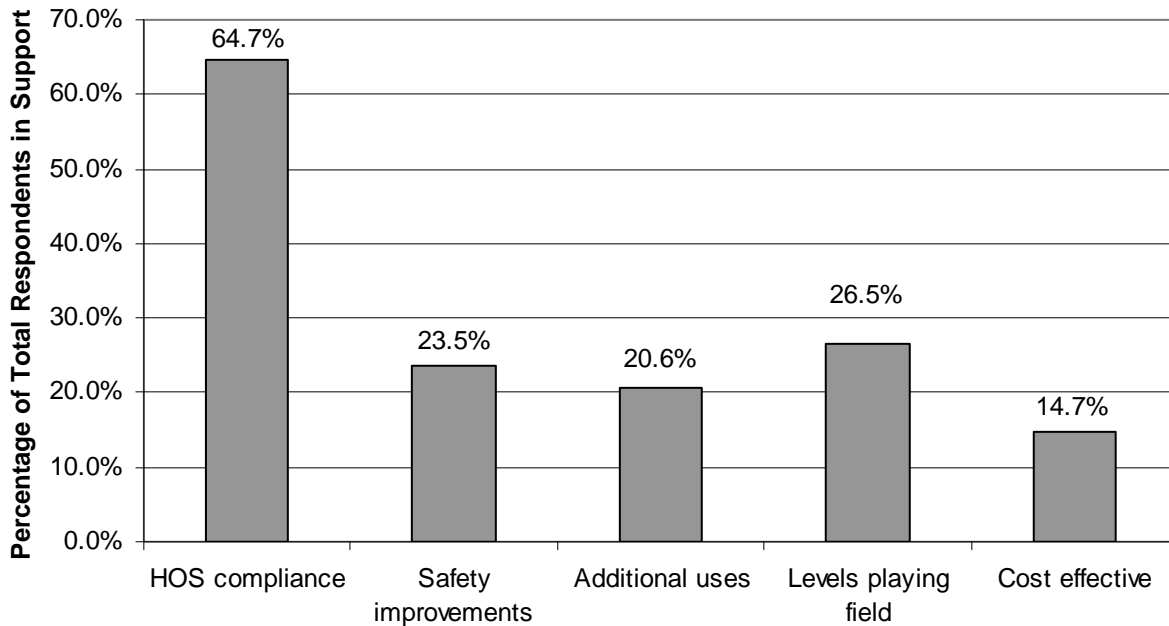


FIGURE 4. The most frequently referenced reasons provided in the docket responses in support of a possible mandate.

It is not surprising to discover that the motor carrier (including owner-operators) opinions on mandatory EOBRs relate closely to the carrier’s current EOBR adoption status. Those motor carriers opposed to a mandate tended to be those that did not currently use EOBRs and want to avoid the cost of purchasing and installing the devices. Likewise, those that favor an EOBR mandate tend to be the ones currently using EOBRs. Those carriers feel at a competitive disadvantage to non-users because of the existing investment and less flexibility in records of duty status.

ATRI Survey Results

Over 150 motor carriers responded to the surveys: 29 carriers currently using EOBR systems and 122 carriers not using EOBRs. The breakdown of respondents by type of carrier is shown in Table 3. Figures may exceed 100 percent since respondents were allowed to select multiple answers if applicable.

TABLE 3: Motor carrier survey respondents by fleet type.

Type of Carrier	Number	Percentage
Private	33	22%
Truckload	89	59%
Less-than-Truckload	24	16%
Owner-Operator	27	18%
Other	7	7%

Overall, this sample can be considered adequately representative of the industry as a whole, based on American Trucking Associations statistics¹⁰. The number of private carriers that participated in the surveys was slightly lower than would be expected, but the breakdown of for-hire carriers and owner-operators is consistent with national weighted statistics[§].

EOBR User Respondents

Respondent Demographics

As previously stated, 29 motor carriers using EOBRs to track drivers' HOS completed surveys. The breakdown of the motor carrier users by fleet type is shown in Table 4.

TABLE 4: Current motor carrier EOBR user survey respondents by fleet type.

Type of Carrier	Number**	Percentage
Private	16	55%
Truckload	9	31%
Less Than Truckload	2	7%
Owner-Operator	1	3%
Other	2	7%

More than half the motor carrier users were private fleets, which is consistent with anecdotal evidence and data collected in the UMTRI cost-benefit analysis. Truckload carriers made up slightly less than a third of the user respondents. The average fleet consisted of 864 vehicles, with fleet size ranging from 10 to 7,200 vehicles. On average, EOBR users employed 1,051 drivers, with the overall number of drivers ranging from 10 to over 8,000.

[§] These statistics are based on the number of motor carriers in each industry segment as reported in American Trucking Trends.

** The numbers in this column sum to 30 because one carrier selected two fleet types to describe its operations.

Reasons for Using EOBRs

More than 75 percent of the motor carriers currently using EOBRs were doing so on 50 percent or more of fleet vehicles, with almost 45 percent using EOBRs on 100 percent of fleet vehicles. When asked the primary reason for using EOBRs, 54 percent selected HOS compliance. The other leading reasons given were tax and fee compliance (15%) and real-time vehicle communication and management (12%). It should be noted that the surveys provided clear definitions for EOBRs as recorders of HOS information; the carriers that did not select HOS compliance as the primary reason still used EOBRs for HOS compliance, but the primary incentive for adopting the devices was for another purpose. Carriers were also asked to select secondary reasons for EOBR use. HOS compliance, business management, engine and vehicle maintenance management, and real-time vehicle communication and management were each selected by at least half of the motor carrier users responding to the question. The two leading secondary reasons selected were tax and fee compliance (80%) and vehicle operating cost management (76%).

EOBR Cost/Price Issues

Information relating to purchase price and maintenance/management costs were also collected from motor carrier users. Table 5 shows the number of carriers that purchased EOBRs by price category. Over a third of the motor carrier users paid more than \$2,000 per unit for systems including EOBR functions. Of these carriers, 20 percent selected HOS compliance as the primary reason for purchasing EOBRs.

TABLE 5. EOBR per unit prices paid by motor carrier current users.

Price Range	Number	Percentage
Less than \$500	2	7%
\$500 - \$999	4	15%
\$1,000 - \$1,499	4	15%
\$1,500 - \$1,999	7	26%
\$2,000 or more	10	37%

Motor carriers were asked about secondary costs associated with EOBRs. On average, monthly EOBR maintenance costs were \$21.41 per truck, monthly wireless subscription fees (when applicable) were \$33.71 per truck, and annual software update costs (when applicable) were \$33.86 per truck.

Finally, respondents were asked the approximate time it took to achieve expected return on investments. Three-fourths of the user respondents indicated that it took less than 3 years with an additional 11 percent selecting more than 3 years. On average, respondents estimated that the life span for an EOBR was approximately 8 years.

Benefits and Impacts

Respondents were asked a series of questions relating to benefits and impacts realized from the use of EOBRs. Ninety-three percent of the respondents indicated some benefit from the use of EOBRs compared to other methods of tracking HOS.

Respondents were asked to weight the *general* benefits realized among safety, productivity and regulatory compliance. On average, carrier users responded that 46 percent of the overall benefit resulted from regulatory compliance, 34 percent from safety, and 20 percent from productivity.

Respondents were then asked to identify *specific* benefits realized from the use of EOBRs. Ninety-two percent selected improved HOS compliance, followed by reductions in administrative burden (85%) and lower costs associated with HOS compliance (62%). Forty-six percent selected better coordination between drivers and loads, and 35 percent selected fewer crashes or lower safety costs as a specific benefit.

Respondents were also asked about *impacts* of EOBR use on driver morale, driver retention and company productivity. Seventy-six percent said that EOBR use improved driver morale and 16 percent said that it had no impact. Sixty-two percent said that driver retention was not impacted by EOBR use, and 19 percent said that it actually improved driver retention; none of the carrier users indicated a negative impact on driver retention as a result of EOBR use. Seventy-eight percent said that the use of EOBRs improved company productivity, and 13 percent said it had no impact; nine percent said that EOBR use actually worsened productivity.

Specific Impacts of EOBRs

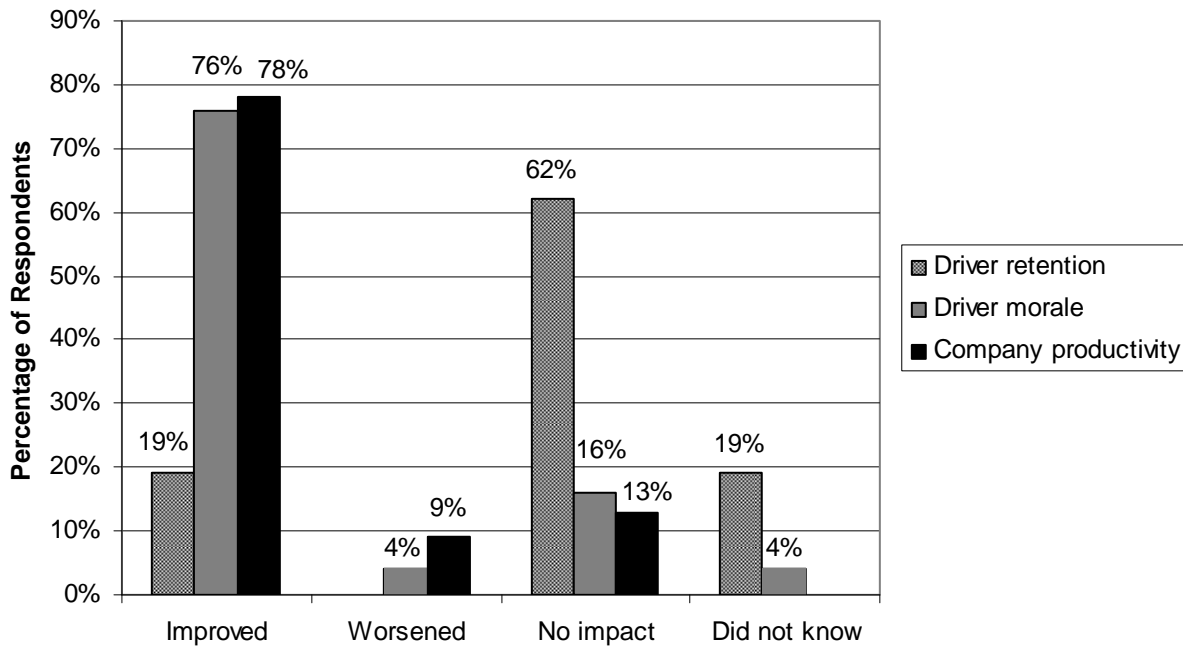


FIGURE 5. Specific impacts realized by motor carrier users.

User System Assessment

User respondents were given the opportunity to share specific likes and dislikes about the EOBR systems used. The EOBR attributes that motor carriers liked were fairly consistent across the respondents. The ease of regulatory compliance and the reduced administrative burden associated with EOBR use were chosen by motor carriers as positive features. Motor carriers also liked logistical benefits that ensued from EOBR use. Specifically, motor carriers mentioned vehicle tracking associated with wireless EOBR devices and improved coordination between drivers and loads to ensure that drivers had enough hours to make assigned deliveries.

Dislikes were less consistent across user respondents and were mostly technical in nature. Several respondents mentioned frustration with EOBR system crashes and cumbersome software upgrade procedures that had to be completed vehicle-by-vehicle. Another dislike was the lack of flexibility when recording a drivers' HOS; with paper logs, drivers round to the nearest 15 minutes, so there is some built-in flexibility. When using EOBRs, as soon as a driver is one minute over his or her allowable driving time, it is recorded as a violation. Some respondents also referred to disadvantages when competing with motor carriers not using EOBRs and overcoming initial driver resistance.

EOBR Technical Attributes

Finally, carrier users were asked about the technical functionalities of the EOBR systems used. Nearly all (92%) of the respondents used EOBR systems with GPS capability. User IDs and passwords were the most common method used to identify drivers (81%) followed by smart cards (8%). Carriers were asked where the driver Record of Duty Status was stored; 58 percent responded that records were stored via an on-board computer and 58 percent separately responded that records were stored at the trucking company facility. Although some carriers use multiple techniques to store data, there does not appear to be a strong preference between storing data on-board and at trucking company facilities. Thirty-one percent said the record was stored at an outside vendor data storage system.

Over half (54%) of the respondents transmitted HOS data from the truck to the company facility via satellite or terrestrial uploads and an additional 27 percent used short-range, wireless transmissions (see Figure 6). Carriers were also queried on how data uploading was initiated. Forty-four percent responded that the data could be automatically uploaded at a time specified by the carrier and 40 percent responded that the data could be manually uploaded by the driver. Twenty percent responded that the data could be manually uploaded by company facility administrators and 16 percent said that the data could be automatically uploaded in real-time (see Figure 7). Ninety-six percent of respondents said that their current system was upgradeable; of these, 100 percent said the software could be upgraded and 42 percent said the CPU or processor could be updated.

HOS Data Transmission by Motor Carrier Users

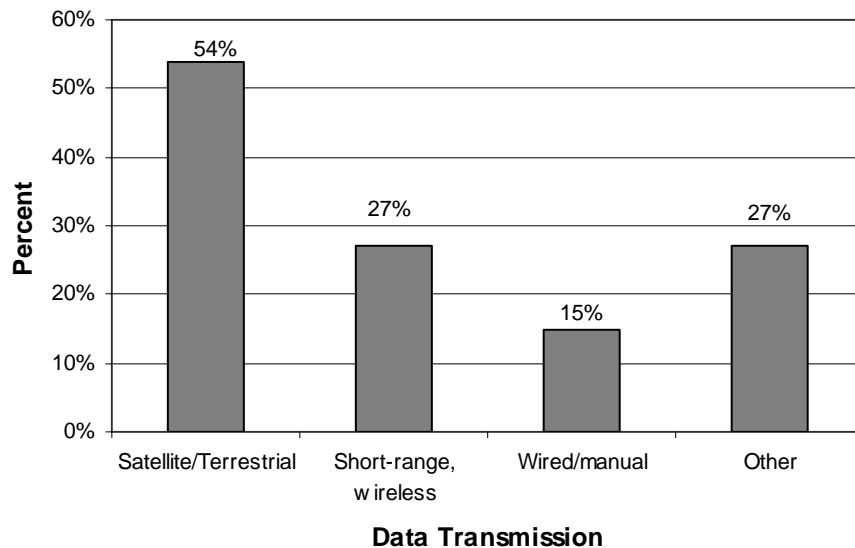


FIGURE 6. HOS data transmission methods used by motor carriers.

HOS Data Upload by Motor Carrier Users

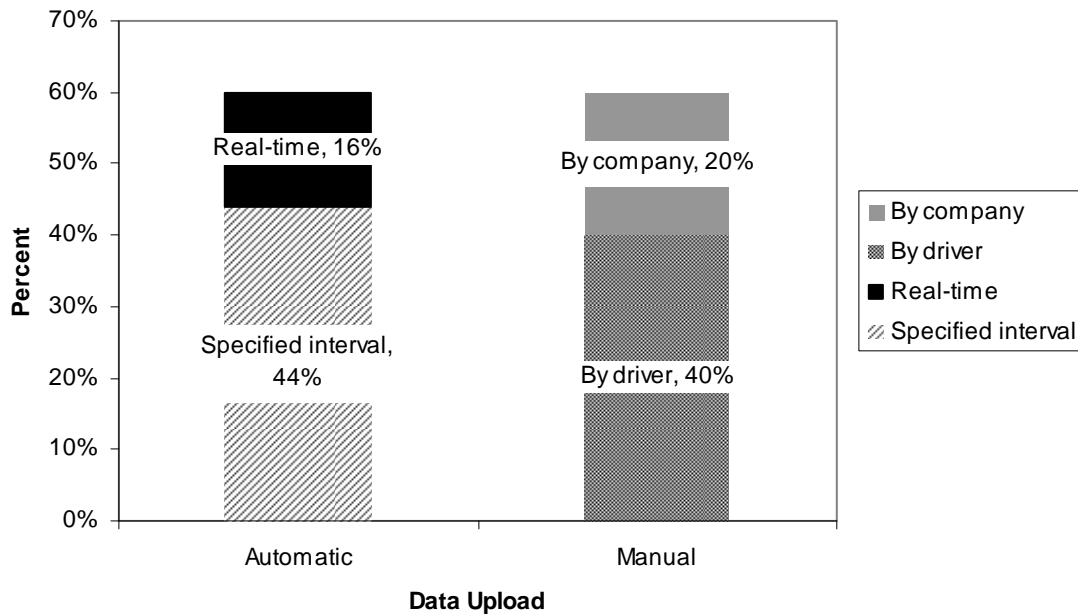


FIGURE 7. HOS data upload methods used by motor carriers.

EOBR Non-User Respondents

Respondent Demographics

A total of 122 carriers that do not use EOBRs for HOS tracking completed surveys. The breakdown of fleet type is shown in Table 6.

TABLE 6: EOBR non-user survey respondents by fleet type.

Type of Carrier	Number	Percentage
Private	17	14%
Truckload	80	66%
Less-than-Truckload	22	18%
Owner-Operator	26	21%
Other	5	4%

Two-thirds of the non-user respondents were truckload carriers with the remaining respondents being fairly evenly distributed among private carriers, LTL carriers, and owner-operators. The average fleet consisted of 860 vehicles, with fleet size ranging from 1 to 20,000. The mean number of drivers EOBR non-users employed was 1,061 drivers; the actual number of drivers range from 1 to 23,000.

Non-User HOS Tracking

Carrier non-users documented the methods utilized to manage HOS records. Ninety-two percent of non-users utilize paper logs in 50 percent or more of fleet vehicles and over 67 percent of the motor carrier non-users utilize paper logs to track driver HOS in all fleet vehicles. Time cards were the other main form of HOS tracking used by carriers. Thirteen percent use time cards in 50 percent or more of fleet vehicles, and six percent use time cards in all fleet vehicles. As a result of carriers utilizing multiple methods to monitor HOS, percentages do not sum to 100. However, no one respondent's HOS compliance method(s) totaled less than 100 percent.

Reasons for Not Using EOBRs

Carriers were asked to provide the primary reasons for not using EOBRs. Each respondent was instructed to rank up to three reasons. Almost two-thirds (64%) of respondents selected "cost" as a primary reason for not using EOBRs. The other leading reasons selected were:

- Currently in compliance with HOS rules (24%);
- Concerned over data privacy/ownership/security (22%);
- Concerned over EOBR impacts on driver retention (22%); and
- No government mandate (20%).

Other reasons selected by a smaller percentage included driver privacy concerns (14%), unfamiliarity with the technology (14%), productivity loss that will result from strict compliance with HOS rules (10%) and the administrative burden associated with converting to EOBRs (7%).

EOBR Costs

Motor carriers were asked about additional features which might be of interest should the use of EOBRs for HOS record-keeping be mandated. Almost two-thirds (63%) selected management of IFTA regulations. Over half of the respondents selected real-time vehicle communication and management (56%), vehicle operations cost management (54%), and engine/vehicle maintenance management (53%). Business management functions were selected by 36 percent of respondents. The average carrier that responded to this question selected three additional features.

The type of carrier responding had statistically significant correlations to the type of additional functions in which a preference was indicated. Compared to other carriers, owner-operators were less likely to want vehicle operating cost management, business management or real-time vehicle communication and management functions. Private fleets were more likely to want IFTA regulatory compliance functions, and truckload carriers were more likely to want real-time vehicle communication functions.

The motor carrier non-users were asked to indicate a reasonable price for basic EOBR units and enhanced EOBR units with the functionalities selected in the previous question. These carriers were then asked to indicate reasonable monthly maintenance costs for both basic and enhanced units. Figures 8 and 9 illustrate the differences in the average prices reported by each fleet type.

Average Reasonable Purchase Prices Reported by Motor Carrier Non-Users

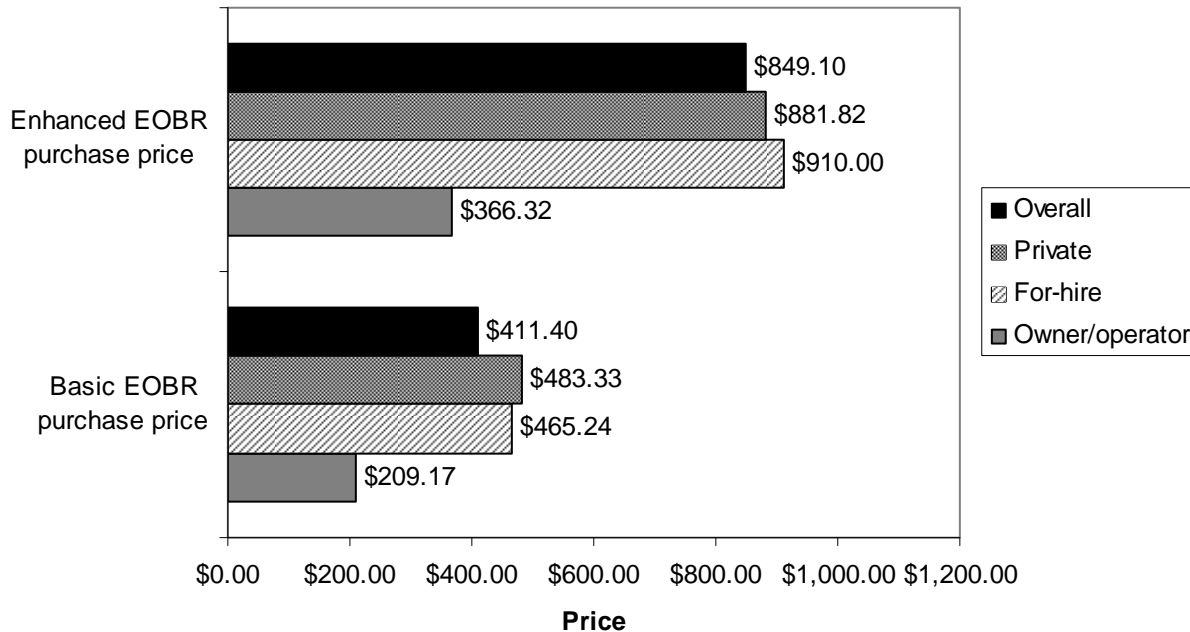


FIGURE 8. Average reasonable purchase price reported by non-users by carrier type.

Average Reasonable Monthly Maintenance Costs Reported by Motor Carrier Non-Users

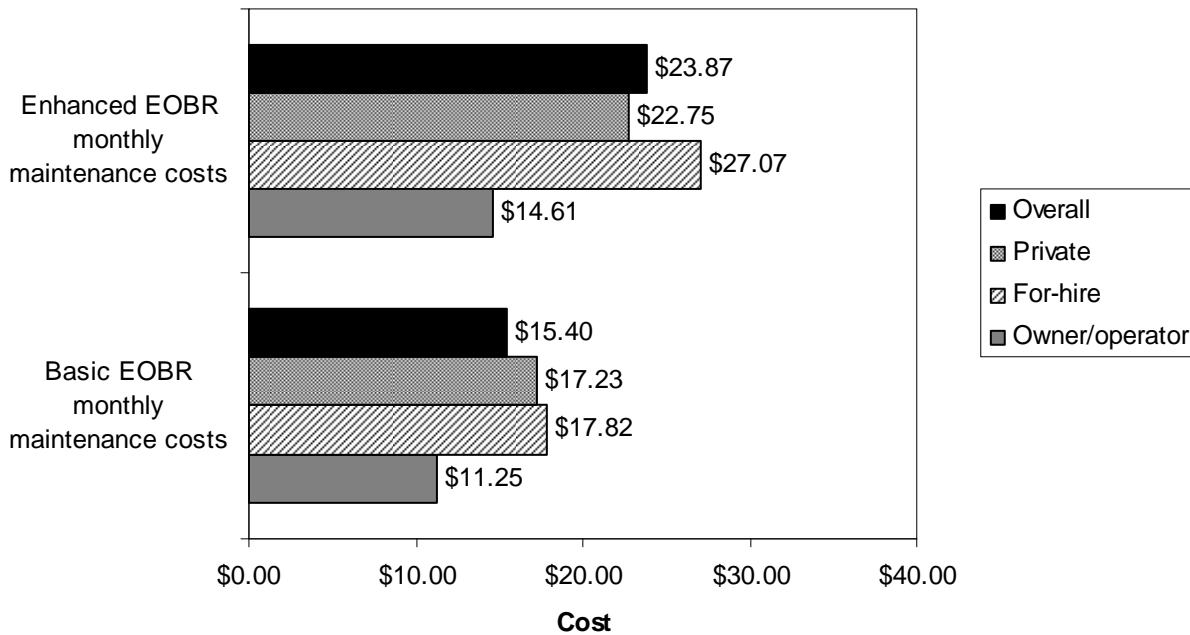


FIGURE 9. Average reasonable maintenance costs reported by non-users broken down by carrier type.

For an EOBR that solely records HOS information, owner-operators reported an average reasonable per unit price of \$209.17 while the averages reported by for-hire and private carriers were considerably higher. The average reasonable price for all carriers was \$411.40. When asked about a reasonable price for an EOBR with the additional functions proposed, the average response from owner-operators was \$366.32, while the overall average was \$849.10. Carriers were asked a similar question about a reasonable average monthly maintenance cost. Again, the reasonable price proposed by owner-operators was much lower than the prices proposed by all other fleet types. The average maintenance price submitted by owner-operators was \$11.25 for a basic unit compared to an average of \$15.40 by all carriers. For an EOBR with additional functions, the average monthly maintenance cost given by owner-operators was \$14.61 compared to \$23.87^{††} for all carriers.

Finally, non-users were asked how devices should be paid for in the event of an EOBR mandate. Over half (53%) said that the government should implement new tax credit programs to cover the costs. Thirty-eight percent responded that the government

^{††} This figure includes 2 carrier responses that submitted ostensibly annualized figures; thus the responses were divided by a 12-month time period and incorporated into the processing as such.

should provide the devices free of charge and 19 percent said that motor carriers should cover the costs.

EOBR Data

The last carrier question related to appropriate uses of data collected by EOBRs. A large majority (88%) selected motor carrier driver management as an appropriate use of data. Just over half (54%) responded that it would be appropriate to use EOBR data for public sector regulatory enforcement and 17 percent selected actuarial and research analysis for insurance purposes as an appropriate use of data.

EOBR Vendors

Product Purpose

Twelve vendors completed surveys. Vendors were initially asked to identify the top two (“primary”) purposes of the product being offered. Nine responded that HOS compliance was the primary purpose followed by tax and fee regulation compliance (50%). Real-time vehicle communication and management and vehicle operating cost management were each selected by 40 percent of the respondents as the primary function, with business management functions selected by 30 percent, and engine or vehicle maintenance management selected by 20 percent.

When asked about the information actively selected/collected by the EOBRs, 82 percent chose driver HOS. Vehicle status/use was selected by 92 percent of respondents. Tax and regulatory fee compliance and vehicle location were each selected by 75 percent of respondents, and engine operating parameters and communication were each selected by 67 percent.

EOBR Cost

Vendors were asked to identify the price range for the product offered. A third (33%) of the respondents indicated costs of less than \$500, 25 percent indicated costs between \$500 and \$1,000, 17 percent indicated costs between \$1,000 and \$1,500, and 25 percent indicated costs greater than \$1,500 (see Figure 10).

EOBR Vendor Price Ranges

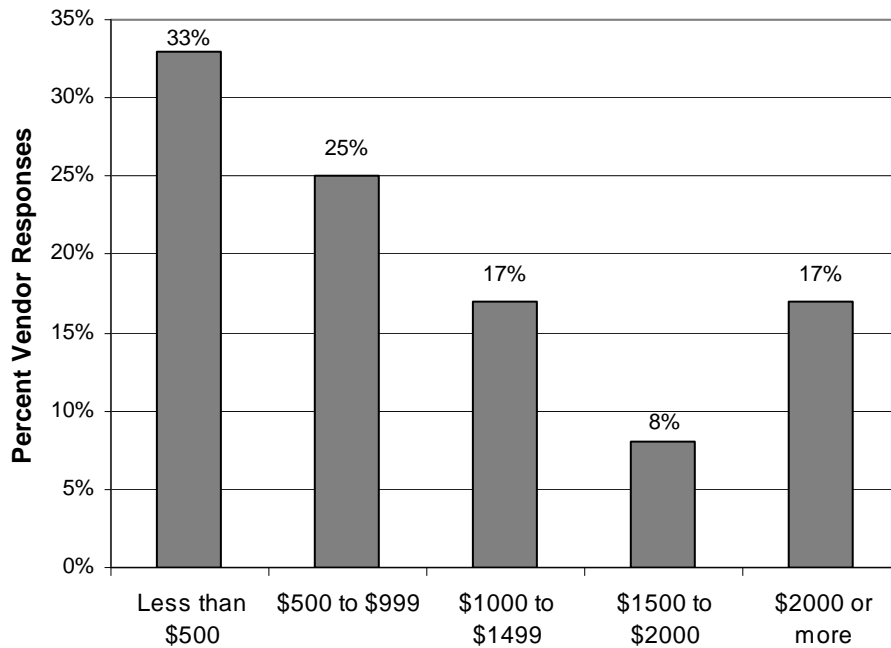


FIGURE 10. Per unit purchase prices indicated by EOBR vendors.

Technical Attributes

Vendors were asked a series of questions relating to specific product functionalities, including:

- Specific EOBR recording capabilities;
- Data recorded by the EOBR;
- Ability to make corrections to the data recorded;
- Duty status options;
- Driver identification techniques;
- HOS data storage;
- Data transmission processes; and
- Data security and accessibility.

The questions and responses are summarized in Appendix D.

Overall Survey Summary

Non-users referenced cost issues and driver retention concerns as two major reasons for not using EOBRs. However, the users did not experience quantifiable reductions in

driver retention as a result of EOBR use. Non-users were asked to propose reasonable prices for the devices if mandated, and the average response was \$411.40 for a basic unit that just recorded HOS. The vendor surveys revealed that there are products available near this price, but these units do not appear to have much market penetration. Only two current users reported paying less than \$500 per unit.

Furthermore, there is a clear difference between the data storage options offered by vendors and the methods used by motor carriers, as indicated in Table 7. A much higher percentage of vendors offer storage services, data storage on portable devices and on-board computer storage options as primary data storage solutions than there are motor carriers that primarily use these options. In contrast, a greater percentage of motor carrier users rely primarily on storing data at the trucking facilities than there are vendors that offer those options. These observations cannot be used to draw any conclusions regarding product market penetration because vendors and users were allowed to select multiple primary options. It is likely that many vendors offer a number of options and motor carriers choose the option that best meets company needs.

TABLE 7: Data storage options provided by vendors compared to options used by carriers.

Data Storage Options	Provided by Vendors	Used by Motor Carriers
On-board computer	73%	58%
Portable device	55%	8%
Trucking company facility	45%	58%
Outside vendor data storage system	55%	31%
Other	0%	4%

Non-users also referenced data privacy issues as a major concern. One hundred percent of vendors responded that data was or could be encrypted during transfer and 73 percent responded that data was or could be encrypted/protected during storage. Data privacy and ownership cannot be addressed at the technical level (e.g. DES encryption levels and access/firewall protocols) by this research, but should be considered in any future rulemaking to resolve the concerns raised by drivers and carriers.

Interviews

Follow-up interviews were conducted to provide additional qualitative insight into the survey findings.

EOBR User Respondents

Reasons for Using EOBRs

Four motor carrier users were interviewed as a follow-up to the surveys. Respondents consisted of truckload carriers, two of which were in the testing phase and had EOBRs installed on less than 2 percent of fleet trucks, and one private carrier. The fleet sizes of the carriers interviewed ranged from 80 vehicles to nearly 9,000 vehicles. The truckload and private carriers with devices installed on all fleet vehicles indicated adopting the technology primarily for HOS regulatory compliance; driver management was a secondary reason. One of the fleets that is in the testing phase responded that the top reason for investigating the technology was to understand the safety benefits, followed by driver management benefits, regulatory compliance, and finally reductions in administrative costs. Both companies that are testing the EOBRs indicated a desire to have some experience with the devices in the event of a mandate.

EOBR Cost / Price

The motor carrier users were asked to provide costs associated with the systems currently used. However, two of the carriers had non-disclosure agreements with the product vendors and were unable to discuss this information. Two other carriers did not discuss explicit cost information, but did describe the systems used. Both of these carriers used systems provided by the same vendor, and although this vendor was interviewed, specific product cost information was not provided.

Only one of the carriers was able to provide a methodology for measuring return on investment (ROI). This carrier incorporated driver-time utilization, back office administrative time, time spent on regulatory compliance and system ease of use to determine ROI. This carrier did not include a safety ROI for two primary reasons: 1) only two percent of the fleet had EOBR installations, and 2) the carrier did not believe that a legitimate EOBR-safety nexus could be created from the data available.

User System Assessment

Three motor carriers discussed EOBR likes and dislikes. Two carriers highlighted regulatory compliance benefits, such as alerts that indicate when drivers have exceeded pre-set thresholds and real-time communication of accurate HOS information. Another carrier reiterated strong opinions in favor of the real-time accessibility and availability of information provided by EOBRs. One of the carriers also mentioned the logistical benefits offered by EOBRs, and that the devices make it easier to coordinate drivers

and loads. The only complaint mentioned was that the system could not verify that drivers were actually on-duty, off-duty or sleeping when indicated.

EOBR Safety Impacts

Motor carrier users were asked how effective EOBRs were at improving safety. Generally carriers appeared uncomfortable or unprepared to answer this question specifically; only two carriers offered direct responses. One carrier responded that EOBRs are very effective improving safety, while the other responded that, “compliance aside,” the ability of EOBRs to improve safety presupposes that the HOS rules improve safety. This particular carrier felt that the driver should be able to determine when he or she was tired and needed rest.

EOBR Mandate

Not surprisingly, opinions about an EOBR mandate ranged from being completely in favor to completely opposed. One of the carriers said it would depend on what the mandate entailed. Another carrier said that it was opposed to a mandate because of the potential for the information collected to be used against drivers. A third carrier said that a mandate would be acceptable as long as it applied to all carriers in order to maintain a level playing field.

Three of the four carriers referenced system costs, especially for small carriers and owner-operators, as a major challenge to implementing an EOBR mandate. Other concerns mentioned included the amount of time motor carriers were given to install and train on the new technology, and establishing standards and consistency across the available technologies. The major benefits proposed included the establishment of a level playing field, improved compliance with HOS, improved safety, and improved productivity. While only one carrier believed safety would be a direct benefit, several carriers implied that an EOBR mandate may force “marginal” carriers out of the industry.

EOBR Non-Users Respondents

The six carrier non-users interviewed covered truckload, LTL, agricultural and specialized carriers; no private carrier non-users were interviewed. The fleet sizes of the carriers range from 28 vehicles to over 12,000 vehicles.

Reasons for Not Using EOBRs

The responses varied significantly among the carriers interviewed. Typical responses provided for not using EOBRs included: cost; the belief that drivers are currently operating in compliance with the HOS rules; the need to focus more on passenger vehicle drivers than commercial vehicle drivers; concerns about productivity impacts; driver retention; and uncertainty surrounding the details of a possible mandate. The two predominately LTL carriers varied in fleet size from 350 vehicles to 7,000 vehicles. Both

of these carriers indicated not using EOBRs for HOS tracking due to the nature of LTL operations – drivers drive scheduled routes, are able to return home every night, and are generally not in situations where the choice has to be made between completing a delivery and resting.

Neither of the LTL carriers thought that EOBRs were very effective at improving safety. When asked to rate the effectiveness of EOBRs at improving safety on a scale of 1 to 10 (1 being not at all effective, 10 being very effective), one LTL carrier gave a rating of 1 and the other gave a rating of 2; both responded that this was essentially due to the nature of the LTL sector. One of the two LTL carriers said that EOBRs would be more effective at improving safety for over-the-road drivers.

Of the remaining TL carriers interviewed, 75 percent indicated that while there were positive aspects to EOBR use, EOBRs would not be deployed until a mandate was in place. Justifications included the fact that, without a mandate, carriers who invested in EOBRs would be at a competitive disadvantage to those who chose not to make the investment. These same carriers also ranked the effectiveness of EOBRs at improving safety much higher than the LTL carriers, giving an average rating of 7. A different reason provided for not using EOBRs at this time was concern about investing in an early system with uncertainty over what a mandate might require; carriers are concerned about investing in a system that may not meet government requirements. Seventy-five percent of TL carriers indicated that an EOBR mandate could have positive outcomes (includes compliance) for the industry as long as it was mandated across the board for all truckload carriers.

The last non-user carrier interviewee was a small fleet that relies exclusively on owner-operators to deliver goods. Although this carrier was firmly opposed to an EOBR mandate, it did respond that one of the benefits would be consistency in enforcement across all the states; however, the carrier did not believe EOBRs were effective at improving safety.

Additional Features

The carriers were asked about additional functionalities that would make EOBRs more appealing. Two of the carriers responded that there were no additional functionalities of interest. The remaining four carriers indicated an interest in a variety of other functionalities including IFTA monitoring, fuel management, load assignments and other capabilities that would improve the overall efficiency of business processes.

EOBR Cost

Carriers were asked about reasonable unit prices for basic EOBRs that solely recorded HOS, as well as reasonable prices for EOBRs with the additional functionalities in which carriers are interested. Reasonable per-unit purchase prices for a basic EOBR ranged from \$0 (for the small truckload carrier that was opposed to a mandate and saw no

general value in the devices) to \$1,000, and the reasonable prices for an enhanced EOBR ranged from \$0 (again for the small truckload carrier that saw no incremental value in the additional capabilities) to \$2,000. Additional questions were asked regarding reasonable monthly wireless fees (if applicable) and monthly maintenance costs. For a basic system, the total range motor carriers gave for a monthly wireless fee was \$0 to \$15, and the range for an enhanced system was also \$0 to \$15. Only one of the motor carriers increased the reasonable monthly wireless fee to factor in additional functionalities. Finally, carriers were asked about a reasonable average monthly maintenance cost. Only two carriers responded to this question with one response varying from \$0.40 per truck (\$5,000 for the entire fleet) for a basic EOBR to \$0.80 per truck (\$10,000 for the entire fleet) for an enhanced EOBR. The second respondent proposed \$100 annually per truck for both a basic and enhanced system.

EOBR Data

The carriers were then asked about appropriate and inappropriate uses of the data collected by EOBRs. Three of the six carriers responded that litigation was an inappropriate use and no other inappropriate uses were discussed by any of the carriers interviewed. Interestingly, five of the vendors answered this question and indicated that internal use of the data (for compliance and management purposes) and enforcement were appropriate uses of the data. One of these vendors indicated that litigation was also an appropriate use of the data.

EOBR Mandate

Finally, the motor carriers were asked about the benefits and challenges associated with an EOBR mandate. All but one of the carriers responded that an EOBR mandate would likely result in improved compliance^{††} with HOS rules. The only benefit mentioned by the last carrier was that it would ensure consistent enforcement among all the states. However, the two LTL carriers both added that the mandate would have to include enough flexibility to account for different types of carrier operations. Other challenges that were mentioned included cost concerns with EOBR products, compatibility with existing on-board technologies, driver training, the amount of time the mandate provides to adopt the new systems, driver acceptance and managing strict enforcement of HOS in relation to other challenges like truck parking shortages and congestion.

EOBR Vendors

Current EOBR Use

Six EOBR vendor follow-up interviews were conducted. Four of the vendors were willing to provide information regarding product market share, which ranged from 30,000

^{††} Although several carriers reiterated that HOS compliance may not necessarily lead to improved safety.

to 50,000 units. The ATA Technology and Maintenance Council estimates that there are over 100,000 total units currently in use¹¹. Each vendor was asked to rank the top three reasons driving sales to carriers. Of the five vendors that answered this question, two listed HOS compliance in the top three, but only one (the vendor with the most basic system) responded that HOS compliance was the number one reason. This was also the only vendor to choose safety as a primary reason why carriers purchased the product. Fuel cost management and compliance with fuel tax regulations (IFTA) were both frequently cited in the top three reasons, along with business productivity benefits.

EOBR System Functionalities

Of the vendors interviewed, the most basic EOBR system monitored HOS, vehicle speed, engine RPM, and vehicle location via GPS. The more advanced systems included a number of additional functionalities such as IFTA management, fuel management, event data recording such as hard braking or sudden accelerations, and vehicle diagnostics. Of the four vendors that provided more detailed cost information, the per-unit purchase prices for the EOBR systems ranged from \$500 to \$2,500 depending on product functionalities. Although not included in this series of interviews, other vendors have indicated that basic HOS EOBRs could be purchased for as little as \$300. The vendor-provided costs associated with wireless subscription fees (as applicable) ranged from \$15 to \$50 (in comparison, 75 percent of motor carrier users that responded to that survey question estimated monthly maintenance costs to be \$40 or less for the HOS function). Three of the four vendors indicated that maintenance costs would be minimal, and the fourth vendor indicated not charging for maintenance, and providing free software updates. The highest cost given was \$40 per vehicle per year for preventative maintenance.

Relating to driver identification, four vendors answered these questions and indicated using a variety of techniques. Two of the vendors use identification codes and passwords to identify drivers. One of the vendors uses a code key with remote identification, and the fourth vendor relies primarily on drivers being assigned to a specific vehicle. To manage team drivers, this vendor also provides each driver with a unique log-in ID. Three of the four interviewed vendors provide encrypted data during wireless transfer; the fourth vendor relies on the proprietary nature of the system to prevent outside access to data. To protect information during storage, vendors rely on firewalls, password protection and proprietary security measures.

Marketing Challenges

Four vendors described a number of challenges experienced in marketing systems to carriers. One vendor noted that there were fewer challenges marketing to private carriers, but the for-hire sector was more reluctant to invest in EOBR technologies. The cost of the system was highlighted as a major deterrent, although one vendor noted that the savings carriers experienced in fuel economy alone (provided the system includes fuel management functions) would more than cover the initial investment. Another

vendor described reluctance by carriers to deploy EOBRs until a mandate is issued and its requirements understood. Another vendor responded that with very few exceptions, no large, for-hire fleets had adopted the technology and the smaller fleets look for the larger fleets to set the precedent^{§§}.

EOBR Mandate

Somewhat surprisingly, not all of the vendors were in favor of an EOBR mandate. However, all the vendors could provide a list of benefits that might accrue from a mandate, including easier compliance, improved enforcement and the creation of a level the playing field by making it more difficult for drivers and carriers to skirt the HOS rules. Of the two vendors that were clearly opposed to a mandate, the reasons included technical challenges that need to be resolved, the potential third-party establishment needed to inspect or validate systems to ensure proper operation and a lack of proven safety benefits. The challenges that vendors described included the need for clear standards, high adoption costs for the industry, overcoming negative driver reactions to the systems, and developing an effective method for relaying information for roadside inspections.

Overall Interview Summary

Opinions regarding EOBRs and a possible mandate vary greatly among carriers and vendors. Fleet sector and size have a clear impact on a carrier's perception of EOBRs. Surprisingly, the large truckload carriers that did not currently use EOBRs seemed to view a possible mandate more favorably than the TL users that were currently using or testing EOBR systems^{***}. Overall, there were affordable systems that met most of the medium to large non-users' criteria for having a reasonable price. Any actual monthly wireless subscription fees were higher than what motor carriers thought was reasonable, but the maintenance costs were generally lower. The price and cost data collected in both the surveys and the interviews are summarized in Table 8.

^{§§} This finding is validated by the ATRI/Gartner G2 Trucking Technology Surveys conducted in 2003 and 2005. These surveys found that as new technologies are introduced into the marketplace, the larger companies are the first to adopt them. However, as time progresses, the percentage of medium and small carriers adopting the technologies continues to increase, often exceeding the percentage of large fleets with the technologies.

^{***} While TL non-users may not overtly support a mandate, they were more consistent (100% provided at least one or more possible mandate benefits) in asserting mandate benefits. This effect declined with the inclusion of non-TL respondents.

TABLE 8: A summary of the cost and price information collected in the surveys and interviews.

	Non-Users (Reported Reasonable Price)		Users (Actual Price Paid)		Vendors	
	Surveys	Interviews	Surveys	Interviews	Surveys	Interviews
Cost per Truck						
Purchase Price	\$411.40 (basic) \$849.10 (enhanced)	\$440 (basic) \$840 (enhanced)	\$1,509.26 ^{†††}	Could not provide information	\$958.33 ^{†††}	\$1,400.00
Monthly Maintenance Price	\$15.40 (basic) \$23.87 (enhanced)	\$4.45	\$21.41	Could not provide information	N/A	Minimal
Monthly Wireless Subscription Fees	N/A	\$11.33	\$33.71	Could not provide information	N/A	\$40.13

^{†††} This average was determined by using the midpoint of the range selected by the respondent on the surveys. For the respondents that selected “\$2,000 or more,” \$2,000 was used to determine this average. Therefore, the actual average may be higher than the one reported here.

^{†††} This average was determined by using the midpoint of the range selected by the respondent on the surveys. For the respondents that selected “\$2,000 or more,” \$2,000 was used to determine this average. Therefore, the actual average may be higher than the one reported here.

Section 4 Findings and Recommendations

Research Summary

The ATRI research primarily focused on EOBR characteristics, functionalities, and usage benefits and concerns. It did not attempt to develop new analyses on the role of EOBRs in managing fatigue or relating EOBRs to safety metrics or empirical outcomes. Even so, numerous participants and respondents cited the need for further documentation and justification of the relationship between EOBRs and safety. As such, there is a significant need for, and interest in, research that scientifically documents the linear relationship between EOBRs, compliance, fatigue and safety.

However, the research does provide some important insight into opportunities and challenges associated with voluntary and mandatory usage of EOBRs.

General findings, described in specific sections below, include:

- The impact of EOBRs by carrier users on driver retention and morale was far more positive than the impact perceived by EOBR non-users.
- EOBR usage is typically rationalized as a compliance tool by both users and non-users, rather than a safety management system.
- Almost all carriers, including those opposed to an EOBR mandate, can articulate potential benefits from an EOBR mandate.
- Cost, privacy and the lack of a safety nexus are the primary barriers to industry support of EOBR usage and mandates.
- In analyzing data provided by carrier users, non-users and system vendors, EOBR system costs appear to be disjointed in terms of reasonable vs. expended vs. published system costs.
- Existing EOBR pricing levels, using both reasonable and published costs, generally exceed small carriers' and owner-operators' financial abilities and expectations.
- Carriers generally believe that EOBR mandate requirements may be flexible across sectors, but must be standard within sectors to ensure uniformity and a "level playing field." Nevertheless, different fleet sizes will likely experience different financial impacts from an EOBR mandate.
- Vendors and carriers alike are concerned about the lack of EOBR standards and uniform practices. Some version of technical and functional standards – possibly the ATA Technology & Maintenance Council's emerging EOBR "recommended practices" – should be included in the mandate requirements rather than as a response to the rulemaking. Approaches and processes to inspect EOBRs are needed to ensure they are functioning correctly and within the specifications of the regulations. Should a mandate be implemented, a system may be needed to validate the proper functioning of the system since carriers will be held responsible for the information recorded.

- Carriers are extremely concerned about standardized EOBR enforcement of HOS compliance as well as data access for non-compliance purposes.

EOBR Cost

Finding:

Although cost was a top concern for motor carriers, affordable systems (as defined by carrier expectations) are currently available for medium to large carriers, with more expected to enter the marketplace. There does appear to be a series of disconnects between “reasonable” prices listed by non-users (by fleet size), prices paid by users, and vendor-published prices. Most carriers that currently use EOBRs paid more than \$1,000 per unit. Interestingly, 33 percent of the vendors that responded to the online survey indicated that their EOBR product cost less than \$500. However, only 6.9 percent of current users reported paying \$500 or less. The average reasonable price reported by non-users was \$411.40; for owner-operators, the average reasonable price reported was \$209.17. Vendors indicated during the interviews and informal discussions that several EOBR products could be available for as low as \$300.

It appears that the vendor community may not yet be fully geared towards developing reasonably priced systems in advance of an EOBR mandate.

Recommendations:

- Both vendors and carriers recognize that cost is a major challenge to an EOBR mandate, especially for small carriers and owner-operators. Opportunities for direct or indirect financial assistance would help allay cost issues. Without such tools, small carriers and owner-operators are likely to suffer considerable negative impacts. The feasibility of government subsidies, block purchase discounts and tax credits should all be evaluated.
- Research needs to be conducted on both the direct and societal costs and benefits of an EOBR mandate. Cost savings that may accrue from improved safety resulting from reductions in fatigue-related accidents as well as enforcement time savings could potentially provide the basis for public financial assistance. This appears to be particularly compelling to small carriers and owner-operators.
- There is a current lack of available information on the actual costs of a minimally compliant EOBR. The trucking industry should work with EOBR vendors to educate carriers on the options available and the realistic costs of the various products available.

Driver Retention/Industry Adoption

Finding:

There is a clear disconnect between the perceived impacts EOBRs will have on driver retention (by non-users) and the actual impacts experienced by current users. Driver retention was mentioned as a major concern by 22 percent of the non-users in the

surveys and by two carriers during the interviews. The experience of carriers that use EOBRs, however, has shown that there are no major negative impacts on driver retention when EOBRs are used. In fact, 81 percent of carriers using EOBRs did not experience negative impacts on driver retention from the use of EOBRs, and 19 percent believed it actually improved driver retention.

Recommendations:

- The trucking industry, technology vendors and government should develop driver-oriented training programs and informational materials to educate carriers and drivers on the real impacts of EOBRs to relieve unsubstantiated concerns.
- There is a lack of robust empirical data on the impact of EOBRs on small carriers and owner-operators since very few have deployed the devices. More research is needed to understand the impact an EOBR mandate will have on trucking industry business failures and the requisite impact on capacity.

Market Options

Finding:

While HOS compliance is similarly ranked as a primary objective by carriers and vendors, mutual expectations decrease considerably on price, data management, standards and other functionalities. This likely arises from the minimal market demand for pre-mandate EOBRs, and concern and confusion over what may, or may not, be mandated in the future.

Recommendation:

Vendors should work with carriers and FMCSA to document, design and test EOBR systems that meet industry requirements for cost, functionality, maintenance, data privacy and technical standards. Additional outreach opportunities need to be developed to ensure that all interested stakeholders have the opportunity to provide input. Moderated, web-based forums and discussion groups could potentially provide ample opportunities to submit and receive feedback.

Sector Differences

Finding:

Neither LTL nor TL carriers felt that EOBRs would be beneficial to all operational scenarios since courier and short-haul LTL drivers, as an example, make regularly scheduled runs and are able to return home every night. On the other hand, it is important that a level playing field is developed to the greatest degree given the intense capital investment that would be needed to deploy EOBR systems fleet-wide.

Recommendation:

A mandate should analytically consider the operational characteristics of different sectors of carriers and the requisite impacts on safety outcomes. However, no one group should be economically disadvantaged to the degree that the marketplace is

reshaped by the mandate. Ultimately what is needed is a large-scale study that causally (correlationally at minimum) links the relationship of fatigue to safety, and the successful management thereof by HOS regulations. At that point it becomes more apparent to concerned carriers that EOBRs would be a meaningful safety monitoring tool, assuming the technical and functional issues such as positive driver ID are resolved.

Limitations in Current Technology

Finding:

Vendors and carriers both discussed the need to establish standards, consistency and interoperability among systems before EOBRs could feasibly be mandated.

Recommendations:

- EOBR standards need to be developed prior to a mandate. The ATA Technology and Maintenance Council has compiled an EOBR Task Force to develop Recommended Practices for EOBR devices that would serve as a voluntary industry standard. Although a working draft of the Recommended Practices (RP) has been composed, the Task Force is currently waiting for the NPRM to be released before completing work on the RP document.
- Enforcement and inspection strategies also need to be developed prior to a mandate. Based on interviews, there does not appear to be a clear understanding or approach for accessing and/or enforcing EOBR-oriented HOS compliance. From an enforcement agency standpoint, issues exist with data access, data uniformity and standards, electronic data privacy laws, personnel training and potential acquisition issues for technology hardware (for electronic data access and storage).

Data Privacy & Security

Finding:

One of the concerns frequently referenced in the motor carrier non-user interviews was that data collected could be used against drivers and carriers in litigation. Motor carriers were reluctant to support a mandate that would require the collection of information that could be used against them regardless of negligence. One carrier stated that “he who holds the data, loses.” A leading cause or basis of this concern is state tort law that separates – dramatically in some instances – negligence from financial liability. Data security was a leading concern among non-users, and while all of the participating vendors ensured that data was encrypted during transfer and protected during storage, a legal request for stored data would usurp this “data integrity” and require the release of targeted data into the public domain.

Recommendation:

A mandate should only require the collection of the minimum information needed to accurately confirm driver identification and HOS status. Carriers and vendors should

work together to ensure that any other data collected is only accessible by the motor carrier.

Section 5 Implications for Deployment

A synthesis of the ATRI research components determined that there is still considerable confusion and disagreement regarding EOBRs. Clarification of what an EOBR is and what it records, documentation of actual system costs and the real impacts on driver retention will help relieve the concerns of many carriers. In part, the lack of accurate information has left many drivers, individuals and carriers fearing the worst. The real impacts of EOBRs on productivity and driver retention seem to be much less severe than the anticipated impacts. Despite the misunderstandings, there are genuine concerns over the ability of small carriers and owner-operators to afford even the most basic systems – a substantive issue that must be considered before a mandate is adopted. Lastly, there is little to no research on the consequential relationship between EOBRs, HOS, fatigue and safety. Such research would likely and dramatically increase acceptance of EOBRs.

As was the case with the UMTRI research, ATRI was not able to document the specific benefit-cost ratio for EOBRs for HOS recording because most carriers that have EOBRs use them for a number of additional purposes. For large carriers, there appear to be significant benefits that can be realized; EOBR usage is associated with reductions in administrative and compliance costs, real-time communication between drivers and dispatchers and some improved coordination of drivers and loads. However, the improvement in compliance with HOS regulations alone does not directly transfer to productivity improvements in motor carrier operations and smaller carriers and owner-operators appear to have little or no need for the additional functionalities. One vendor mentioned that the savings a carrier will experience using the fuel management function will more than cover the cost of the system. This still offers little insight into the actual benefit of the HOS functions for carriers, but incorporating non-HOS functions that will have clear benefits for small carriers as well as large carriers will help make the systems more appealing.

There is also concern regarding the feasibility of a mandate based on the technologies that are currently available. One of the major benefits that would result from an EOBR mandate is that the playing field will effectively be level across impacted sectors. For this benefit to be realized, all EOBR systems must collect information in a consistent manner. Although there are some specifications that EOBRs must currently meet, the standards are not adequately developed to ensure complete consistency across the various products currently available. Additionally, the discovery and exploitation of loopholes in HOS record-keeping capabilities could overwhelm the benefits EOBRs may provide, resulting in nothing more than the automated documentation of inaccurate information.

Furthermore, EOBRs will only be effective at improving safety for the motor carrier industry if the HOS rules are relevant to safety and operational objectives. One of the concerns raised in the docket analysis that should be addressed prior to a mandate is

the possible safety-mitigating impacts that may result from drivers and/or carriers trying to “beat the clock” to maintain pick-up and delivery schedules.

Based on this research, there is a clear potential for EOBRs to provide considerable compliance and limited productivity benefits, but there are a number of challenges that will have to be resolved before EOBRs meet this potential.

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Appendix A

Electronic On-Board Recorders: User Survey

Company Information

1. How is your fleet best described? (N=29)
 - Private fleet
 - Truckload carrier
 - Less than truckload carrier
 - Owner/operator
 - Bus carrier
 - Other, please specify: _____

2. How many vehicles are in your fleet? _____

3. How many drivers does your company employ? _____

4. Please indicate the method(s) your company currently uses to track driver hours-of-service (HOS), next to each method indicate the percentage of the fleet using that particular method.

	% of Fleet
Paper Logs	_____ %
Time Cards	_____ %
Electronic On-Board Recorders with HOS Functions	_____ %
Other, please specify: _____	_____ %

5. Please indicate your company's reasons for using EOBRs?

Primary Reason (Check only one.)	Secondary Reasons (Check all that apply.)	
<input type="radio"/>	<input type="checkbox"/>	Regulatory compliance – hours-of-service
<input type="radio"/>	<input type="checkbox"/>	Regulatory compliance – taxes and fees (mileage and fuel tax information)
<input type="radio"/>	<input type="checkbox"/>	Vehicle operating cost management (fuel economy)
<input type="radio"/>	<input type="checkbox"/>	Business management functions (automated payroll, etc.)
<input type="radio"/>	<input type="checkbox"/>	Engine/vehicle maintenance management
<input type="radio"/>	<input type="checkbox"/>	Real-time vehicle communication and management (dynamic scheduling)
<input type="radio"/>	<input type="checkbox"/>	Other, please specify: _____

6. Recognizing that price information is sensitive, please indicate a general range for the per unit **purchase price** of the EOBR system your company uses. (Check only one)

- Less than \$500
- \$500 - \$999
- \$1000 - \$1499
- \$1500 - \$1999
- \$2000 or more

7. What is the average annual **maintenance/upkeep cost** per truck associated with your EOBR system?

\$ _____

8. What are the monthly **subscription fees** per truck that may be associated with your EOBR system?

\$ _____

9. What is the average annual cost per truck associated with **software updates**? (Please specify whether this is a total system update cost or a per vehicle cost.)

\$ _____ total system update \$ _____ per vehicle update

10. What is the approximate amount of time for the return on investment (ROI) for your company with the EOBR system? (Check only one)

- Less than 1 year
- 1 year – 3 years
- More than 3 years
- Have not/will not recover investment
- Don't know

11. What is the estimated life span of the EOBR system your company uses?

_____ years

12. What do you like about EOBRs for HOS record keeping?

- 1.
- 2.
- 3.

13. What do you dislike about EOBRs for HOS record keeping?

- 1.
- 2.
- 3.

14. What would you change about the EOBR HOS product you currently use?

- 1.
- 2.
- 3.

15. Has your company realized benefits from the use of EOBRs for the HOS recordkeeping compared to other methods for HOS record-keeping?

- Yes
 No (Please continue to Question 16.)

15b. How would you weight the general benefits your company has realized from the use of EOBRs for HOS record keeping in the following categories?
(Please note: The total percentage should sum to 100%.)

	% of Total Benefit
Safety	_____%
Productivity	_____%
Regulatory Compliance	_____%
Other, please specify: _____	_____%
Total	100%

16. What specific benefits has your company realized from the use of EOBRs for HOS record keeping? (Check all that apply.)

- Lower costs associated with HOS compliance
- Improved compliance with HOS rules
- Better driver/load coordination
- Reduced administrative burden
- Fewer crashes/lower safety costs
- Other, please specify: _____
- Other, please specify: _____
- Other, please specify: _____
- None

17. How has your company's use of EOBRs for HOS record keeping impacted driver morale? (Check only one)

- No impact
- Improved driver morale
- Worsened driver morale
- Don't know

Comments:

18. How has your company's use of EOBRs for HOS record keeping impacted driver retention? (Check only one)

- No impact
- Improved driver retention
- Worsened driver retention
- Don't know

Comments:

19. How has your company's use of EOBRs for HOS record keeping impacted company productivity? (Check only one)

- No impact
- Improved company productivity
- Worsened company productivity
- Don't know

Comments:

20. Does your EOBR have GPS capability?

- Yes
- No

21. How does your system identify drivers?

- User ID and password
- Biometrics
- Smart cards
- USB device
- Other, please specify: _____

Explanation: _____

22. Where is the driver Record of Duty Status primarily stored?

- On-board computer
- Portable device
- Trucking company facility
- Outside vendor data storage system
- Other, please specify: _____

23. How is HOS data transmitted from the truck to the company facility?

- Satellite/terrestrial upload
- Short-range, wireless transmission
- Wired/manual upload
- Other, please specify: _____

24. How can HOS data be uploaded from the truck to the company facility?

- Automatically uploaded in real-time
- Automatically uploaded at interval specified by carrier
- Manually uploaded by driver
- Manually uploaded by company facility administrator
- Other, please specify: _____

25. Is the current system upgradeable?

- Yes
- No

25b. If yes, which aspect of the system can be upgraded?

- Software
- CPU/Processor
- Other, please specify: _____

Appendix B

Electronic On-Board Recorders: Non-User Survey

Company Information

1. How is your fleet best described? (Check all that apply)
 - Private fleet
 - Truckload carrier
 - Less than truckload carrier
 - Owner/operator
 - Bus carrier
 - Other, please specify: _____

2. How many power units are in the fleet? _____

3. How many drivers does your company employ? _____

4. Please indicate the method your company currently uses to track driver hours-of-service (HOS). If your company uses a variety of methods, please indicate what percentage of the fleet uses each method.

	% of Fleet
Paper Logs	_____%
Time Cards	_____%
Electronic On-Board Recorders with HOS Functions	NA
Other, please specify: _____	_____%

Electronic On-Board Recorder Use

5. What are your company's primary reasons for not using EOBRs? (Please select up to three reasons.)

	1	2	3	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Cost
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	No government requirement
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Administrative burden
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Concerns over driver privacy
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Currently in compliance with HOS rules
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strict compliance with HOS rules will result in productivity loss
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Concerns over data privacy/ownership/security
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Concerns over driver retention if EOBRs used
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	New / unfamiliar technology
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Currently considering use of EOBRs
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Other, please specify: _____

6. If EOBRs are mandated, how should the devices be paid for?
- Costs should be covered by motor carriers
 - New tax credits programs should be developed to compensate motor carriers for cost
 - Government should provide the devices free of charge to motor carriers
 - Other financial incentives: _____
 - Other non-financial incentives: _____
 - Other, please specify: _____
7. Aside from HOS record-keeping, what additional functions would make EOBRs more appealing for use by motor carriers?

Desirable Functions

- Regulatory compliance - International Fuel Tax Agreement (IFTA)
 - Vehicle operating cost management (fuel economy)
 - Business management functions (payroll, etc.)
 - Engine/vehicle maintenance management
 - Real-time vehicle communication and management (dynamic scheduling)
 - Other, please specify: _____
 - Other, please specify: _____
 - Other, please specify: _____
8. What is a reasonable per unit equipment **purchase price** for:
- a. An EOBR that provides *basic* HOS record-keeping? \$ _____
 - b. An EOBR with HOS record-keeping and *additional functions* from Q7? \$ _____
9. What is a reasonable monthly per unit **maintenance price** for:
- a. An EOBR that provides *basic* HOS record-keeping? \$ _____
 - b. An EOBR with HOS record-keeping and *additional functions* from Q7? \$ _____
10. What are appropriate uses of HOS data collected by EOBRs?
- Motor carrier driver management (internal use)
 - Regulatory enforcement (government access)
 - Actuarial analysis for insurance purposes (insurance company access)
 - Other, please specify: _____
 - Other, please specify: _____
 - Other, please specify: _____

Appendix C

Electronic On-Board Recorders: Vendor Survey

Company Information

1. What are the primary purposes of your EOBR product? (Check up to two)
 - Regulatory compliance – hours-of-service
 - Regulatory compliance – taxes and fees (mileage and fuel tax information)
 - Vehicle operating cost management (fuel economy)
 - Business management functions (automated payroll, etc.)
 - Engine/vehicle maintenance management
 - Real-time vehicle communication and management (dynamic scheduling)
 - Other, please specify: _____

2. What information does your EOBR monitor?
 - Regulatory compliance information - International Fuel Tax Agreement (IFTA)
 - Engine operating parameters
 - Vehicle status and use/event recording
 - Vehicle location
 - Communications
 - Driver hours-of-service recording
 - Other, please specify: _____
 - Other, please specify: _____
 - Other, please specify: _____

3. What is the price range for this EOBR product?
 - Less than \$500
 - \$500 - \$999
 - \$1000 - \$1499
 - \$1500 - \$1999
 - \$2000 or more

4. Does your system:

	Yes	No	Don't Know
a. ...accommodate driver teams?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. ...have a mechanism in place to manage instances when drivers fail to log-on before driving?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. ...provide different permissions for different types of users (e.g. are drivers only granted access to driver-oriented functions while authorized technicians are granted access to other functions)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. ... detect and record sensor failures?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. For each item below that your system tracks, please indicate the method used to record the information:

	Automatically Recorded	Manually Entered	Does not record
a. Vehicle movement and stop periods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Engine on/off	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Daily vehicle distance traveled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Changes in driver duty status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Vehicle/driver location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Vehicle/EOBR sensor integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Date/time of duty status entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Truck/tractor/trailer number	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Name of carrier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Main office address of carrier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Daily start/end time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l. Shipping information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Does your system allow drivers to manually enter information regarding:

	Yes	No	N/A
a. Driver identification and password	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Duty status update	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Adverse driving conditions encountered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Duty status amendment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Name of co-driver	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Does your system allow drivers to correct previous entries or omissions prior to certification of the HOS record at the end of each 24-hour period as defined by the motor carrier in the following ways?

	Yes	No	Don't Know
a. Entering on-duty, not driving time prior to access to EOBR system (e.g. warehouse, dock time, office time)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Entering on-duty, not driving time at an additional, non-related motor carrier/employer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Correcting shipping documentation information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Correcting trailer number(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Correcting driver <i>manual</i> duty status selection (e.g. driver selects incorrect duty status originally)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Correcting <i>automatic</i> duty status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Does your system record information regarding the corrections made?
- Yes
 - No
 - I don't know
9. Which of the following duty status options are available using your system?
- Off-duty
 - Sleeper berth
 - Driving
 - On-duty, not driving
 - On-duty, secondary employment
 - On-duty, activity
10. How does your system identify drivers?
- User ID and password
 - Biometrics
 - Smart cards
 - USB device
 - Other, please specify: _____

Explanation: _____

11. Where is the driver Record of Duty Status primarily stored?
- On-board computer
 - Portable device
 - Trucking company facility
 - Outside vendor data storage system
 - Other, please specify: _____
12. How is the HOS data transmitted from the truck to the company facility?
- Satellite/terrestrial upload
 - Short-range, wireless transmission
 - Wired/manual upload
 - Other, please specify: _____
13. How can HOS data be uploaded from the truck to the company facility?
- Automatically uploaded in real-time
 - Automatically uploaded at interval specified by carrier
 - Manually uploaded by driver
 - Manually uploaded by company facility administrator
 - Other, please specify: _____

14. Is the data encrypted during:

- | | Yes | No | Don't Know | Option Available |
|-------------|--------------------------|--------------------------|--------------------------|--------------------------|
| a. Transfer | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Storage | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

15. Does your system provide a mechanism for a driver's electronic log data to follow him or her from one vehicle to another?

- Yes
- No
- Don't know

16. Will a power loss result in lost/erased data records?

- Yes
- No
- Don't know

17. How can HOS data be accessed?

- On-board display, viewed in cab
- Can be printed out using an on-board printer
- On-board display removable from cab via bungee cords
- Accessed via removable data stick
- Accessed at company facility
- Wireless transmission to truck/enforcement personnel upon request from the data storage facility
- Other, please specify: _____

18. Is your system integrated with the vehicle's sensors through connectivity to the vehicle ECM?

- Yes
- No
- Vehicle is not ECM equipped
- Don't know

19. If a vehicle is not ECM equipped, does the system allow for synchronizations with non-ECM speedometer and tachometer?

- Yes
- No
- Don't know

20. Is your system upgradeable?

Yes

No

20b. If yes, which aspect of the system can be upgraded?

Software

CPU/Processor

Other, please specify: _____

Please check here if *all* information collected in this survey can be distributed publicly.

Please check here if you would prefer all identifying information relating to your products to be kept confidential.

Appendix D

Complete Results of Vendor Survey

Does your system:

	Percentage
...accommodate team drivers?	91%
...have a mechanism in place to manage when drivers fail to log-on before driving?	100%
...provide different types of access for different types of users?	82%
...detect and record sensor failures?	100%

Please indicate the method used to record the information:

	Automatically Recorded	Manually Entered	Does Not Record
Vehicle movement and stop periods	100%	0%	0%
Engine on/off	100%	0%	0%
Daily vehicle distance traveled	100%	0%	0%
Changes in driver duty status	67%	33%	0%
Vehicle location	83%	8%	8%
Vehicle/EOBR sensor integrity	100%	0%	0%
Date/time of duty status entry	100%	0%	0%
Truck/tractor/trailer ID number	58%	42%	0%
Name of carrier	75%	25%	0%
Main office address of carrier	75%	25%	0%
Daily start/end time	75%	25%	0%
Shipping information	40%	40%	20%

Does your system allow drivers to *manually* enter information regarding:

	% Yes
Driver ID and password	67%
Duty status update	83%
Adverse driving conditions encountered	58%
Duty status amendment	67%
Name of co-driver	58%

Does your system allow drivers to correct previous entries or omissions prior to certification of the HOS record at the end of each carrier-designated 24-hour period in the following ways?

	% Yes
Entering on-duty, not driving time occurring prior to access to the vehicle-based EOBR system (i.e. time spent loading the truck before actually entering the vehicle cab and logging onto the EOBR)	50%
Entering on-duty, not driving time at an additional, non-related motor carrier/employer	50%
Correcting shipping documentation information	58%
Correcting trailer number	59%
Correcting driver manual duty status selection	42%
Correcting automatic duty status	17%

Does your system record information regarding the corrections made?
75% indicated Yes.

Which of the following duty status messages/options are available using your system?

	Percentage
Off-duty	83%
Sleeper berth	92%
Driving	100%
On-duty, not driving	83%
On-duty, secondary employment	33%
On-duty, active	58%

How does your system identify drivers?

	Percentage
User ID and password	64%
Biometrics	9%
Smart cards	36%
USB device	18%
Other	36%

Where is the driver Record of Duty Status primarily stored?

	Percentage
On-board computer	73%
Portable device	55%
Trucking company facility	45%
Outside vendor data storage system	55%
Other	0%

Indicate all the options for transmitting HOS data from the truck to the company facility.

	Percentage
Satellite/terrestrial upload	73%
Short-range, wireless transmission	45%
Wired/manual upload	36%
Other	18%

Indicate all the options for uploading HOS data from the truck to the company facility?

	Percentage
Automatically uploaded in real time	55%
Automatically uploaded at interval specified by carrier	45%
Manually uploaded by driver	73%
Manually uploaded by company facility administrator	27%
Other	9%

Is the data encrypted during:

	Yes	No	Don't Know	Option Available
Transfer	82%	0%	0%	18%
Storage	64%	0%	0%	9%

Does your system provide a mechanism for a driver's electronic log data to follow him or her from one vehicle to another?

91% indicated Yes.

Will a power loss result in lost/erased data records?

100% indicated No.

How can HOS data be accessed?

	Percentage
On-board display, viewed in cab	100%
Can be printed out using an on-board printer	55%
On-board display removable from cab via retractable cords	18%
Accessed via removable data stick	18%
Accessed at company facility	73%
Wireless transmission to truck/enforcement personnel upon request	73%
Other	55%

Is your system integrated with the vehicle's sensors through connectivity to the vehicle ECM?

100% indicated Yes.

If a vehicle is not ECM equipped, does the system allow for synchronizations with non-ECM speedometer and tachometer?

50% indicated Yes.

Is your system scaleable/upgradeable?

91% indicated Yes.

Which aspect of your system can be upgraded?

	Percentage
Software	100%
CPU/Processor	60%
Other	40%