Intrastate Motor Carrier Safety Assessment System

Feasibility and Recommended Approach

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PREFACE

This report discusses the feasibility of determining the safety status of individual intrastate motor carriers. This work has been carried out on behalf of the Federal Motor Carrier Safety Administration (FMCSA), and builds directly on previous work carried out at the U.S. Department of Transportation's John A. Volpe National Transportation Systems Center (the Volpe Center) in Cambridge, MA. The Volpe Center had designed, developed and implemented SafeStat, an automated safety status measurement system for individual interstate motor carriers. The goal of this study is to determine the feasibility of developing a SafeStat-like system for intrastate motor carriers.

In recent years, several states have expressed interest in developing a SafeStat-like system that would assess intrastate carriers in their states, to support state enforcement programs as well as the federal/state Performance and Registration Information Systems Management (PRISM) program. The study identifies the data requirements based on the needs of a SafeStat-like intrastate carrier safety assessment system. The study addresses the feasibility of implementing a safety assessment system for intrastate carriers, using currently available data at the federal level. Considerations in judging feasibility include the type, quality, and quantity of data available for intrastate carriers, and the comparability of intrastate carriers and interstate carriers. Three sample states were selected for the study, Connecticut, Kentucky and Oregon, because of their data collection efforts and participation in FMCSA's PRISM program.

This report discusses the feasibility and pitfalls of implementing an intrastate safety assessment system with currently available data. The report also recommends an approach for implementing such a system, and discusses sample results obtained by running the recommended approach.

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EXECUTIVE SUMMARY

Problem Statement

This report discusses the feasibility and pitfalls of implementing an intrastate safety assessment system with currently available data. This work has been carried out on behalf of the Federal Motor Carrier Safety Administration (FMCSA), and builds directly on previous work carried out at the U.S. Department of Transportation's John A. Volpe National Transportation Systems Center (the Volpe Center) in Cambridge, MA. The Volpe Center had designed, developed and implemented SafeStat, an automated safety status measurement system for individual interstate motor carriers. The goal of this study is to determine the feasibility of developing a SafeStat-like system for intrastate motor carriers.

Scope of Study

In recent years, several states have expressed interest in developing a safety assessment system for the intrastate carriers in their states. The goals of these states are to support state enforcement programs, as well as the federal/state Performance and Registration Information Systems Management (PRISM) program. The study addresses the feasibility of a safety assessment system for intrastate carriers using currently available data at the federal level. Considerations in judging feasibility include the type, quality, and quantity of data available for intrastate carriers, and the comparability of intrastate and interstate carriers.

Choice of Study States

A basic requirement for conducting a SafeStat-like assessment of intrastate carriers using data available at the federal level, is the ability to uniquely identify intrastate carriers by US DOT numbers and attribute their respective safety events such as crashes and roadside inspections through recording of USDOT numbers. Thus, this feasibility study focused on states that have been issuing US DOT number to intrastate carriers and had been recording USDOT numbers for safety events used in the SafeStat algorithm. Three sample states that were selected for the study, Connecticut, Kentucky and Oregon, were among the first to issue USDOT numbers to intrastate carriers and attribute safety data by these USDOT numbers at the federal level into the Motor Carrier Management Information System (MCMIS). All safety event data used in this study are from the period from March 1998 to March 2001.

Data Analysis

Analysis was conducted on the intrastate data to help determine the feasibility and approach to implementing a SafeStat-like assessment on intrastate carriers in the study states. The results of the analysis showed that:

- Ability to match safety events to the proper intrastate carrier improved with time and was approaching the level observed nationally for interstate carriers, thereby suggesting that the data requirements could be met for employment of a SafeStat-like methodology.

- The numbers of intrastate carriers meeting data sufficiency criteria for assessment are small, but growing significantly.
- There were significant differences between interstate and intrastate safety performance measures collectively in all three states and between the intrastate carriers in different states. To what extent these variations are based on actual safety differences or on differences in how safety data are collected by each state, is uncertain. While these observed differences in safety measures do not preclude the ability to conduct a SafeStat-like approach on intrastate carriers, they do emphasize that a state's ability to implement the same data collection procedures for interstate and intrastate carriers in a complete and consistent fashion is an important influence on the feasibility of obtaining accurate results.

Evaluation of Candidate Approaches

A number of candidate approaches to assessing the safety of intrastate carriers were considered in this study. The following five criteria are used to evaluate the candidate approaches:

A. ***Sufficient size of carrier pool.*** Prior work on interstate SafeStat indicates that comparison amongst groups of less than 100 carriers can yield less than desirable outcomes.
B. ***Comparability of carriers in pool.*** Data must be collected in a consistent and complete manner.
C. ***Integrity of existing assessment system.*** Any viable approach must not compromise the integrity and accuracy of current SafeStat results for interstate carriers.
D. ***Holding carriers to a common standard.*** By applying the same standards to intrastate carriers as are currently being applied to interstate carriers, one ensures a consistent SafeStat assessment for all carriers. Carrier to carrier consistency is critical for integrating the intrastate results into safety programs, such as PRISM, ISS and PrePass, that currently only include interstate carriers.
E. ***Ease of implementation.*** The recommended approach should not be excessively difficult to implement and maintain.

Recommended Approach: "Benchmarked SafeStat"

Currently, each interstate carrier's SafeStat results are based on safety measures such as accident rates and OOS rates, which are compared with the safety measures of all other interstate carriers with similar amounts of safety events such as number of crashes and inspections. All of the interstate carriers' measures are ranked on their numerical value and are assigned a percentile value ranging from 0 (representing the lowest measure) to 100 (representing the highest measure).

An approach dubbed "Benchmarked SafeStat" was judged to be the most likely to yield accurate and meaningful results for intrastate carriers. To obtain intrastate carrier results, the "Benchmarked SafeStat" approach compares an individual intrastate carrier's safety measures to the measures benchmarked by SafeStat for the entire population of *inter*state carriers. This is accomplished by creating a "lookup" table of measures and associated percentile values based on the latest interstate SafeStat run. Then each intrastate carrier's

measures are compared to the "lookup" table to determine the associated percentile ranking.

This approach effectively assesses the intrastate carrier's safety status relative to the safety status of all interstate carriers without pooling the intrastate carriers in the full interstate SafeStat run. This approach also has the clear advantages having a sufficient carrier pool size, not affecting the interstate carrier SafeStat results in any way, holding all carriers (intrastate and interstate) to the same standard, and is easy to implement using data available in MCMIS.

Results of "Benchmarked SafeStat" in the Three Study States

The "Benchmarked SafeStat" approach to assessing the safety of intrastate carriers was tested using March 2001 MCMIS data. Among the three study states, 29 intrastate carriers received SafeStat scores (i.e., 2 or more SEA values of 75 or higher); of these, 6 were from CT, 10 from KY, and 13 from OR.

A total of 423 carriers, or almost 20% of the 2,216 intrastate carriers meeting data sufficiency criteria, had at least one deficient SEA value (i.e., SEA value of 75 or higher). These 423 intrastate carriers represents 17% of <u>all</u> carriers (intrastate and interstate) that had at least one deficient SEA value for the three study states (2,501). This 17% figure is close to the intrastate portion of all vehicles operated by the study state domiciled carriers of 21%. These figures show that the "Benchmark SafeStat" approach successfully identified problem intrastate carriers in proportion to relative size of intrastate operations domiciled in the study states.

Using the results of this study, the state of Connecticut exercised its newly legislated authority to do compliance reviews on intrastate carriers, and conducted compliance reviews on 4 of their 6 SafeStat scored intrastate carriers. All four of these carriers were found to have serious acute or critical violations leading to one carrier receiving an unsatisfactory safety rating and another receiving a conditional safety rating. Connecticut's compliance review results provide real-life confirmation that the "Benchmarked SafeStat" approach can be successful as a means of identifying problem intrastate carriers for safety programs.

Requirements for Obtaining Intrastate Carrier SafeStat Results

Based on the results of the three study states, it appears feasible to employ a "Benchmarked SafeStat" approach to assess the safety status of individual intrastate carriers. The success of accurately assessing the safety of intrastate carriers is based on the quality and quantity of the data going into the assessment. Therefore, before states can hope to have useful intrastate SafeStat results, the following conditions need to be met:

1. The state must issue US DOT numbers and collect motor carrier census information on sizable proportion of intrastate carriers domiciled in the state. Additionally, these carriers must have had USDOT numbers for a sufficient length of time (ideally 30 months) for there to be meaningful safety event data attributable to them.

2. The state uploads all its intrastate safety data (e.g. crash, inspection, traffic enforcement, compliance reviews) into the MCMIS for a timeframe of 30 months.
3. The state collects comprehensive intrastate carrier crash and inspection data, attributed to specific carriers using USDOT numbers, and subjects intrastate carriers to *similar scrutiny* to what is being accomplished at a national level in terms of recording their crashes, conducting roadside inspections, and conducting compliance reviews. The following are examples of situations that would preclude the state from having comprehensive safety data on intrastate carriers:
   - The state's accident recording is poor for reportable crashes that occur on local roadways. This can likely cause intrastate carrier crashes to be under-reported.
   - The state focuses a disproportionately large amount of their resources on inspecting interstate carriers. For instance, if a state performs most of the inspections at entry points to the state, the chances of obtaining intrastate carrier inspections are diminished.
   - The state does not record and upload crash/inspection data in a complete and timely matter.
   - The state does not make an effort to record the USDOT numbers properly on intrastate inspections and crashes.

As states meet the data reporting requirements, they can receive safety assessments of their intrastate carriers. The intrastate results can be calculated along with each full SafeStat run and can be incorporated into the safety programs in which the state is interested, such as prioritization of compliance reviews, the Inspection Selection System (ISS), PrePass, etc. This will ultimately provide the states with ability to regulate their intrastate carriers with the same level of scrutiny as the interstate carriers.

Future Work

- Continue to generate intrastate carrier assessments using the "Benchmarked SafeStat" approach to coincide with every full SafeStat run for Connecticut, Kentucky and Oregon.
- Examine other states' intrastate carrier data available in MCMIS to find other potentially eligible states to receive intrastate carrier safety assessments.
- Assist states interested in intrastate carrier safety assessments in meeting the requirements to ultimately become eligible to receive meaningful intrastate results.

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CHAPTER 1. INTRODUCTION

1.1 Project Objective

The Federal Motor Carrier Safety Administration (FMCSA) sponsored the development of an automated, data-driven methodology to measure the safety status of interstate motor carriers for the purpose of identifying and prioritizing carriers for FMCSA safety programs. FMCSA has used SafeStat to assess the safety performance and compliance of interstate motor carriers first in a program with five participating states since 1995 and nationwide since 1997. SafeStat, a data-driven system, bases its assessment of an individual carrier on the carrier's safety performance and compliance relative to other *interstate* carriers. In recent years, several states have expressed interest in developing a similar system that would assess *intrastate* carriers in their states, which are currently not covered under the national implementation of SafeStat. The goals of these states are to support state enforcement programs, as well as the federal/state Performance and Registration Information Systems Management (PRISM) program. The PRISM program currently ties the safety fitness of *interstate* motor carriers to state commercial vehicle registrations.

The objective of this study is to examine the feasibility of and evaluate the options for developing a SafeStat-like safety assessment system for intrastate carriers. The data requirements are first identified, based on the needs of a SafeStat-like system. Considerations in judging feasibility include the type, quality, and quantity of data available for intrastate carriers, and the comparability of intrastate and interstate carriers. Once the most feasible option has been selected, this study then focuses on implementing the selected approach and verifying the results.

1.2 Choice of Study States

An intrastate motor carrier assessment system requires that the data from important safety events be attributed to the unique carriers involved. It is also preferable that such data are stored in a centralized database. For these reasons, the analysis focuses on the states of Connecticut, Kentucky, and Oregon. These states were among the first to issue USDOT numbers to intrastate carriers, and attribute safety data by these USDOT numbers at the federal level into the Motor Carrier Management Information System (MCMIS). Connecticut, Kentucky, and Oregon have been collecting intrastate carrier data during the 30-month period of time covered by the March 2001 SafeStat run. All safety event data used in this study are from the period from September 1998 to March 2001.

1.3 Organization of Report

The remainder of this report is structured as follows. Chapter 2 presents analysis of carrier-based safety data. The analyses performed include: an assessment of the ability to attribute safety event data to unique carriers, an assessment of the sufficiency of safety event data for a SafeStat-like analysis, and a comparison of the safety measures for intrastate and interstate carriers.

Chapter 3 uses the results of the analysis from Chapter 2, to determine the advantages and disadvantages of alternate intrastate carrier safety assessment approaches, and identifies a recommended approach.

Chapter 4 describes the implementation of the approach recommended in Chapter 3, and presents the results obtained using this approach.

Chapter 5 presents the conclusions of the study and the requirements for states to obtain useful intrastate carrier safety assessments using the recommended approach.

CHAPTER 2. DATA ANALYSIS

This chapter is concerned with an examination of the quality and quantity of existing safety data on intrastate carriers from the Motor Carrier Management Information System (MCMIS) databases to evaluate the following:

1. Is it feasible to perform a SafeStat-like assessment for intrastate carriers in the selected study states?
2. If it is feasible, what are the advantages and disadvantages of the different approaches, and which approach is preferred?

Sections 2.1 – 2.3 briefly summarize results from an earlier report, *Safety Assessment System for Intrastate Carriers: Feasibility, Data Analysis, and Recommendations* (Volpe Center, December 2000), and provide updated results using more recent data (September 2001). The three sections deal with the following three issues, respectively:

1. Ability to attribute safety event data to a unique intrastate carrier
2. Sufficiency of data for conducting a meaningful safety assessment
3. Variations in interstate and intrastate safety performance measures

Section 2.4 presents the conclusions of the analysis with regard to feasibility and choice of an approach to assessing the safety of intrastate carriers.

The two data runs referred to (September 2000 and March 2001) each cover a time period of 30 months ending in the specified month. Thus, the September 2000 data run includes crashes, inspections, and moving violations occurring between March 1998 and September 2000, and the March 2001 run includes crashes, inspections, and moving violations occurring between September 1998 and March 2001, resulting in a 24-month overlap in the time period covered in each run.

2.1 Ability to Attribute Safety Event Data to Unique Intrastate Carriers

The amount and completeness of safety event data attributed to a particular carrier determines the ability to accurately assess the carrier's safety status through a SafeStat-like system. To determine the ability to link intrastate carrier safety event data to specific entities, the match rate (the percentage of safety event data that can be attributed to specific carriers via USDOT numbers) for each type of data was calculated.

2.1.1 September 2000 Results

An analysis was conducted to ensure that carriers identified as intrastate by the states were not involved in safety events (i.e., crashes and roadside inspections) outside of their states of domicile. Of all carriers with crashes/inspections and identified as intrastate, 6% were linked to crashes outside of the domicile states and 14% were linked to inspections outside of the domicile states. Based on discussions with enforcement officials, it is believed that the observed out-of-state events linked to intrastate carriers were most likely a problem with carriers violating their intrastate operating authority.

Overall, the match rates for intrastate carriers were found to be substantially lower than the match rates for interstate carriers, as shown in the summary results below, and in detailed tabulation (Volpe Center, December 2000):

- Intrastate carrier crash match rate: 55% (vs. 97% for interstate carriers)
- Intrastate carriers roadside inspection match rate: 68% (vs. 98% for interstate carriers)

If these low match rates for intrastate safety events arose from actual problems with matching intrastate safety events to specific carriers, they would hinder the implementation of a SafeStat-like assessment of the safety of intrastate carriers. However, further analysis of the match rates of intrastate data, and consultation with state officials in two of the study states, CT and KY, indicated that at least two factors had contributed to these apparently low match rates.

First, start-up issues had contributed to the low match rates. The match rates of most intrastate safety event data for each state improved significantly over the course of the observed 30-month time period.

A second factor contributing to the apparently low match rates, especially for crash data, was the inclusion of exempt carriers (i.e., carriers not required to have a USDOT number) in the safety event data. The Model Minimum Uniform Crash Criteria (MMUCC) requires that states record crashes of a whole range of entities in the MCMIS crash file that are exempted from requiring USDOT numbers, and, therefore, do not appear in the MCMIS Census file. These entities include state and local governments, school districts, churches, and other public and private entities that operate both freight and passenger vehicles.

2.1.2 March 2001 Results

Match rates as defined in Section 2.1.1 were recalculated using data from the March 2001 SafeStat run. An improvement was made to the analysis methodology and an attempt was made to eliminate unmatched inspections and crashes attributable to exempt carriers. The approach entailed using the name of the carrier as a basis for elimination. Carriers named with phrases such as “school district,” “city of,” “town of,” “county of,” “state of,” “of transportation,” were eliminated from consideration. The resulting match rates for crashes and inspections, respectively, are shown in Tables 2.1 and 2.2 below.

By eliminating the unmatched exempt intrastate crash data, the September 2000 match rate calculated in the prior report for the three study states went up from 55 percent to 74 percent. A more modest improvement in the intrastate crash match rate was seen from September 2000 (74 percent) to March 2001 (80 percent). While the intrastate crash match rate of 80 percent is lower than the interstate crash match rate of 97 percent for the three study states, it is very close to the national interstate crash match rate of 86 percent.

Table 2.1 Match Rates for Interstate and Intrastate Carrier Crash Data.

State	Interstate crash match rate		Intrastate crash match rate	
	September 2000	March 2001	September 2000	March 2001
U.S.	**82%**	**86%**	**n/a**	**n/a**
CT	97%	97%	78%	72%
KY	97%	96%	72%	80%
OR	98%	99%	76%	84%
Total, 3 states	**97%**	**97%**	**74%**	**80%**

The March 2001 inspection match rate results (Table 2.2) show a small improvement over the September 2000 match rate results, going up from about 68 percent to 73 percent. Most of the improvement is attributable to start-up effects, since the inspection records do not contain a significant number of exempt carriers.

A detailed examination of unmatched intrastate inspections during a site visit to Connecticut Department of Motor Vehicles (CTDMV) revealed one possible reason for the existence of unmatched intrastate inspection records. CTDMV had a policy (since then discontinued) of performing inspections on intrastate carriers filing for (or renewing) their registration, and in many instances (for example with new entrants) these carriers would not have pre-existing USDOT numbers; they would be assigned a USDOT number only at the end of the registration process. Therefore, the record for this initial inspection would not have a USDOT number associated with it. According to CTDMV officials, this is the explanation for a majority of the unmatched intrastate inspection records from Connecticut.

Table 2.2 Match Rates for Interstate and Intrastate Carrier Inspection Data.

State	Interstate inspection match rate		Intrastate inspection match rate	
	September 2000	March 2001	September 2000	March 2001
U.S.	**91%**	**92%**	**n/a**	**n/a**
CT	96%	96%	74%	73%
KY	98%	98%	70%	69%
OR	98%	99%	64%	78%
Total, 3 states	**98%**	**98%**	**68%**	**73%**

The conclusion is that a large amount of matched intrastate crash and inspection data do exist, and that the trend in the match rate is moving in the right direction, albeit slowly. This finding strengthens the case for the feasibility of an intrastate carrier safety assessment system since it suggests that the data requirements could be met for employment of a SafeStat-like methodology.

2.2 Sufficiency of Safety Event Data

SafeStat also requires a sufficient amount of event data about an individual carrier over the 30-month period of analysis to evaluate its safety status. These criteria are:

1. At least 2 crashes
2. At least 3 driver inspections
3. At least 3 vehicle inspections
4. At least 3 moving violations in conjunction with roadside inspections

Intrastate carriers tend to be smaller operations than interstate carriers (on average, operating half the number of power units of interstate carriers). In general, this fact reduces the chances of individual intrastate carriers being involved in safety events and meeting the data sufficiency standards required by SafeStat. However, as the match rates for intrastate carrier safety data improve, the number of intrastate carriers meeting data sufficiency standards will also improve.

The criteria listed were used to generate numbers of intrastate carriers from the September 2000 and the March 2001 data run which meet SafeStat data sufficiency criteria. The results are shown in Table 2.3 below.

Table 2.3 Intrastate Carriers Meeting Data Sufficiency Criteria.

Data Sufficiency Criterion	No. of Intrastate Carriers (September 2000)			No. of Intrastate Carriers (March 2001)		
	CT	KY	OR	CT	KY	OR
2 or more Crashes	17	53	16	14	48	35
3 or more Drivers Inspections	231	771	440	308	890	937
3 or more Drivers OOS Inspections	3	8	1	6	22	16
3 or more Vehicle Inspections	240	510	458	315	623	954
3 or more Vehicle OOS Inspections	65	112	111	79	138	296
3 or more Moving Violations	6	53	67	2	44	64

There has clearly been significant increase in the numbers of inspections being performed on intrastate carriers with commensurate large increases in the numbers of carriers with at least 3 driver and vehicle inspections, and those with at least 3 driver and vehicle out-of-service inspections. This was the case for all three states. For crashes and moving violations, however, the numbers of carriers meeting data sufficiency criteria have not changed significantly.

2. 3 Interstate and Intrastate Safety Performance Measures

Intrastate motor carrier census information and the following safety event data collected in the three states were examined and the associated performance measures were calculated:

1. Crash Data: Crash Rate in terms of the number of crashes normalized by the number of power units.
2. Driver and Vehicle Inspection Data:
   a) Driver Out-of-service (OOS) Rates in terms of the number of drivers placed OOS normalized by the number of driver inspections.

b) Vehicle Out-of-service (OOS) Rates in terms of the number of vehicles placed OOS normalized by the number of vehicle inspections.

3. Moving Violations Data: Moving Violation Rate in terms of the number of moving violations collected during roadside inspections normalized by the number of drivers.

This section discusses the above data for intrastate as well as interstate carriers from the three study states obtained from the September 2000 and March 2001 data sets acquired in conjunction with biannual SafeStat runs.

2.3.1 September 2000 Results

The SafeStat approach to assessing motor carrier safety is based on a relative comparison of each carrier's performance measures to its peers. As a general peer group intrastate carriers appear to have significant differences when compared to interstate carriers. The following differences and similarities for intrastate and interstate operators' safety performance were observed:

- Crash Rates: Based on the matchable crashes, the intrastate carriers had a crash rate about half that of the interstate carriers.
- Roadside Inspections: Intrastate carrier's drivers and vehicle were not inspected as frequently as the drivers and vehicles of interstate operators. Intrastate carriers domiciled in the three states represented over 20% of the drivers and vehicles but only 5% of the inspections.
- Driver OOS Rates: Intrastate carrier drivers had a lower OOS rate (5.7%) than interstate carrier drivers who were inspected in the same 3 states (9.3%).
- Vehicle OOS Rates: Intrastate carrier vehicles had a higher OOS rate (32%) than interstate carrier vehicles that were inspected in the states (21%).
- Moving Violation Rates: Intrastate carrier drivers had a lower moving violation rate of 58 moving violations per 1,000 drivers than the interstate drivers domiciled in the states (149 moving violations per 1,000 drivers).

Another consideration when comparing the safety performance measures of intrastate carriers to those of interstate carriers is that an intrastate carrier is under the direct influence of the domicile state's safety program and data collection, whereas an interstate carrier is subjected to the influence of multiple states. If a state's safety program or data completeness deviates substantially from the rest of the nation, then it will more heavily impact the overall results of that state's intrastate carriers than its interstate carriers. For example, Connecticut records far fewer moving violations in conjunction with roadside inspections than Kentucky, Oregon, or the national average. Only 6 Connecticut intrastate carriers had 3 or more moving violations, while Kentucky and Oregon each had about 10 times that number.

2.3.2 March 2001 Results

Table 2.4 below shows the comparative crash rates per 1,000 power units for intrastate and interstate carriers.

Table 2.4. Cumulative Crash Rates for Interstate and Intrastate Carriers (Crashes per 1000 PU)

Domicile State	September 2000		March 2001	
	Interstate	Intrastate	Interstate	Intrastate
U.S.	**46**	**n/a**	**39**	**n/a**
CT	35	15	26	15
KY	49	25	40	28
OR	51	11	45	27
Total, 3 states	**45**	**18**	**38**	**24**

The results for March 2001 are comparable to the earlier results obtained from September 2000 data, with the exception of the crash rate for Oregon intrastate carriers. The number of recorded intrastate crashes for Oregon more than doubled. However, this doubling puts OR in line with KY, and the intrastate carriers continue to have a significantly lower crash rate than interstate carriers.

The results in Table 2.4 indicate that, for whatever reason (whether it is an incomplete count of intrastate crashes, or a lower crash rate in actuality because of differences in operation), intrastate carrier crash rates are significantly lower than interstate carrier crash rates. In each of the states, the intrastate crash rate is about 60 to 70 percent of the interstate crash rate. Also noteworthy is the difference in crash rates for intrastate carriers between the study states; the crash rate for CT intrastate carriers is significantly lower than the corresponding rates for the other two states.

Table 2.5 below shows the comparative driver out-of-service rates for intrastate and interstate carriers obtained from both the September 2000 run and the March 2001 run.

Table 2.5. Driver OOS Rates for Interstate and Intrastate Carriers

Domicile State	September 2000		March 2001	
	Interstate	Intrastate	Interstate	Intrastate
CT	14.2%	8.0%	14.0%	8.2%
KY	8.2%	4.0%	7.8%	5.1%
OR	9.5%	3.4%	9.2%	4.7%
Total, 3 states	**9.3%**	**4.4%**	**9.3%**	**5.3%**

National Interstate Driver OOS Rate (March 2001) = 8.3%

The interstate driver OOS rates are essentially the same as in the September run. The intrastate driver OOS rates, however, show an increase although still substantially below the interstate OOS rates. The state-to-state variation is similar between the September 2000 and the March 2001 run, i.e. the relative ranking of the driver OOS rates for the three states remains the same, both on the interstate side and the intrastate side.

To determine the reason intrastate driver OOS rates are lower than interstate rates, the types of driver OOS violations were examined. Hours-of-service (HOS) and log book violations comprised roughly three quarters of all driver OOS violations cited to interstate carriers, but only 15% of intrastate driver OOS violations. This is to be expected because

many of the intrastate drivers are not required to keep logs, thereby making logbook violations inconsequential and HOS violations hard to discover. Also, the short-haul nature of many intrastate firms may make it less likely for such operations to violate HOS regulations relative to their longer-hauling interstate peers.

While the interstate drivers are much more likely to be issued an HOS or logbook OOS violation than intrastate drivers, intrastate drivers were found to be twice as likely to be issued non-HOS/logbook driver OOS violations. This partially offsets the intrastate/interstate driver OOS rate discrepancy caused by HOS and logbook violations.

Table 2.6 shows the vehicle out-of-service rates for interstate and intrastate carriers.

Table 2.6. Vehicle OOS Rates for Interstate and Intrastate Carriers

Domicile State	September 2000		March 2001	
	Interstate	Intrastate	Interstate	Intrastate
CT	35%	42%	31%	39%
KY	18%	25%	16%	26%
OR	20%	35%	19%	34%
Total, 3 states	**21%**	**32%**	**19%**	**32%**

National Interstate Vehicle OOS Rate (March 2001) = 22%

The vehicle OOS rates for intrastate carriers are consistently higher than for interstate carriers, and have remained essentially unchanged between the September 2000 and the March 2001 run.

Table 2.7 shows the moving violation rates for interstate and intrastate carriers.

Table 2.7. Intrastate and Interstate Moving Violation Rates (Moving Violations per 1000 Drivers)

Domicile State	September 2000		March 2001	
	Interstate	Intrastate	Interstate	Intrastate
CT	36	26	32	4
KY	180	51	202	36
OR	208	102	233	91
Total, 3 states	**149**	**58**	**164**	**43**

National Moving Violation Rate for Interstate Carriers (March 2001) = 129

The intrastate moving violation rate is consistently lower than the interstate moving violation rate, and varies considerably between the states. Note that CT has significantly lower moving violation rates than the other states, on both the intrastate and interstate side.

2.4 Conclusions from Data Analysis

2.4.1 Match rates

The analysis in section 2.1.2 shows that it is possible to attribute a significant (and growing) share of crashes and roadside inspections to unique intrastate carriers using a USDOT number (80% and 73%, respectively). This is a strong argument for the feasibility of an intrastate carrier safety assessment based on SafeStat methodology.

In spite of the fact that the matching of safety event data to specific intrastate carriers was found to be incomplete within the three states, there was a significant amount of safety event data attributable to unique intrastate motor carriers. This fact illustrates that the efforts of the states in (1) assigning USDOT numbers to intrastate carriers, and (2) recording the safety events involving intrastate carriers, provide the opportunity to develop safety profiles of many individual intrastate motor carriers.

2.4.2 Data sufficiency

The analysis in section 2.2.2 shows that the numbers of intrastate carriers meeting data sufficiency criteria for assessment are small, but growing significantly. As with the match rates, this is further evidence of the feasibility of a SafeStat-like procedure for assessing increasing numbers of intrastate carriers in the states.

2.4.3 Safety measures

Two overall conclusions from the analysis of safety measures for intrastate and interstate carriers in section 2.3.2 are:

1. There are considerable differences between intrastate carriers and interstate carriers for the examined safety measures.
2. There are differences between the different states when comparing the safety measures for intrastate carriers.

To what extent these variations are based on actual safety differences between intrastate and interstate carriers and between operations in different states, or on differences in how safety data are collected by each state, is uncertain. General differences in safety measures between intrastate carriers and interstate carriers does not preclude the ability to assess the relative safety of individual intrastate carriers and interstate carriers as long as the same collection procedures are being implemented completely and consistently.

CHAPTER 3. EVALUATION OF APPROACHES

Five candidate approaches to assessing the safety of intrastate carriers were considered in this study. This chapter provides an evaluation of the five candidate approaches by applying the following criteria and recommends an approach that is the most likely to yield accurate and meaningful results.

3.1 Criteria for Evaluation

The following five criteria are used to evaluate the candidate approaches:

A. ***Sufficient size of carrier pool.*** SafeStat is a system of comparative assessment, in which basic safety measures for a carrier (such as crash rates and out-of-service rates) are compared to the corresponding measures for other carriers. The comparative analysis yields percentile rankings for each of the SafeStat indicators. However, for a carrier to be eligible for a percentile ranking, it must meet the corresponding data sufficiency criterion shown in Table 2.3. To produce percentile rankings that are meaningful and consistent over time requires a sufficient number of carriers to compare with each other. Based on prior work on the interstate SafeStat, the smallest comparison group in SafeStat was just under a 100 carriers. Comparing groups of carriers smaller than this may result in less than desirable outcomes.

B. ***Comparability of carriers in pool.*** SafeStat results are based on comparing carriers with similar amounts of safety data to each other to obtain relative measures of their safety. In order for SafeStat to provide the most accurate results, the SafeStat data from the carriers that are being assessed has to be collected in a consistent and complete manner.

C. ***Integrity of existing assessment system.*** Any viable approach must not compromise the integrity and accuracy of current interstate SafeStat results.

D. ***Holding carriers to a common standard.*** For several of the interested states, one of the key attributes of an intrastate carrier assessment system is to hold intrastate carriers to the same safety standard as interstate carriers. By holding all carriers to a common standard, the type of operation – interstate, intrastate hazmat, and intrastate non-hazmat – will not influence a carrier's safety status; the safety status will be influenced by safety performance alone. A common standard also ensures one consistent SafeStat assessment for each carrier which is critical for integrating the intrastate results into safety programs that currently only include interstate carriers such as ISS and PrePass.

E. ***Ease of implementation.*** It is advantageous that the recommended approach not be excessively difficult to implement and maintain. Also, the impact of start-up issues should be kept to a minimum.

3.2 Assessments of Candidate Approaches

Recommended Approach

"Benchmarked SafeStat"

Each interstate carrier's SafeStat results are based on safety measures such as accident rates and OOS rates, that are compared to the safety measures of all other interstate carriers with similar amounts of safety events such as number of crashes and inspections. All of the interstate carriers' measures are ranked by their numerical value and are assigned a percentile value ranging from 0 (representing the lowest measure) to 100 (representing the highest measure). To obtain intrastate carrier results, the "Benchmarked SafeStat" approach compares an individual intrastate carrier's safety measures to the measures benchmarked by SafeStat for the entire population of *inter*state carriers. This is accomplished by creating a "lookup" table of measures and associated percentile values based on the latest interstate SafeStat run. Then each intrastate carrier's measures are compared to the "lookup" table to determine the associated percentile ranking. This approach effectively assesses the intrastate carrier's safety status relative to the safety status of all interstate carriers without pooling the intrastate carriers in the full interstate SafeStat run.

"Benchmarked SafeStat" approach is currently being implemented in the monitoring phase on PRISM's Motor Carrier Safety Improvement Process for interstate carriers. This approach has provided SafeStat results for selected individual interstate carriers on-demand without having to recalculate the results of all interstate carriers.

Criteria:

A. *Sufficient size of carrier pool* – Pass. Individual intrastate carrier measures are compared to the measures benchmarked by all interstate carriers. Thus, the resulting percentile rankings of the intrastate carriers are based on a sufficient carrier pool size.
B. *Comparability of carriers in pool* – Questionable. The analysis in Chapter 2 noted some differences between intrastate and interstate carriers. This is a concern given that this approach compares intrastate safety measures to interstate safety measures. The match rates for the intrastate safety data in the three study states were lower, but not considerably lower, than the safety data of all interstate carriers. State-to-State differences in collecting safety data were also noted in Chapter 2. While State-to-State differences adversely affect the interstate SafeStat results, some of these problems are mitigated by the fact that these carriers by definition are operating in multiple states, thereby "averaging out" the affects of State-to-State differences over multiple states. Intrastate carrier safety data are completely dependent on the data collection of the domicile state. The only way to see if these differences and the general differences in interstate and intrastate safety measures (also noted in Chapter 2) make this approach infeasible is to run it and examine the outcome. The results of this analysis are shown in Chapter 4, where it is concluded that despite the potential problems with satisfying this criterion, this approach can produce meaningful results.

C. *Integrity of existing assessment system* – Pass. Basing intrastate results strictly on the benchmarked interstate results has no effect on the interstate results.
D. *Holding carriers to a common standard* – Pass. Benchmarking assures a common standard.
E. *Ease of implementation* – Pass. This approach is already being implemented for interstate carriers in PRISM states.

Other Considered Approaches

Full SafeStat Approach

This approach combines all carriers with USDOT numbers (both interstate and intrastate carriers) and runs SafeStat.

Problem Criteria:
C. *Integrity of existing assessment system* – Fail. This approach places all carriers (interstate and intrastate carriers) into the same pool. The influx of a large number of intrastate carriers will alter the ranking of interstate carriers. The non-matching data and start-up problems for intrastate carriers will not just impact the assessment of intrastate carriers but will bias the percentile rankings for interstate carriers.

State-Specific Intrastate SafeStat Approach

This approach uses a state-specific SafeStat methodology that compares safety measures of intrastate carriers within the same domiciled state.

Problem Criteria:
A. *Sufficient size of carrier pool* – Fail. Many states, especially small states, will not have enough intrastate carriers with sufficient data to produce meaningful and stable percentile ranking.
D. *Holding carriers to a common standard* – Fail. Intrastate carriers will be held to standard relative to only intrastate carriers with the state and SafeStat will continue to hold interstate carriers to a standard that is relative to all interstate carriers nationally. These two standards will be different.
E. *Ease of implementation* – Fail. This approach would require each state to have its own methodology, thus potentially leading to 50 different motor carrier safety assessment programs.

Note that the above problems are mainly from the standpoint of implementing a SafeStat-like assessment system based on MCMIS data. If a state has a sizable pool of intrastate carriers, has the means to attribute safety data to these carriers (whether through a USDOT number or some other unique identifier), and collects complete, accurate safety event data for these carriers, then they can develop their own safety assessment system. The state of Missouri has implemented such an approach successfully.

Individual State SafeStat Approach

This approach uses a state-specific SafeStat methodology that compares safety measures of all carriers (both interstate and intrastate) domiciled within the same state.

Problem Criteria:

A. *Sufficient size of carrier pool* - Fail. While including domiciled interstate carriers in the ranking process increases the chance of having enough motor carriers to produce meaningful percentile ranking over the State-Specific Intrastate Approach, many small states will not have enough carriers with sufficient data to produce meaningful and stable percentile ranking.
D. *Holding carriers to a common standard* – Fail. Interstate carriers would have two different assessments: (1) using this approach – relative measure of their safety compared to all carriers domiciled within their state and (2) full SafeStat – relative measure of their safety compared to all interstate carriers nationally. This will provide interstate carriers with two different results.
E. *Ease of implementation* - Fail. This approach would require each state to have its own methodology, thus potentially leading to 50 different motor carrier safety assessment programs.

National Intrastate SafeStat Approach

This approach pools all intrastate carriers nationally and compares safety measures relative to one another.

Problem Criteria:

B. *Comparability of carriers in pool* – Questionable. While this approach mitigates the potential problems caused by general differences in safety measures between intrastate and interstate carriers by only using intrastate carriers, there are still potential problems caused by the state differences in safety programs and data collection.
D. *Holding carriers to a common standard* – Fail. The intrastate carriers will be held to a different standard than interstate carriers.
E. *Ease of implementation* – Fail. Another SafeStat program to run and maintain. Start-up issues will have to be thoroughly analyzed. For example, each state's intrastate data will have to be examined before including it in the national intrastate carrier pool due to the potential of sub-par quality data biasing the overall results.

3.3 Recommended Approach

The "Benchmarked SafeStat" approach, which compares an individual intrastate carrier's safety measures to the measures benchmarked by SafeStat, is the preferred approach. It has the clear advantages having a sufficient carrier pool size, not affecting the interstate carrier SafeStat results in any way, holding all carriers (intrastate and interstate) to the same standard, and is easy to implement. While these advantages are essential to meeting fundamental methodology criteria, the only major concern with this approach is the

comparability of intrastate and interstate carrier safety measures. The ability to meet this criterion is mostly based on each state's ability to consistently and completely collect safety event data on intrastate carriers in a similar fashion to how data are collected nationally on interstate carriers. While some of the analysis in Chapter 2 shows that the data on intrastate carriers are less than perfect, the implementation of this approach, described in the next chapter, provided meaningful results that will only improve as the data improves. It is clear that the advantages of this approach outweigh the potential disadvantages and make this approach superior to the other candidate approaches.

CHAPTER 4. IMPLEMENTATION OF RECOMMENDED APPROACH

The "Benchmarked SafeStat" approach to assessing the safety of intrastate carriers was tested using March 2001 MCMIS data. This chapter discusses the methodology of the approach, the results of the test implementation, and verification of the results by CT enforcement.

4.1 "Benchmarked SafeStat" Methodology

The first step in testing the "Benchmarked SafeStat" for use in assessing the safety status of intrastate carriers was to identify intrastate, non-hazmat carriers domiciled in the states from the MCMIS Census file. Once this subset of the Census file was created, the crash, inspection, and moving violation records for these carriers over the 30-month period for the March 2001 SafeStat run were found by matching the DOT number from the Census to the DOT numbers of the safety event records. The accident involvement, driver inspection, vehicle inspection, and moving violation measures were calculated for these carriers using the SafeStat methodology. As of March 2001, MCMIS was not set up to accept compliance review or closed enforcement case data of intrastate carriers, therefore no compliance review-related or enforcement-related measures were calculated.

Once the measures were computed, the indicator values for each intrastate carrier were found by interpolating in benchmark tables of measures and indicators from the March 2001 SafeStat (interstate) run. This allowed the measures to be converted into a percentile ranking from 0 to 100, thus converting the absolute carrier measures to the relative indicator values used in SafeStat. The "benchmarking" gave each intrastate carrier the same assessment as if it were included in the full SafeStat run, but because the intrastate carriers were not pooled with interstate carriers in SafeStat, they did not in any way affect the original SafeStat results.

As with the interstate SafeStat, the indicator percentile rankings were used to compute each SEA value in accordance with the SafeStat methodology. The carriers with 2 or more SEA values equal to or greater than 75 were given a SafeStat score and carriers with any SEA values of 75 or higher were assigned to a SafeStat Category of A through G. SafeStat Scores were computed using the weighted SEA Values in accordance with the SafeStat methodology.

4.2 Results from March 2001 "Benchmarking" SafeStat Approach

Among the three study states, 29 intrastate carriers received SafeStat scores (i.e., 2 or more SEA values of 75 or higher); of these, 6 were from CT, 10 from KY, and 13 from OR. Only one of these carriers had a high enough score to be in Category A. A total of 423 carriers, or almost 20% of the 2,216 intrastate carriers meeting data sufficiency criteria, had at least one deficient SEA value (i.e., SEA value of 75 or higher). The sizable number of intrastate carriers with safety deficiencies that were identified by implementing the "Benchmarked SafeStat" illustrates the feasibility of this approach. As

data reporting improves for intrastate carriers, the process will become even more effective in identifying and ranking intrastate carriers with measurable safety problems.

The distribution of SafeStat categories for both intrastate and interstate carriers domiciled in the study states is shown in Table 4.1. The definition of categories A through G is provided in the footnotes below the table. Note that category G, Safety Management SEA ≥ 75, is not applicable for intrastate carriers due to the lack of compliance reviews and closed enforcements for intrastate carriers as of March 2001.

Table 4.1. Comparison of Distribution of Intrastate Carriers and Interstate Carriers Between Categories A through G, Domiciled in the Study States

	Intrastate		**Interstate**	
	Number	**%**	**Number**	**%**
Category A	1	0.2%	21	1.0%
Category B	25	5.9%	220	10.6%
Category C	3	0.7%	191	9.2%
Scored carriers (categories A-C)	**29**	**6.9%**	**432**	**20.8%**
Category D	31	7.3%	97	4.7%
Category E	17	4.0%	302	14.5%
Category F	346	81.8%	1,082	52.1%
Category G	n/a	n/a	165	7.9%
Total carriers in categories A-G	**423**	**100.0%**	**2,078**	**100.0%**

Definitions:
Category A: eligible for a SafeStat score (i.e. at least two SEA values ≥ 75) and with a SafeStat score ≥ 350.
Category B: eligible for a SafeStat score (i.e. at least two SEA values ≥ 75) and with 225 ≥ SafeStat score < 350.
Category C: eligible for a SafeStat score (i.e. at least two SEA values ≥ 75) and with SafeStat score < 225.
Category D: has only one SEA value (the Accident SEA) ≥ 75; not eligible for a SafeStat score.
Category E: has only one SEA value (the Driver SEA) ≥ 75; not eligible for a SafeStat score.
Category F: has only one SEA value (the Vehicle SEA) ≥ 75; not eligible for a SafeStat score.
Category G: has only one SEA value (the Safety Management SEA) ≥ 75; not eligible for a SafeStat score.

The total number of intrastate carriers (423) with at least one deficient SEA value (i.e., values of 75 or higher) represents 17% of all carriers (intrastate and interstate) with at least one deficient SEA value for the three study states (2,501). The 17% figure is close to the intrastate portion of all vehicles and drivers operated by carriers domiciled in the study states, of 21% and 25%, respectively. (Volpe, 2000). These statistics indicate that despite some of the data problems attributed to intrastate carriers discussed in Chapter 2, there are sufficient data in the study states to evaluate intrastate carriers in the same way that SafeStat is currently assessing interstate carriers. The "Benchmarked SafeStat" approach on intrastate carriers successfully identified a sizable proportion of the trucking operations domiciled within these study states as having safety problems that would otherwise go undetected.

While the number of intrastate carriers with at least one deficient SEA value is in proportion to overall size of the intrastate operations in the study states, the distribution

of problems associated with the intrastate carriers differed from the distribution of problems associated with the domiciled interstate carriers. Of the carriers with at least one deficient SEA value, the intrastate carriers have a much higher proportion with vehicle problems (88% with deficient Vehicle SEAs) and lower proportion of driver-related problems when compared to interstate carriers. See Table 4.2. These SafeStat results coincide with the data analysis presented in Chapter 2 which showed that intrastate carriers as a whole had a higher vehicle OOS rate and a lower driver OOS rate than interstate carriers.

Table 4.2. Distribution of 3 Study State Intrastate and Interstate Carriers by SEA Values ³ 75

SEA value	Number of Carriers					% share of all carriers with at least one SEA ³ 75			
	ACSEA ³ 75	DRSEA ³ 75	VHSEA ³ 75	SMSEA ³ 75	At least one SEA ³ 75	ACSEA ³ 75	DRSEA ³ 75	VHSEA ³ 75	SMSEA ³ 75
Intrastate	42	37	374	n/a	423	10%	9%	88%	n/a
Interstate	167	601	1,369	444	2,078	8%	29%	66%	21%

Note:
The sum of the ACSEA ≥ 75, DRSEA ≥ 75, VHSEA ≥ 75 and SMSEA ≥ 75 columns is greater than the number of carriers with at least one SEA ≥ 75, since the same carrier may have a score ≥ 75 in more than one SEA. For the same reason, the percentages add up to greater than 100%.

4.3 Validation of Approach and Results

The analysis of the "Benchmarked SafeStat" results on intrastate carriers shows that it performs well for assessing intrastate carrier safety in the study states. It is significant that the "Benchmarked SafeStat" did identify a number of intrastate carriers with safety problems proportional to the intrastate segment of the motor carrier industry. However, generally, the types and distribution of safety problems that intrastate carriers have based on the available data differ significantly from the interstate carriers. These differences make it important that the intrastate carrier data should not be incorporated into the overall interstate SafeStat data for concerns that doing so will significantly alter the relative ranking of the interstate carriers and possibly bias their SafeStat results.

More important than merely establishing that the approach taken was the best alternative, is validating the usefulness of the results. Each of the three study states was sent a list of the carriers from their states that had SafeStat scores, as well as the carriers without SafeStat scores but with one deficient SEA value. The state of Connecticut exercised its newly legislated authority to do compliance reviews on intrastate carriers, and conducted compliance reviews on 4 of their 6 SafeStat scored intrastate carriers (all were in Category B). All four of these carriers were found to have serious acute or critical violations leading to one carrier receiving an unsatisfactory safety rating and another receiving conditional safety rating. This provides real-life confirmation that the "Benchmarked SafeStat" approach can be successful means of identifying problem intrastate carriers for safety programs.

CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the three study states, Connecticut, Kentucky, and Oregon, it appears feasible to employ a "Benchmarked SafeStat" approach to assess the safety status of individual intrastate carriers. However, the three states stand out from other states in that they have been issuing USDOT numbers to intrastate carriers for a long period of time and that they have excelled in accurately and completely reporting their safety event data.

The success of accurately assessing the safety of intrastate carriers is based on the quality and quantity of the data going into the assessment. Therefore, before states can hope to have useful intrastate SafeStat results, the following conditions need to be met:

1. The state must issue US DOT numbers and collect motor carrier census information on sizable proportion of intrastate carriers domiciled in the state. Additionally, these carriers must have had USDOT numbers for a sufficient length of time (ideally 30 months) for there to be meaningful safety event data attributable to them.
2. The state must upload all its intrastate safety data (e.g. crash, inspection, traffic enforcement, compliance reviews) into the MCMIS for the same timeframe (i.e. 30 months).
3. The state must collect comprehensive intrastate carrier crash and inspection data, attributed to specific carriers using USDOT numbers, and must subject intrastate carriers to *similar scrutiny* to what is being accomplished at a national level in terms of recording their crashes, conducting roadside inspections, and conducting compliance reviews. The following are examples of situations that would preclude the state from having comprehensive safety data on intrastate carriers:
   - The state's accident recording is poor for reportable crashes that occur on local roadways. This can likely cause intrastate carrier crashes to be under-reported.
   - The state focuses a disproportionately large amount of their resources on inspecting interstate carriers. For instance, if a state performs most of the inspections at entry points to the state, the chances of obtaining intrastate carrier inspections are diminished.
   - The state does not record and upload crash/inspection data in a complete and timely matter.
   - The state does not make an effort to record the USDOT numbers properly on intrastate inspections and crashes.

The results of an intrastate carrier safety assessment will be as good as the data that feed into the system. The quality and quantity of intrastate safety data will determine the coverage and accuracy of the assessment of the "Benchmarked SafeStat" results. Before a state starts computing SafeStat results on their intrastate carriers, their safety data should be examined in a similar fashion to what was described in this report to ensure that the data will support this approach.

As states meet the data reporting requirements, they can receive safety assessments of their intrastate carriers using the "Benchmarked SafeStat" approach. This approach will

ensure that the intrastate carriers are being assessed at same standard as the interstate carriers. The intrastate results can be calculated along with each full SafeStat run and can be incorporated into the safety programs in which the state is interested, such as prioritization of compliance reviews, the Inspection Selection System (ISS), PrePass, etc. This will ultimately provide the states with ability to regulate their intrastate carriers with the same level of scrutiny as the interstate carriers.

Future Work

A number of tasks are planned as follow-on to the work already completed with the three study states:

- Continue to generate intrastate carrier assessments using the "Benchmarked SafeStat" approach to coincide with every full SafeStat run for Connecticut, Kentucky and Oregon.
- Examine states' intrastate carrier data available in MCMIS to find other states potentially eligible to receive intrastate carrier safety assessments and establish contacts with these states to assess their interest in such a program.
- Assist states interested in intrastate carrier safety assessments in meeting the requirements to ultimately become eligible to receive meaningful intrastate results.