

# **Safety Analysis and Industry Impacts of the Pre-Employment Screening Program (PSP)**



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

**October 2013**

## **FOREWORD**

The Federal Motor Carrier Safety Administration (FMCSA) established the Pre-Employment Screening Program (PSP) to comply with Federal legislation requiring the Agency to provide information on driver safety performance to persons conducting pre-employment screening for the motor carrier industry. The PSP launched on May 11, 2010, and is a voluntary program. Motor carriers may use the information provided through the PSP—comprised of 5 years of crash data and 3 years of inspection data on the driver—to assist in determining if a driver applicant should be hired.

The methodology examines crash rates and driver-related out-of-service (OOS) rates of the portion of the motor carrier population using PSP. Safety performance of these carriers is compared for a 12-month period prior to and 12 months after the start of using PSP. This data is then compared to a control group of motor carriers that did not use PSP.

FMCSA's analysis determined that both the PSP group and the control group (non-PSP) experienced a decline in crashes in two size classes and driver OOS rates in all size classes. However, the motor carriers using PSP witnessed a greater decline in both metrics over the non-PSP group in the four size classes.

Since the mission of FMCSA is to reduce crashes, injuries, and fatalities involving commercial motor vehicles (CMV), and FMCSA data indicate that many crashes are due to driver error, the impacts PSP has on the safety performance of drivers and the motor carrier industry is of particular interest to the Agency.

## **NOTICE**

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or the use thereof.

The contents of this report reflect the views of the contractor, who is responsible for the accuracy of the data presented herein. The contents do not necessarily reflect the official policy of the U.S. Department of Transportation.

This report does not constitute a standard, specification, or regulation.

The United States Government does not endorse products or manufacturers named herein. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

## Technical Report Documentation Page

1. Report No. <b>FMCSA-RRA-13-003</b>	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle <b>Safety Analysis and Industry Impacts of the Pre-Employment Screening Program</b>		5. Report Date <b>October 2013</b>	
		6. Performing Organization Code	
7. Author(s) <b>Johnsen, Michael; Rears, Johnathan; Gruberg, Richard</b>		8. Performing Organization Report No.	
9. Performing Organization Name and Address <b>USDOT/Federal Motor Carrier Safety Administration</b>		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address <b>U.S. Department of Transportation Federal Motor Carrier Safety Administration Office of Analysis, Research, and Technology 1200 New Jersey Ave., SE Washington, DC 20590</b>		13. Type of Report and Period Covered <b>Final Report</b>	
		14. Sponsoring Agency Code <b>FMCSA</b>	
15. Supplementary Notes <b>Corrections to the formulas that appear in Figure 10 and Figure 12 of the appendix of this report were applied in October of 2014.</b>			
16. Abstract <b>In this report, FMCSA analyzes the safety impacts of the Pre-Employment Screening Program (PSP) and presents metrics and anecdotal information on attitudes of carriers using PSP. The safety impacts are examined by comparing the crash rates and driver out-of-service (OOS) rates during the 12-month time periods prior to and after the start of PSP use. These data are then compared to the general carrier population. This analysis finds that the carriers using PSP reduced their crash and driver OOS rates over the general carrier population. FMCSA also provides metrics indicating that motor carriers are the most active users of the PSP, and use of the PSP has been steadily increasing since the PSP began distributing information in May 2010. An informal query of some carriers using PSP reveals that carriers like the system, use it for determining the accuracy of potential drivers' resumes, and use it for every newly hired driver.</b>			
17. Key Words <b>PSP, pre-employment screening program, CMV, driver, safety</b>		18. Distribution Statement <b>No restrictions</b>	
19. Security Classif. (of this report) <b>Unclassified</b>	20. Security Classif. (of this page) <b>Unclassified</b>	21. No. of Pages <b>32</b>	22. Price <b>Free</b>

# SI\* (MODERN METRIC) CONVERSION FACTORS

## TABLE OF APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
<b>LENGTH</b>				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	milometers	km
<b>AREA</b>				
in <sup>2</sup>	square inches	645.2	square millimeters	mm <sup>2</sup>
ft <sup>2</sup>	square feet	0.093	square meters	m <sup>2</sup>
yd <sup>2</sup>	square yards	0.836	square meters	m <sup>2</sup>
ac	acres	0.405	hectares	ha
mi <sup>2</sup>	square miles	2.59	square kilometers	km <sup>2</sup>
<b>VOLUME</b>				
fl oz	fluid ounces	29.57	1,000 L shall be shown in m <sup>3</sup> milliliters	ml
gal	gallons	3.785	liters	L
ft <sup>3</sup>	cubic feet	0.028	cubic meters	m <sup>3</sup>
yd <sup>3</sup>	cubic yards	0.765	cubic meters	m <sup>3</sup>
<b>MASS</b>				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2,000 lb)	0.907	megagrams (or "metric ton")	mg (or "t")
<b>TEMPERATURE</b>				
°F	Fahrenheit	$5 \times (F-32) \div 9$ or $(F-32) \div 1.8$	Temperature is in exact degrees Celsius	°C
<b>ILLUMINATION</b>				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m <sup>2</sup>	cd/m <sup>2</sup>
<b>Force and Pressure or Stress</b>				
lbf	poundforce	4.45	newtons	N
lbf/in <sup>2</sup>	poundforce per square inch	6.89	kilopascals	kPa

## TABLE OF APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
<b>LENGTH</b>				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
<b>AREA</b>				
mm <sup>2</sup>	square millimeters	0.0016	square inches	in <sup>2</sup>
m <sup>2</sup>	square meters	10.764	square feet	ft <sup>2</sup>
m <sup>2</sup>	square meters	1.195	square yards	yd <sup>2</sup>
ha	hectares	2.47	acres	ac
km <sup>2</sup>	square kilometers	0.386	square miles	mi <sup>2</sup>
<b>VOLUME</b>				
ml	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m <sup>3</sup>	cubic meters	35.314	cubic feet	ft <sup>3</sup>
m <sup>3</sup>	cubic meters	1.307	cubic yards	yd <sup>3</sup>
<b>MASS</b>				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2,000 lb)	T
<b>TEMPERATURE</b>				
°C	Celsius	$1.8C + 32$	Temperature is in exact degrees Fahrenheit	°F
<b>ILLUMINATION</b>				
lx	lux	0.0929	foot-candles	fc
cd/m <sup>2</sup>	candela/m <sup>2</sup>	0.2919	foot-Lamberts	fl
<b>Force &amp; Pressure Or Stress</b>				
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in <sup>2</sup>

\* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.  
(Revised March 2003, Section 508-accessible version September 2009.)

# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>vii</b>
<b>1. BACKGROUND .....</b>	<b>X</b>
<b>2. SAFETY ASSESSMENT METHODOLOGY .....</b>	<b>3</b>
2.1 CALCULATIONS TO BE PERFORMED USING THE PRE- AND POST-PSP PERIOD DATA.....	3
2.1.1 Data Requested From Vendor.....	5
2.1.2 MCMIS Data.....	5
<b>3. RESULTS OF SAFETY IMPACT ANALYSIS .....</b>	<b>9</b>
<b>4. IMPACTS TO INDUSTRY .....</b>	<b>13</b>
4.1 METRICS .....	13
4.2 COMPANY PERSPECTIVES .....	15
<b>5. SUMMARY AND RECOMMENDATIONS.....</b>	<b>17</b>

## LIST OF APPENDIXES

<b>APPENDIX A—STATISTICAL ANALYSIS FOR SIGNIFICANCE: METHODOLOGY AND RESULTS.....</b>	<b>19</b>
---	-----------

## LIST OF FIGURES (AND FORMULAS)

Figure 1. Line Chart. Total PSP Users.....	viii
Figure 2. Bar Chart. PSP Requests per Month .....	ix
Figure 3. Bar Chart. New PSP Account Holder by Month, May 2010–August 2012 .....	13
Figure 4. Line Chart. Total PSP Users, May 2010–August 2012.....	14
Figure 5. Line Chart. Total PSP Requests by Month.....	14
Figure 6. Bar Chart. PSP Requests by Month.....	15
Figure 7. Equation. Formula to Calculate the Ratio Estimates for Crash Rates.....	19
Figure 8. Equation. Formula to Calculate the Ratio Estimates for OOS Rates .....	19
Figure 9. Equation. Formula to Calculate the Improvement in Carrier Performance.....	19
Figure 10. Equation. Formula to Calculate the Variance for Each Ratio Estimator.....	20
Figure 11. Equation. Formula to Calculate the Variance of the Improvement Statistic .....	20
Figure 12. Equation. Formula to Calculate the Relative Covariance Between Ratio Estimates ...	21
Figure 13. Equation. Variance and Standard Error of the Adjusted Improvement Computation .....	21

## LIST OF TABLES

Table 1. Improvement in Crash Rate and Driver OOS Rate for PSP Group (Adjusted).....	vii
Table 2. Number of Drivers per Size Class .....	5
Table 3. Number of Carriers per Size Class in PSP-Group .....	6
Table 4. Dates by Size Class for Defining Non-PSP Group Pre- and Post-Periods .....	6
Table 5. Number of Carriers by Size Class in the Non-PSP Group .....	7
Table 6. PSP Group—Crash and Inspection Rates Prior to PSP Use.....	9
Table 7. PSP Group—Crash and Inspection Rates After Starting PSP Use.....	9
Table 8. Non-PSP Group—Crash and Inspection Rates in Time Period Corresponding to PSP Group Prior to Use .....	10
Table 9. Non-PSP Group*—Crash and Inspection Rates In Time Period Corresponding to PSP Group After Starting PSP Use.....	10
Table 10. Percent Change in Crash and Driver OOS Rates, PSP Group vs. Non-PSP Group, by Driver Size Class.....	11
Table 11. PSP-Related Improvement in Crash and Driver OOS Rates for PSP Group (Adjusted).....	11
Table 12. Estimated Crashes and Driver OOS Orders Potentially Prevented, by Size Class, Due to Industry Use of PSP .....	12
Table 13. Standard Error Estimates for Crash Rate Improvement From Pre-Installation Period to Post-Installation Period .....	22
Table 14. Standard Error Estimates for OOS Rate Improvement From Pre-Installation Period to Post-Installation Period .....	22

## **ABBREVIATIONS AND ACRONYMS**

<b>Acronym</b>	<b>Definition</b>
CMV	Commercial motor vehicle
FMCSA	Federal Motor Carrier Safety Administration
MCMIS	Motor Carrier Management Information System
NIC Technologies	National Information Consortium Technologies Incorporated
OOS	Out-of-service
PSP	Pre-Employment Screening Program
SMS	Safety Management System
USDOT	United States Department of Transportation

[This page intentionally left blank.]



## EXECUTIVE SUMMARY

The Federal Motor Carrier Safety Administration (FMCSA) established the Pre-Employment Screening Program (PSP) to comply with Federal legislation requiring the Agency to provide information on driver safety performance to persons conducting pre-employment screening for the motor carrier industry. The PSP was launched on May 11, 2010, and is a voluntary program. Motor carriers may use the information provided through the PSP—comprised of 5 years of crash data and 3 years of inspection data on the driver—to assist in determining if a driver applicant should be hired.

Since the mission of FMCSA is to reduce crashes, injuries, and fatalities involving commercial motor vehicles (CMVs) and FMCSA data indicate that many crashes are due to driver error, the impacts PSP has on the safety performance of drivers and the motor carrier industry is of particular interest to the Agency.

The methodology examines crash rates and driver-related out-of-service (OOS) rates of the portion of the motor carrier population using PSP. Safety performance of these carriers is compared for a 12-month period prior to and 12 months after the start of using PSP. These data are then compared to a control group of motor carriers that did not use PSP.

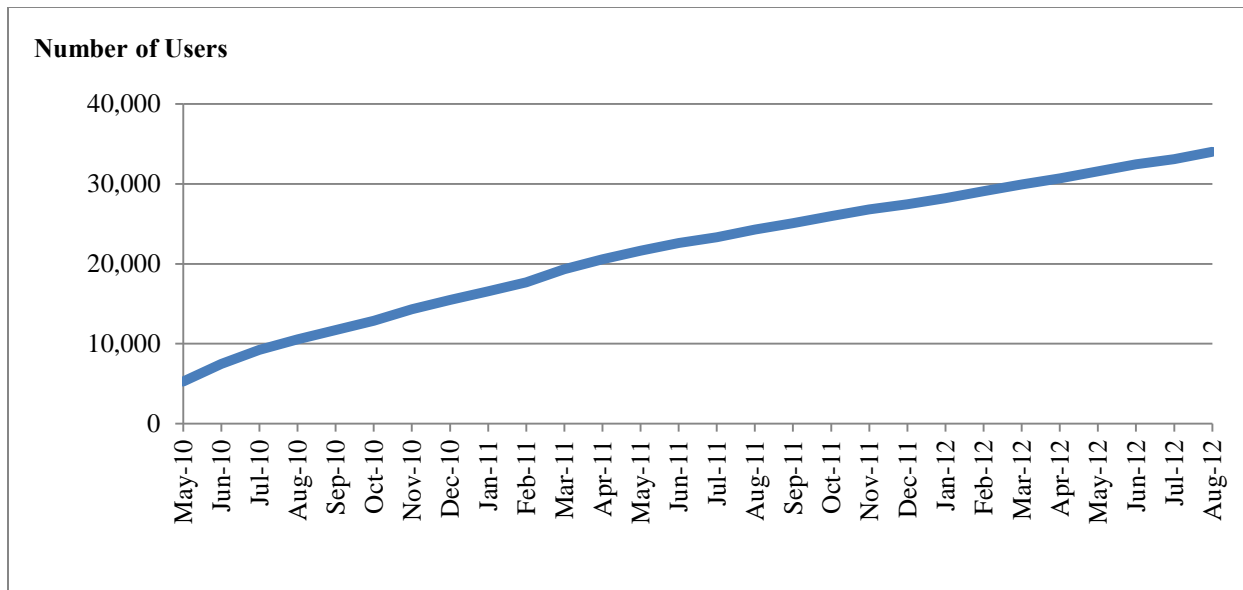
FMCSA's analysis determined that both the PSP group and the control group (non-PSP) experienced a decline in crashes in all size classes. However, the motor carriers using PSP witnessed a greater decline in crash rates over the non-PSP group in the four size classes. After adjusting the crash rate improvement of the PSP group by removing the control group effects, the PSP group still showed improvement in all four size classes (although statistical significance was shown in only two size classes). The overall adjusted improvement in the crash rates for the PSP group, across all size classes, was statistically significant (see Table 1). The PSP group also experienced a decrease in driver OOS rates in all size classes. When adjusted for control group effects, this improvement in driver OOS rates was still statistically significant in all size classes.

**Table 1. Adjusted improvement in crash and driver OOS rates for the PSP group (calculated by subtracting the improvement in the non-PSP group from the improvement in the PSP group).**

Driver Size Class	Crash Rate Improvement	Driver OOS Rate Improvement
1 (1-5)	-12.4%*	-18.3%
2 (6-20)	-20.6%	-12.0%
3 (21-100)	-12.1%	-10.1%
4 (>100)	-3.7%*	-12.8%
<b>All Classes</b>	<b>-8.0%</b>	<b>-17.2%</b>

\*Not statistically significant.

In addition, FMCSA compiled some industry impact information including tracking the extent of PSP use throughout the industry. The number of PSP users has steadily increased monthly since PSP began distributing information in May 2010.



**Figure 1. Line Chart. Total PSP Users**

The total number of requests to the PSP system is also increasing—most notably the monthly request totals continue to climb (as shown in Figures 1 and 2). All of these metrics indicate that PSP use is increasing throughout the motor carrier industry. Currently, there are about 35,000 PSP users making about 70,000 requests per month. These requests come from both drivers and motor carriers, but almost all of these users are motor carrier companies with only a small fraction of requests coming from drivers.

FMCSA also gathered non-scientific information from a handful of motor carriers of various sizes utilizing PSP to provide some evidence, even if anecdotal, of how these companies view the PSP. All represented carriers responded favorably when asked about the system, and they reported using it for new hires. Most carriers use the PSP report to ensure that drivers accurately report information on their applications and do not omit places of employment or crashes. Violations in the PSP report for pre-trip inspections, logbooks, and speeding were high on the list of concerns and were generally believed to be a better indication of a driver’s safety performance rather than violations that the driver had little direct influence to avoid.

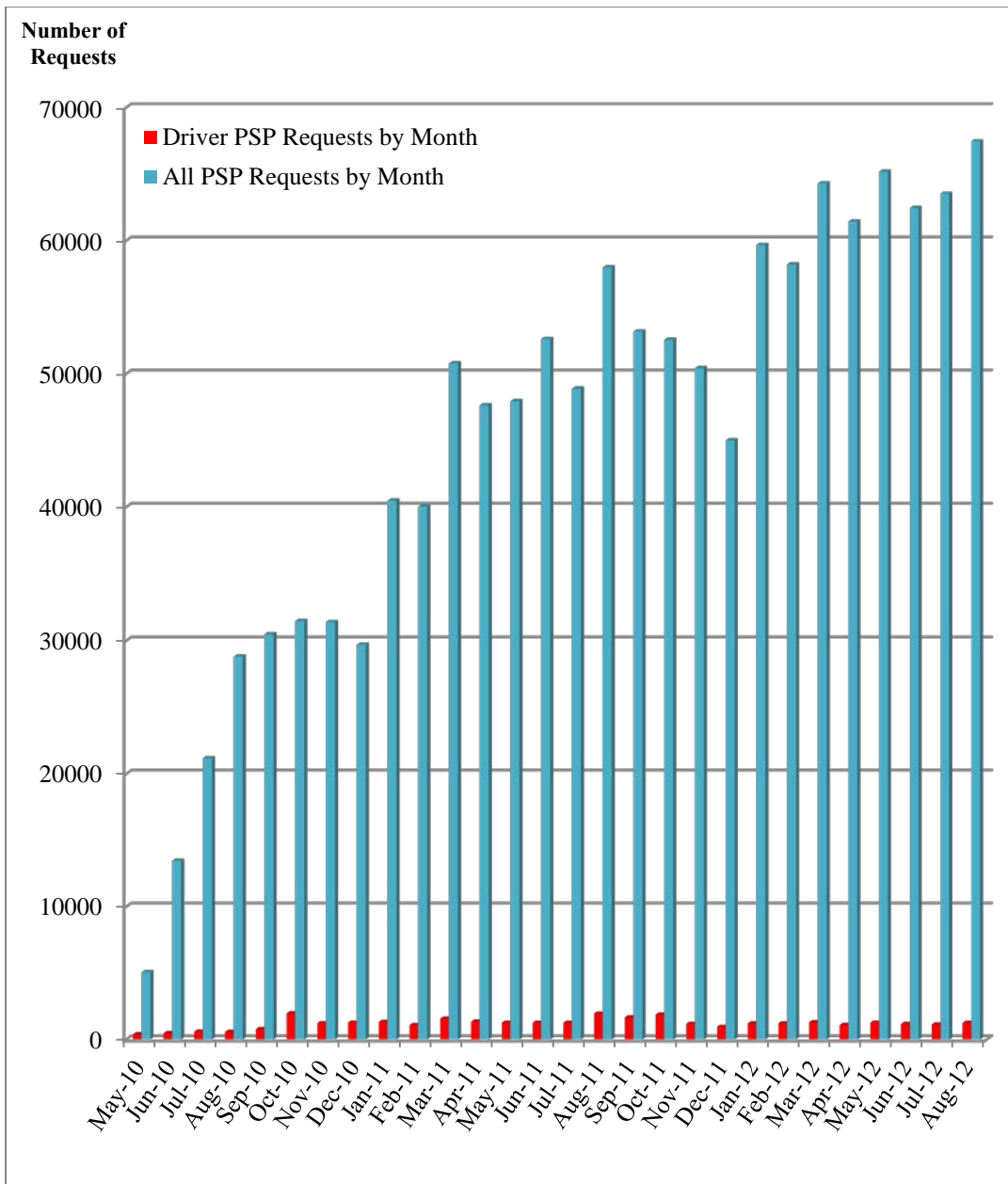


Figure 2. Bar Chart. PSP Requests Per Month

[This page intentionally left blank]

# 1. BACKGROUND

The Federal Motor Carrier Safety Administration (FMCSA) established the Pre-Employment Screening Program (PSP) to comply with Federal legislation requiring the Agency to provide information on driver safety performance to persons conducting pre-employment screening for the motor carrier industry. The PSP was launched on May 11, 2010, and is a voluntary program. Motor carriers can use the information provided through the PSP—comprised of 5 years of crash data and 3 years of inspection data on the driver—to assist in determining if a driver applicant should be hired.

FMCSA used a unique, no-cost contract to implement the PSP. Between November 30, 2010, and March 31, 2011, FMCSA conducted a program evaluation of the PSP. This evaluation provides FMCSA with a reasonable assurance that the contractor operates in compliance with the PSP contract. However, the 2011 evaluation did not investigate the safety impacts that the PSP may have on the commercial motor vehicle (CMV) industry. Consequently, FMCSA embarked on this analysis to determine whether using the PSP has a positive impact on CMV safety.

This evaluation examines the safety implications of the PSP and provides additional metrics on the operation of PSP and the impact to the motor carrier industry. FMCSA examined data provided by the contractor, safety data maintained by FMCSA, and anecdotal profiles of six companies that use the PSP. FMCSA developed a methodology to determine the relative safety of companies using PSP with companies that do not use PSP by comparing driver out-of-service (OOS) rates and crash rates between the two populations. To obtain qualitative data about the PSP and its use by some carriers, FMCSA asked a few companies about their experiences using the PSP system and its impact on their business operations.

The report is divided into two parts: an analysis of the impacts on safety and an analysis on impacts on the industry. The analysis of PSP's safety impacts uses similar analytical techniques as FMCSA crash and inspection data and follows methodologies previously used by FMCSA to determine safety impacts of other policies or programs. FMCSA staff performed the analysis and included carrier information provided by the contractor. The impacts to industry examine the extent of PSP use in the industry and highlight how some companies are using PSP.

[This page intentionally left blank.]

## 2. SAFETY ASSESSMENT METHODOLOGY

The purpose of this investigation was to determine the effect the PSP has on CMV safety. This research study sought to determine if motor carriers realize safety results by using the PSP program. The variable of using the PSP was isolated from other possible safety programs or practices along with minimizing possible bias in the data. Safety performance of carriers of similar size that use the PSP are compared prior to and after initiating use of the PSP, and then these results are compared to carriers that did not use the PSP using similar time ranges.

The methodology examines crash rates<sup>1</sup> and driver-related OOS rates of the portion of the motor carrier population using PSP for a 12-month period<sup>2</sup> prior to their start of using PSP and after their start of using PSP. These data are then compared to a control group that did not use PSP.

### 2.1 CALCULATIONS TO BE PERFORMED USING THE PRE- AND POST-PSP PERIOD DATA

For each population group, the total number of potential crashes that could have been avoided had the carrier been using PSP during the year prior to their initial use was estimated, as well as changes in roadside driver OOS rates. In order to estimate these parameters, the following statistics were calculated at the size class level:

- **Pre-PSP crashes for the size class:** all crashes occurring during each carrier's Pre-PSP time period summed together.
- **Post-PSP crashes for the size class:** all crashes occurring during each carrier's Post-PSP time period summed together.
- **Pre-PSP crash rate for the size class:** all crashes occurring during each carrier's pre-PSP time period summed together, divided by the sum of each carrier's power unit counts during the same period.<sup>3</sup>
- **Post-PSP crash rate for the size class:** all crashes occurring during each carrier's Post-PSP time period summed together, divided by the sum of each carrier's power unit counts during the same period.
- **Control group pre-PSP crash rate for the size class:** all control group carrier crashes occurring during each carrier's pre-PSP time period summed together, divided by the sum of each carrier's power unit counts during the same period.

---

<sup>1</sup> Normalized by power units.

<sup>2</sup> FMCSA attempted to expand the time frame from 12 months to 18 or 24 months, but due to the recent implementation of PSP, longer time frames ran into data quality/availability issues for the post period analysis.

<sup>3</sup> This is one of two common, well-defined methods used for these crash rate determinations. The other method is to normalize the data using vehicle miles traveled instead of power units. A preliminary investigation revealed that both methods seem to yield similar types of results, especially when using this to determine changes in rates.

- **Control group post-PSP crash rate for the size class:** all control group carrier crashes occurring during each carrier's post-PSP time period summed together, divided by the sum of each carrier's power unit counts during the same period.
- **Change in crash rate in size class:** In each size class the unadjusted change in crash rate will be defined to be (post-PSP crash rate minus the pre-PSP crash rate) multiplied by the pre-PSP crash rate.
- **Change in control group crash rate in size class:** In each size class, the change in control group crash rate is defined to be (post-PSP crash rate minus the pre-PSP crash rate) multiplied by the pre-PSP crash rate.
- **Adjusted change in crash rate in size class:** In each size class, the adjusted change in crash rate is defined as the change in crash rate for the size class minus the change in control group crash rate for the size class.
- **Potential crashes prevented in size class:** The number of potential crashes that could have been prevented in each size class as a result of the PSP program is equal to (pre-PSP crashes multiplied by the adjusted change in crash rate).
- **Total potential crashes prevented.** The total potential crashes that could have been prevented because of the PSP program was calculated by adding together all of the crashes prevented in each size class.

Similar calculations were performed based on inspection data collected during the pre-PSP and post-PSP periods:

- OOS rates in pre-PSP period in size class.
- OOS rates in post-PSP period in size class.
- Change in OOS rate in size class.
- Control group OOS rate in pre-PSP period in size class.
- Control group OOS rate in post-PSP period in size class.
- Control group change in OOS rate in size class.
- Adjusted change in OOS rate in size class.
- Potential reduction in OOS violations.

The crashes were normalized by number of power units, thus driver groups of similar size categories were used in this analysis.<sup>4</sup>

---

<sup>4</sup> Section 3.3 Carrier Size from the document: FMCSA Safety Program Effectiveness Measurement: Compliance Review Effectiveness Model, Results for Carriers with Compliance Reviews in Fiscal Year 2008, September 2012, FMCSA-RRA-12-010.



The following carrier size class groupings are used in the analysis:

**Table 2. Number of Drivers Per Size Class**

<b>Driver Size Class</b>	<b>Number of Drivers</b>
1	1–5
2	6–20
3	21–100
4	>100

### **2.1.1 Data Requested From Vendor**

The contractor provided FMCSA with a list of all motor carriers that have accessed PSP via spreadsheet software containing the following information:

- United States Department of Transportation (USDOT) number.
- Company name.
- First date of access.
- Last date of access.
- Total number of months where PSP was accessed.

With these data points, the records of these companies can be compared to FMCSA’s Motor Carrier Management Information System (MCMIS) database, where crash and inspection data are stored. The dates of access data points, along with the total number of months the company used PSP, allow one to estimate changes in motor carrier safety performance subsequent to using PSP.

### **2.1.2 MCMIS Data**

The vendor list of motor carriers participating in PSP was merged with the FMCSA MCMIS files (e.g., registration, inspection, and crash files) to obtain the necessary inspection, crash, and carrier size information required for the analysis. Thus, FMCSA was able to develop crash rates and driver OOS rates for the time periods representing 1 year before and 1 year after the carrier began using PSP. The crash rates used in this report are calculated by dividing the number of crashes by the number of power units.

#### **2.1.2.1 PSP Group**

All carriers accessing the PSP Web site are tracked by FMCSA’s vendor that maintains the Web site. As a result, data are available on which carriers have accessed the site, including the date and time of initial access. The earliest date of Web site access for each carrier (referred to, subsequently, as “start date”) was used to define pre- and post-PSP access periods for each carrier.

The effect of using PSP depends upon the percentage of the company’s total drivers that were screened by PSP during the carrier’s post-PSP access period.<sup>5</sup> In all likelihood, this percentage will be greater for smaller carriers. One PSP screening performed by a carrier with 2 drivers will have a potentially greater safety impact on the carrier than one PSP screening performed by a carrier with 100 drivers. Thus, separate analyses were performed by carrier size, based on the number of drivers. The number of carriers in each size class for the PSP group is shown in Table 3. Note that while there are approximately 35,000 users of PSP, only carriers with sufficient use time (i.e., at least 24 months with sufficient data) are considered.

**Table 3. Number of Carriers per Size Class in PSP Group**

Driver Size Class	Number of Carriers
1	355
2	1,307
3	2,565
4	1,249
<b>Total</b>	<b>5,476*</b>

\*The number of carriers analyzed in this study includes only those that remained consistently active throughout the entire study period.

### 2.1.2.2 Non-PSP Group (Control)

To control for the fact that changes in crash rates and OOS rates of carriers using PSP may be attributable to general trends in the industry occurring during the evaluation period (rather than attributable to PSP), data from a control group, not using PSP, must be evaluated. The control group consists of motor carriers that indicated for-hire operations on their MCS-150 form, have recent activity, and have not used PSP. This group is called the non-PSP group.

Because the control group carriers do not use PSP, they do not have an actual start date that can be used to define the pre- and post-PSP time periods. Thus, the “average” start date for the test group is used for all control group carriers as a substitute for a start date, in each size group. These average dates were calculated by converting the date using Oracle Procedural Language/Structured Query Language into numeric values. Table 4 displays the dates used to define the pre- and post-periods for the control group.

**Table 4. Dates by Size Class for Defining Non-PSP Group Pre- and Post-Periods**

Driver Size Class	First Access Date
1	5/19/2011
2	4/21/2011
3	2/21/2011
4	1/9/2011

---

<sup>5</sup> The PSP group includes carriers that have used PSP at least once. It is unknown if carriers used PSP for all new driver hires, though in the few interviews conducted for this study the carriers indicated they used PSP for all new driver hires.

The pre-PSP period for the control group corresponds to the 12 months prior to the average start date of the test group carriers. The post-PSP period for the non-PSP group starts with the 12-month period following the average start date.

One potential bias to avoid is that companies that use the PSP could have a different safety profile from the general carrier population. Thus, in order to determine the PSP population’s general safety profile, FMCSA examined non-driver related violation rates of these carriers compared to all carriers. The carriers that are included in this set were also examined for their relative crash and driver OOS rates prior to using the PSP to determine if carriers that choose to use PSP are already a safer group of carriers.

The non-PSP group consists of motor carriers that have never used PSP and indicated for-hire operations on their Motor Carrier Identification Report (MCS-150). Carriers were also filtered by FMCSA’s recent activity filter.<sup>6</sup> The relative difference in number of carriers per size class between the PSP group and the non-PSP group are most pronounced in size class 1, as mainly larger carriers are using PSP. Generally, owner/operators who are self-employed do not hire additional drivers. Table 5 shows the number of carriers per size class for the non-PSP (control) group.

**Table 5. Number of Carriers by Size Class in the Non-PSP Group**

Size Class	Number of Carriers
1	368,803
2	43,251
3	11,078
4	1,811
<b>Total</b>	<b>424,943*</b>

\*The number of carriers analyzed in this study includes only those that remained consistently active throughout the entire study period.

---

<sup>6</sup> A “Recent Activity” filter is used by FMCSA to determine if a motor carrier is still operating as there are no requirements for motor carriers to notify FMCSA when they are out of business or not operating. The recent activity filter eliminates companies that have not had any interaction with FMCSA in the past 3 years, including filing forms, inspections, crashes, citations, etc.

[This page intentionally left blank]

### 3. RESULTS OF SAFETY IMPACT ANALYSIS

Tables 6 through 10 display the results of the analysis. Both the PSP group and the non-PSP group saw a reduction in crashes between the two observed time periods, which aligns with the recent decrease in total CMV crashes during this time period. In addition, both groups experienced a decline in total driver OOS inspections. However, the carriers using PSP experienced a greater decrease overall in both crash rates and driver OOS rates, though some of the crash rate decreases were not statistically significant in two of the driver size classes.

**Table 6. PSP Group—Crash and Inspection Rates Prior to PSP Use<sup>7</sup>**

Driver Size Class	All Crashes	Size Class Crash Rate <sup>8</sup>	Power Units	Total Drivers	Total Inspections	Total Driver OOS Inspections	Total Driver Inspections	Driver Size Class OOS Rate
1	126	7.00%	1,799	1,702	4,508	428	4,478	9.56%
2	975	5.93%	16,443	16,423	32,227	2,310	31,910	7.24%
3	5,374	4.81%	111,676	116,364	172,750	9,468	170,987	5.54%
4	21,165	4.14%	511,595	562,954	539,996	18,103	535,503	3.38%
<b>All</b>	<b>27,640</b>	<b>4.31%</b>	<b>641,513</b>	<b>697,443</b>	<b>749,481</b>	<b>30,309</b>	<b>742,878</b>	<b>4.08%</b>

**Table 7. PSP Group—Crash and Inspection Rates After Starting PSP Use<sup>9</sup>**

Driver Size Class	All Crashes	Size Class Crash Rate <sup>10</sup>	Power Units	Total Drivers	Total Inspections	Total Driver OOS Inspections	Total Driver Inspections	Driver Size Class OOS Rate
1	85	5.81%	1,464	1,339	3,619	295	3,600	8.19%
2	730	4.28%	17,043	16,714	30,499	1,906	30,256	6.30%
3	4,655	4.05%	114,851	119,691	168,960	8,024	167,242	4.80%
4	18,271	3.54%	516,125	563,635	517,626	14,272	513,334	2.78%
<b>All</b>	<b>23,741</b>	<b>3.66%</b>	<b>649,483</b>	<b>701,380</b>	<b>720,704</b>	<b>24,497</b>	<b>714,878</b>	<b>3.43%</b>

<sup>7</sup> Contains carriers, with recent activity, and active status.

<sup>8</sup> Normalized by power units.

<sup>9</sup> Contains carriers, with recent activity, and active status.

<sup>10</sup> Normalized by power units.

**Table 8. Non-PSP Group\*—Crash and Inspection Rates in Time Period Corresponding to PSP Group Prior to Use**

Driver Size Class	All Crashes	Size Class Crash Rate *	Power Units	Total Drivers	Total Inspections	Total Driver OOS Inspections	Total Driver Inspections	Driver Size Class OOS Rate
1	15,767	3.09%	509,994	489,639	671,506	45,005	662,119	6.80%
2	11,940	3.35%	356,936	361,055	494,892	25,180	486,395	5.18%
3	10,960	3.19%	343,457	366,235	425,589	16,154	415,130	3.89%
4	14,830	2.03%	731,892	800,810	288,267	6,773	274,387	2.47%
<b>All</b>	<b>53,497</b>	<b>2.75%</b>	<b>1,942,279</b>	<b>2,017,739</b>	<b>1,880,254</b>	<b>93,112</b>	<b>1,838,031</b>	<b>5.07%</b>

\*With recent activity and active status.

\*\*Normalized by power units.

**Table 9. Non-PSP Group\*—Crash and Inspection Rates in Time Period Corresponding to PSP Group After Starting PSP Use**

Driver Size Class	All Crashes	Size Class Crash Rate **	Power Units	Total Drivers	Total Inspections	Total Driver OOS Inspections	Total Driver Inspections	Driver Size Class OOS Rate
1	15,813	2.95%	536,667	512,243	710,739	49,461	699,501	7.07%
2	11,688	3.10%	376,506	382,888	510,774	25,714	501,566	5.13%
3	11,121	3.08%	361,633	388,407	442,180	16,211	430,442	3.77%
4	14,548	1.81%	804,431	878,241	295,335	6,519	278,008	2.34%
<b>All</b>	<b>53,170</b>	<b>2.56%</b>	<b>2,079,237</b>	<b>2,161,778</b>	<b>1,959,028</b>	<b>97,905</b>	<b>1,909,517</b>	<b>5.13%</b>

\*With recent activity and active status.

\*\*Normalized by power units.

The changes in driver OOS rates and crash rates from the “pre-PSP” time period to the “post-PSP” time period were compared between the PSP and non-PSP groups to determine the difference in the rates overall. The following tables show the changes in crash rates and OOS rates:

**Table 10. Percent Change in Crash and Driver OOS Rates, PSP Group vs. Non-PSP Group, by Driver Size Class**

PSP Group			Non-PSP Group		
Driver Size Class	Crash Rate	Driver OOS Rate	Driver Size Class	Crash Rate	Driver OOS Rate
1	-17.1%	-14.3%	1	-4.8%	+4.0%
2	-27.8%	-13.0%	2	-7.2%	-1.0%
3	-15.8%	-13.4%	3	-3.6%	-3.2%
4	-14.4%	-17.8%	4	-10.7%	-5.0%
<b>All</b>	<b>-15.2%</b>	<b>-16.0%</b>	<b>Totals</b>	<b>-7.2%</b>	<b>+1.2%</b>

Note: Reductions in rates shown as negative (-) numbers. Increases in rates shown as positive (+) numbers.

Table 11 displays the adjusted improvement in crash and driver OOS rates for the PSP group, calculated by subtracting the improvement in the non-PSP group from the improvement in the PSP group (note that numbers have been rounded). The results indicate that the PSP group experienced a statistically significant greater improvement in their crash rates over the non-PSP group in two driver size classes (driver size classes 2 and 3) as well as for the overall population. There were not statistically significant differences in driver size classes 1 and 4.

Driver OOS rates improved for the PSP group over the non-PSP group in all driver size classes. For the crash rate, statistical significance was not obtained in driver size class 1 due to the extremely small number of carriers in this size class for the PSP group. In driver size class 4, there simply was not a large enough change in crash rates (as they are rare events) to show statistical change, although for both size classes, crash rates trend towards decreasing.

**Table 11. Adjusted improvement in crash and driver OOS rates for the PSP group (calculated by subtracting the improvement in the non-PSP group from the improvement in the PSP group).**

Driver Size Class	Crash Rate Improvement	Driver OOS Rate Improvement
1	-12.4%*	-18.3%
2	-20.6%	-12.0%
3	-12.1%	-10.1%
4	-3.7%*	-12.8%
<b>All</b>	<b>-8.0%</b>	<b>-17.2%</b>

\*Not statistically significant at the 95-percent interval.

With these data, FMCSA can estimate the possible number of crashes prevented had the carriers experienced the same improvement rate, yet started a year earlier, as well as the number of Driver OOS orders that could have been prevented had the carrier used PSP in the previous year. Table 12 provides these estimates.

**Table 12. Estimated Crashes and Driver OOS Orders Potentially Prevented, by Size Class, Due to Industry Use of PSP**

Size Class	Crashes Prevented	Driver OOS Prevented
1	--*	78
2	199	278
3	664	976
4	--*	2,259
<b>All</b>	<b>863</b>	<b>3,592</b>

\*These totals were left out due to their statistical non-significance.

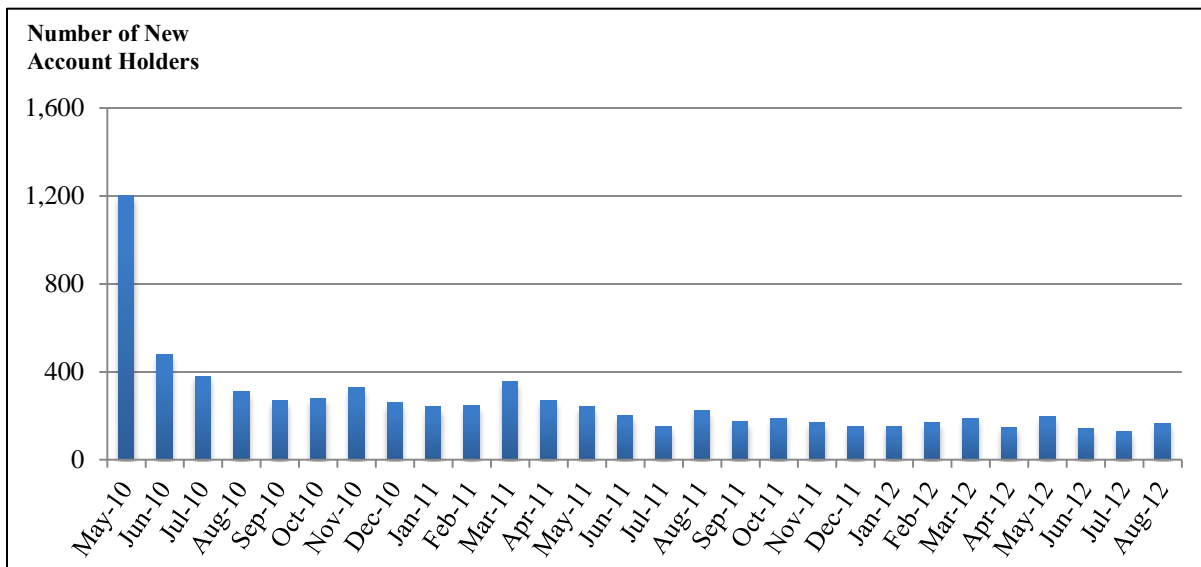


## 4. IMPACTS TO INDUSTRY

An essential component of analyzing the impacts that the PSP has had on the industry is an assessment of the extent of its use within the industry. Since the program is voluntary, and there is a cost associated with requesting a PSP file on a driver, not all carriers utilize PSP when hiring drivers. However, with the introduction of FMCSA's Safety Management System (SMS), which provides safety metrics on a carrier's performance, including driver safety performance, many carriers are utilizing PSP to assure the selection of quality drivers for their company. To provide insight as to why companies use PSP, FMCSA queried a limited number of carriers that use PSP and summarized their comments.

### 4.1 METRICS

FCMSA collected several metrics for this report that demonstrate the market penetration of PSP. When considering the impacts to industry, it is important to note that PSP is a voluntary system and there are no Federal requirements to screen this data for new hires. However, in the first few months after PSP went live,<sup>11</sup> there were a large number of new accounts opened in the system,<sup>12</sup> which is indicative of motor carrier demand. In addition, the high number of accounts opened in the first month is a result of the system taking applications several months before the system started delivering data, so several months of initial applications were processed in May 2010. As shown in Figure 3, it appears the number of new accounts opened has leveled off to slightly less than 200 accounts per month steadily.

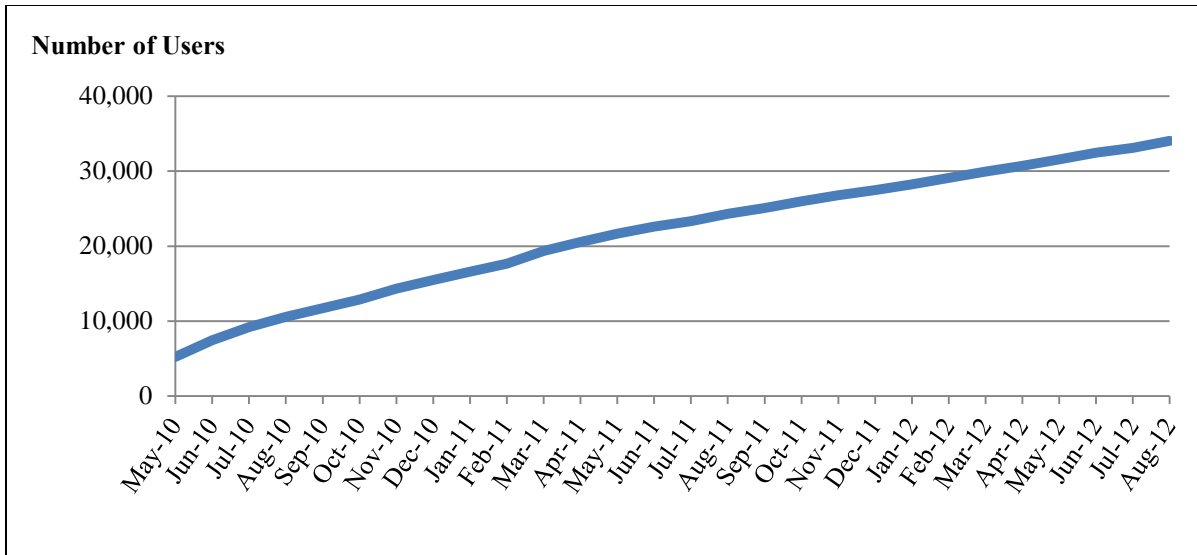


**Figure 3. Bar Chart. New PSP Account Holders by Month, May 2010–August 2012**

Source: NIC Technologies reporting to FMCSA September 2012.

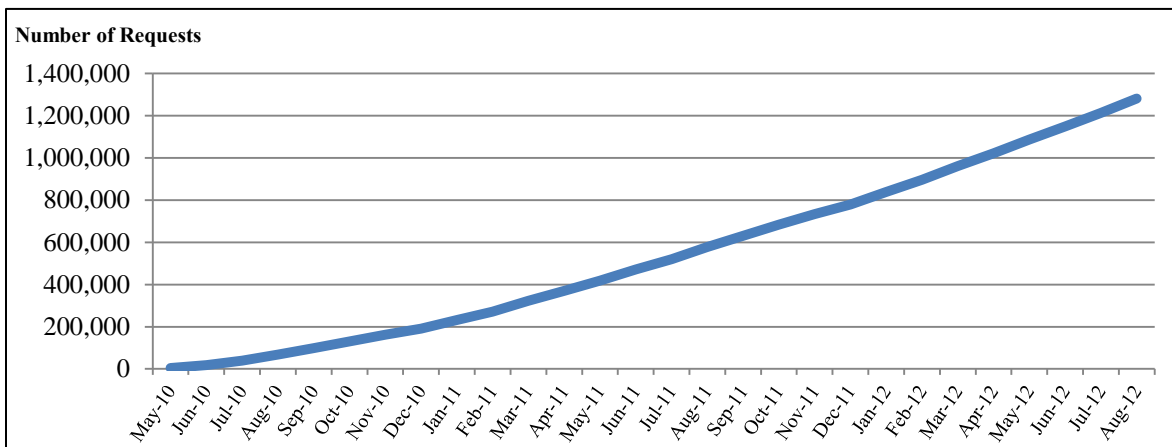
<sup>11</sup> The PSP system accepted applications in January 2010 but did not supply data to carriers until May 2010.

<sup>12</sup> Motor Carriers open accounts but a driver can access data without opening an account.



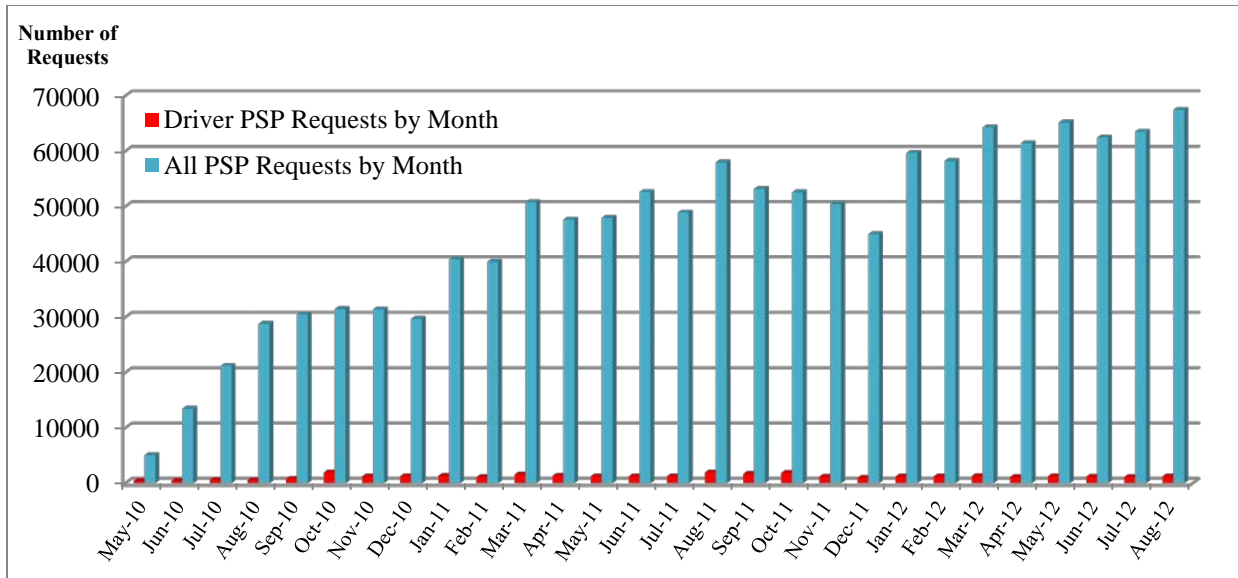
**Figure 4. Line Chart. Total PSP Users, May 2010–August 2012**  
 Source: NIC Technologies reporting to FMCSA September 2012.

An additional way to measure use of the PSP is to look at the total number of requests to the PSP system. Figure 5 shows a steady increase in requests since the program started, indicating a continued increase in use of PSP to almost 1.3 million requests since the program began distributing information in May 2010.



**Figure 5. Line Chart. Total PSP Requests by Month**  
 Source: NIC Technologies reporting to FMCSA September 2012.

Figure 6 shows the total number of requests per month (in blue) with the requests per month made by drivers in the red part of the bar graph. Driver requests make up only a small fraction of overall PSP requests. Thus far, the primary users of PSP have been motor carriers. What is apparent in this graph is that the total number of requests per month continues to increase. This is the most solid piece of evidence that more and more new-hire drivers are being hired only after their PSP file has been reviewed by their employer. It is also important to note that the actual number of drivers requesting their own PSP file may be higher, since FMCSA will provide the same information available in the PSP file for free via the Freedom of Information Act (FOIA).



**Figure 6. Bar Chart. PSP Requests by Month**

Source: NIC Technologies reporting to FMCSA September 2012.

## 4.2 COMPANY PERSPECTIVES

To present a window into the attitudes of companies that use PSP, FMCSA conducted an informal, non-scientific query with six motor carriers from different size classes to highlight how some companies use PSP. While not statistically valid for analytical purposes, this information may help serve as an insight to how some companies approach the data PSP provides. The following seven questions were asked with the answers generally summarized:

- When did you first start using the PSP?
- Do you use it for every new driver hire?
- How many drivers have you used it for in the last year?
  - <10.
  - 11–40.
  - 40–70.
  - >70.
- How do you use the PSP?
- Do you think it improves your company’s crash and inspection profile?
- Will you continue using it?
- Other comments?

All of the queried carriers have been using PSP for longer than 1 year. Overall, the motor carriers that responded to the questions found the PSP tool to be valuable and will continue to use it. One

motor carrier responded that they could not imagine hiring anyone without viewing the data in the PSP report. The motor carriers that responded obtained a PSP report on every driver they hired. The most frequent use of the report, as described by the carriers FMCSA queried, is to assure that drivers are accurately reporting all information on their applications, and not omitting places of employment or crashes.

Motor carriers responded that they can also observe if drivers have worked for companies with poor safety ratings in the past. These queried motor carriers are seeking drivers who have a strong sense of safety culture. Violations in the inspection report for pre-trip inspections, logbooks, and speeding were high on the list of concerns and were generally believed to be a better indication of a driver's safety performance than violations that the driver had less influence to avoid, such as violations resulting from an issue that it is the responsibility of the motor carrier to correct. Mostly, the motor carriers questioned believe that using PSP will help them hire the best drivers available and will improve their overall safety ratings. Motor carriers responding to FMCSA's questions indicated that drivers with good safety records were, by far, in higher demand and that they potentially could command better compensation and benefits.

Carriers provided feedback on the program regarding their desire for more information on drivers that the PSP does not provide. In particular, one motor carrier would like to have more information on drivers who lack inspections. One motor carrier noted that the system would probably be used more often if the price per report were lower. Motor carriers responding to FMCSA's questions also noted that using the PSP reports reveals a lack of available safe drivers, adding to the concern of a shortage of qualified and safe drivers.

## **5. SUMMARY AND RECOMMENDATIONS**

An initial analytical investigation reveals that carriers that use PSP have improved driver OOS and crash rates, compared to other motor carriers. Use of the PSP data for hiring has been steadily increasing since the PSP program began in May 2010. Drivers are also able to receive their PSP data, but, so far, make up only a small fraction of the requests. Anecdotally, companies that use PSP think the program has value, they use PSP for all of their hires, and they plan to continue using PSP. These companies tend to believe drivers with favorable PSP data are more in demand and, potentially, more marketable and valuable.

The PSP is still a relatively new program and its use is continuing to expand within the motor carrier industry. Thus, performing this type of analysis in following years may provide additional insight into the effectiveness of the PSP. To determine how motor carriers really use PSP data would require an official survey or other type of analytical process to fully explore carrier attitudes towards PSP. In addition, this analysis omitted even a cursory investigation into how drivers view PSP and future research would benefit by including their opinions and attitudes.

[This page intentionally left blank]

# APPENDIX A—STATISTICAL ANALYSIS FOR SIGNIFICANCE: METHODOLOGY AND RESULTS

## MEASUREMENT OF THE PRECISION OF THE ESTIMATES

For this analysis, estimates of both crash rates and OOS rates were produced for both the PSP and the non-PSP groups for the pre- and post-installation time periods. The dataset used for this analysis was at the carrier level (i.e., one data record per carrier) and, as a result, both the crash rate and OOS rate estimates for each population group and time period represent ratio estimates. In the case of crash rates, the estimator for each population group is given by,

$$R_{\text{crash}} = \frac{\sum \text{crashes during the time period}}{\sum \text{carrier power units during the time period}}$$

Figure 7. Equation. Formula to Calculate the Ratio Estimates for Crash Rates

where each summation is over all carriers in the population group. For the OOS rates, the estimator is given by,

$$R_{\text{OOS}} = \frac{\sum \text{OOS inspections during the time period}}{\sum \text{inspections during the time period}}$$

Figure 8. Equation. Formula to Calculate the Ratio Estimates for OOS Rates

where each summation is over all carriers in the population group. The improvement in carrier performance was calculated as the percent change in these ratios from the pre-PSP installation period to the post-PSP installation period. That is,

$$\text{Improvement} = \frac{R_{\text{post}} - R_{\text{pre}}}{R_{\text{pre}}}$$

Figure 9. Equation. Formula to Calculate the Improvement in Carrier Performance

where  $R_{\text{post}}$  and  $R_{\text{pre}}$  represent ratio estimates of the crash or OOS rate calculated during the post- and pre-periods, respectively. Separate estimates of  $R_{\text{crash}}$  and  $R_{\text{OOS}}$  were calculated for each combination of size group and time period (pre-installation and post-installation), yielding eight measurements for each of the two estimators in the test group, as well as eight measurements for the control group. In addition, both  $R_{\text{crash}}$  and  $R_{\text{OOS}}$  were calculated for all size groups combined for both the pre- and post-installation periods.

In the case of the improvement, defined above, the statistic was measured for each size group and for all size groups combined. Once these statistics were generated, an “adjusted improvement” statistic was calculated for each size group and for all size groups combined, by subtracting the improvement statistic for the control group from the improvement statistic for the test group (adjusted improvement equals  $\text{improvement}_{\text{test}}$  minus  $\text{improvement}_{\text{control}}$ ).

Despite the fact that all carriers using PSP and all carriers not using PSP were evaluated, the crash rate and OOS rates generated during the study were treated as statistical estimates generated from a sample rather than a census, since the data from the study only represent information collected from specific points in time. In future points in time, carrier behavior may differ, and there may be more or fewer carriers in each of the two population groups. Such a population is referred to as a superpopulation. Consequently, sampling errors were calculated for all estimates. The variance for each ratio estimator of the form,  $R$  equals the summation of each respondent's  $Y$  values, divided by the summation of each respondent's  $X$  values, can be expressed as:<sup>13</sup>

$$\text{Var}(R) = \frac{1}{n \bar{X}^2} (s_y^2 + R^2 s_x^2 - 2R \text{cov}_{yx})$$

**Figure 10. Equation. Formula to Calculate the Variance for Each Ratio Estimator**

where,

$n$  = the number of carriers in the sample,

$\bar{X}$  = the average value for the variable  $x$ ,

$s_y^2$  = the population variance for the variable  $y$ ,

$s_x^2$  = the population variance for the variable  $x$ ,

$\text{cov}_{yx}$  = the covariance between  $y$  and  $x$ .

In the case of the crash rates measured in this study,  $y$  represents the total number of crashes associated with the carrier during the time period in question, and  $x$  represents its total number of power units. In the case of the measured OOS rates,  $y$  represents the total number of OOS-related inspections associated with the carrier during the time period in question, and  $x$  represents its total number of inspections during this same period.

The variance of the improvement statistic (unadjusted) is given by,

$$\begin{aligned} \text{Var}(\text{Improvement}) &= \text{Var}\left(\frac{R_{\text{post}} - R_{\text{pre}}}{R_{\text{pre}}}\right) = \text{Var}\left(\frac{R_{\text{post}}}{R_{\text{pre}}}\right) \\ &\approx \left(\frac{R_{\text{post}}}{R_{\text{pre}}}\right)^2 \{ \text{Var}(R_{\text{post}})/R_{\text{post}}^2 + \text{Var}(R_{\text{pre}})/R_{\text{pre}}^2 + \text{Cov}(R_{\text{post}}, R_{\text{pre}})/(R_{\text{post}} R_{\text{pre}}) \} \end{aligned}$$

**Figure 11. Equation. Formula to Calculate the Variance of the Improvement Statistic**

The term  $\text{Cov}(R_{\text{post}}, R_{\text{pre}})$  in Figure 12 represents the relative covariance between the post- and pre- ratio estimates and can be calculated as follows:<sup>14</sup>

<sup>13</sup> (see Cochran, Sampling Techniques, 1977. p. 155)

<sup>14</sup> (see Cochran, Sampling Techniques, 1977. pp. 180-184)



$$\text{Cov}(R_{\text{post}}, R_{\text{pre}}) = \frac{1}{n(n-1)\bar{X}_{\text{post}}\bar{X}_{\text{pre}}} \{ \sum y_{\text{post}}y_{\text{pre}} - R_{\text{post}}\sum y_{\text{pre}}x_{\text{post}} - R_{\text{pre}}\sum y_{\text{post}}x_{\text{pre}} + R_{\text{post}}R_{\text{pre}}\sum x_{\text{post}}x_{\text{pre}} \}$$

Figure 12. Equation. Formula to Calculate the Relative Covariance Between Ratio Estimates

where,

$y_{\text{post}}$  = total carrier crashes or total carrier OOS inspections during the post-installation period,

$y_{\text{pre}}$  = total carrier crashes or total carrier OOS inspections during the pre-installation period,

$x_{\text{post}}$  = total carrier power units or total carrier inspections during the post-installation period,

$x_{\text{pre}}$  = total carrier power units or total carrier inspections during the pre-installation period.

The variance and standard error of the adjusted improvement are given by,

$$\begin{aligned} \text{Var (Adjusted Improvement)} &= \text{Var (Improvement}_{\text{test}}) - \text{Var (Improvement}_{\text{control}}) \\ \text{Standard Error (Adjusted Improvement)} &= \sqrt{\text{Var (Adjusted Improvement)}} \end{aligned}$$

Figure 13. Equation. Variance and Standard Error of the Adjusted Improvement Computation

The statistical significance of each adjusted improvement estimate was determined by calculating a 95-percent confidence interval around each estimate, using the formulas listed above to obtain the standard error estimate. The 95-percent confidence interval is obtained by taking each estimate and adding plus or minus 1.96 times the standard error of the estimate. If this interval did not include the value zero, the estimate was considered statistically significant. All calculations were performed using the SAS programming language. The standard error estimates for the improvement statistics for crash rates and OOS rates are presented below in Tables 13 and 14, respectively. The tables suggest that all net (i.e., adjusted) improvement statistics are statistically significant, except for the crash rate improvements in size classes 1 and 4. In two cases, given the size of the standard error of the estimate, the 95-percent confidence interval includes zero.

**Table 13. Standard Error Estimates for Crash Rate Improvement From Pre-Installation Period to Post-Installation Period**

Improvement, PSP Group			Improvement, Non-PSP Group		Net Improvement, PSP Group	
Driver Size Class	Crash Rate Improvement	Standard Error	Crash Rate Improvement	Standard Error	Net Crash Rate Improvement	Standard Error
1	17.1%	12.7%	4.8%	0.5%	12.4%	12.8%
2	27.8%	3.6%	7.2%	1.2%	20.6%	3.8%
3	15.8%	1.9%	3.6%	1.3%	12.1%	2.3%
4	14.4%	2.5%	10.7%	3.2%	3.7%	4.1%
<b>All Sizes</b>	<b>15.2%</b>	<b>1.4%</b>	<b>7.2%</b>	<b>1.4%</b>	<b>8.0%</b>	<b>2.3%</b>

**Table 14. Standard Error Estimates for OOS Rate Improvement From Pre-Installation Period to Post-Installation Period**

Improvement, PSP Group			Improvement, Non-PSP Group		Net Improvement, PSP Group	
Driver Size Class	OOS Rate Improvement	Standard Error	OOS Rate Improvement	Standard Error	Net OOS Rate Improvement	Standard Error
1	14.3%	8.3%	-4.0% <sup>†</sup>	0.7%	18.3%*	8.4%
2	13.0%	2.8%	1.0%	1.1%	12.0%	3.0%
3	13.4%	1.5%	3.2%	1.6%	10.1%	2.2%
4	17.8%	1.5%	5.0%	2.2%	12.8%*	2.6%
<b>All Sizes</b>	<b>16.0%</b>	<b>1.1%</b>	<b>1.2%</b>	<b>0.6%</b>	<b>17.2%</b>	<b>1.2%</b>

\*Estimate not statistically significant at the 95-percent confidence level.

†Negative number indicates OOS rates worsened.

[This page intentionally left blank]