

***EVALUATION OF THE DIFFERENCES BETWEEN SPONTANEOUS
AND ANTICIPATED ROADSIDE INSPECTIONS
OF MOTOR CARRIERS***

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August 1994

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ABSTRACT

The goal of the present study is to improve the effectiveness of highway safety inspections of motor carriers. These inspections can be broadly classified as anticipated or spontaneous. Anticipated inspections are defined as those in which the driver is usually aware that there is a high probability that an inspection will take place. These would normally occur at fixed sites, such as highway weigh stations. Conversely, spontaneous inspections are those in which the driver may be unaware that an inspection will take place. These would usually be conducted at roadside facilities, such as rest areas, check points, or even by a highway patrol or truck regulatory officer on the shoulder of a road.

This project evaluates the differences, if any, between violations found during the two broad classifications of inspections as described above. The data used are taken from all the inspections conducted in North Dakota during calendar year 1993. This is conducted to provide the Office of Motor Carriers management staff with the information to improve the roadside inspection procedures and to allocate Motor Carrier Safety Assistance Program funds as efficiently as possible. This will, in turn, result in the maximum removal of unsafe equipment and drivers from service.

LIST OF ACRONYMS

DOT	Department of Transportation
FHWA	Federal Highway Administration
HM	Hazardous Materials
ICC	Interstate Commerce Commission
MCMIS	Motor Carrier Management Information System
MCSAP	Motor Carrier Safety Assistance Program
OMC	Office of Motor Carriers
OOS	Out-of-Service

INTRODUCTION

Safety is the number one priority of the Federal Highway Administration (FHWA).¹ In order to help accomplish this objective, Congress has passed twelve commercial vehicle safety enactments since 1982. However, the passage of the Motor Carrier Act of 1980, which significantly deregulated the trucking industry and allowed many new entrants, is what initiated the profound interest in commercial vehicle safety (there are approximately 45,000 carriers with ICC certification today compared to 18,000 in 1980).² Reflecting this, the Bureau of Motor Carrier Safety, a once small safety component of the FHWA, was given a notable staff increase and elevated in prominence to the Office of Motor Carriers (OMC) in 1985. Including the ICC carriers, the OMC's domain currently covers approximately 275,000 carriers (for-hire and private). These carriers operate about 3.6 million vehicles and log more than 100 billion miles a year.³

To accomplish its safety objectives, the OMC and the states cooperate closely. The Motor Carrier Safety Assistance Program (MCSAP), which was established by the Surface Transportation Assistance Act of 1982, facilitates this cooperation. This program has grown substantially and currently receives \$65 million in federal funds per year. These funds are transferred to the states, primarily in order for them to conduct roadside inspections and safety reviews of carriers. Currently, approximately 1.6 million roadside inspections are conducted per year (compared to about 36,000 before MCSAP) resulting in a substantial number of drivers and/or vehicles being placed out-of-service (OOS) for serious violations of the safety regulations.⁴

¹U.S. Department of Transportation. *Motor Carrier Activities of the Federal Highway Administration*. Publication No. FHWA-MC-93-023, September 1993

²Ibid.

³Ibid.

⁴Ibid.

There are three main types of roadside inspections conducted on motor carriers as part of the MCSAP. The Level I inspection is referred to as the North American Standard Inspection and is the most comprehensive. It includes a thorough check of the driver (medical certificate, hours of service, etc.) and the vehicle (brakes, tires, lighting, etc.), including an underneath-the-vehicle inspection. Similarly, in a Level II inspection the inspector also checks the driver, but only walks around the vehicle to search for defects. This level does not include an examination underneath the vehicle. This level is usually conducted when factors prevent a sufficient completion of a Level I inspection. Finally, in a Level III inspection only the driver is examined. In each of these inspection types, items are checked which are deemed to be crucial to operating the vehicle safely. Any violations found can be divided into two major groups: (1) those items not posing any immediate danger, such as record keeping or minor vehicle defects, and (2) more severe items that require a driver and/or vehicle to be placed out-of-service (OOS) until the violation is fixed.

In addition to the three different levels, inspections can be classified into two other categories: those that take place at fixed facilities, those that don't. Some are conducted at fixed facilities, such as those at weigh stations, where a driver is usually aware that an inspection could conceivably take place. These will be referred to as *anticipated* inspections. Other inspections take place at temporary inspection sites (at rest areas or check points) or are even conducted by a highway patrol or truck regulatory officer on the shoulder of a highway. In these situations, a driver is normally unaware that an inspection will take place. These will be referred to as *spontaneous* inspections.

The overall objective of this project is to examine the differences, if any, in violations found between these two general categories of inspections. This analysis is being conducted to

provide OMC and DOT management with information and data that will allow them to improve the effectiveness of the roadside inspection program and remove the maximum number of unsafe drivers and vehicles from the highway. This would, in turn, lead to a reduction of accidents and contribute to achieving FHWA's safety goals.

RESEARCH METHOD AND ANALYSIS

In order to complete this analysis, data were requested from the North Dakota Highway Patrol through the SAFETYNET system. This system contains all the data collected during a roadside inspection including any violations found and an indication of whether or not the driver and/or vehicle was placed out-of-service. Under the MCSAP, inspectors enter and maintain inspection data locally using SAFETYNET, and then are able to transmit relevant records electronically to the central Motor Carrier Management Information System (MCMIS) at FHWA. Specifically, data were requested that included information related to all roadside inspections conducted in North Dakota in calendar year 1993. The data set contained many variables including, the date, duration, location, and level of the inspection; the facility (fixed or roadside); the total number of violations and indication whether they were out-of-service violations or not, as well as their violation code and category; and indications of weather the truck inspected was interstate or intrastate. All analysis was completed utilizing SAS statistical software in a mainframe environment.

As a summary of the data, there were 9,363 Level I, II, and III inspections conducted in North Dakota in 1993. Of these, 49.0 percent (4,584) were conducted at fixed facilities and 51.0 percent (4,779) at the roadside as defined earlier. A breakdown by level shows that 47.5 percent (4,452) were Level I, 8.2 percent (770) were Level II, and 44.2 percent (4,141) were level III as

defined above. However, these levels were not evenly distributed among the fixed and roadside facilities. Of the fixed facility inspections, 63.8 percent (2,923) were Level I, 7.0 percent (322) were Level II, and 29.2 percent (1,339) were Level III. Conversely, of the roadside facility inspection, 32.0 percent (1,529) were Level I, 9.4 percent (448) were Level II, and 58.6 percent (2,802) were Level III. The fixed facilities conduct about twice as many Level I inspections, while the roadside facilities conduct about twice as many Level III inspections. This is due to the fact that the fixed facilities are normally better equipped to perform the Level I inspection.

Another breakdown shows that 93.6 percent (8,766) of the inspections were conducted on interstate vehicles and 6.4 percent (597) were conducted on intrastate vehicles. These were about evenly distributed between the fixed and roadside facilities.

Table 1 illustrates the violations found by category for all levels and types of roadside inspections conducted in North Dakota in 1993. Both the total number of violations and the total number of out-of-service violations found are given. There were a total of 14,956 violations found in these inspections in 1993. Considering only out-of-service violations, there were a total of 3,252 found. Hereafter, only the out-of-service violations will be used in analyses as these are considered the most critical and capable of posing an immediate danger.

Examining the data, it is apparent that vehicle violations are much more commonly found than driver or hazardous materials (HM) violations. Vehicle violations comprise almost 74 percent of all out-of-service violations found. Within this category, the most common violations found are brake-related (these make up 60.5 percent of the vehicle violations). Within the driver violation category, the most common violations fall under hours-of-service, which comprise 80.0 percent of

all driver violations. Very few hazardous materials violations were found in 1993 (only 0.6 percent of the total number of violations, with the majority being improper placarding violations).

In parentheses underneath the total OOS violations found are the total number of drivers and/or vehicles actually placed out-of-service. For example, there were 831 total OOS driver violations found in 1993, but only 708 drivers were placed out-of-service (i.e., some had more than one violation). Similarly, there were 2,402 vehicle OOS violations, but only 1,421 vehicles placed out-of-service. The number of hazardous materials OOS violations found was equal to the number placed out-of-service, so these numbers aren't given in parentheses. Finally, the total OOS violations found was 3,252, with 1,998 drivers and/or vehicles actually being placed out-of-service. One may notice that summing the violations from each category gives the total violations, but summing the number placed out-of-service for each category does not give the total placed out-of-service. This is due to the fact that a particular inspection can only be counted as resulting in an out-of-service once, even if both a vehicle and driver were placed out-of-service in the inspection.

As the table illustrates, the overall 1993 North Dakota OOS Violation Rate (the total OOS violations found divided by the total number of inspections) is 0.3473. The overall OOS Rate (the number of drivers and/or vehicles placed OOS divided by the number of inspections) is 0.2134. The latter can be interpreted as on the average, indicating that, there is approximately a 21.3 percent chance that a given inspection will result in the vehicle and/or driver being placed out-of-service.

Table 1. Violations Found Out of 9,363 Level I, II, and III Inspections Conducted in ND in 1993

Violation Category	Total Number	Percent of Total	Total OOS Number	Percent of Total
Driver				
Medical certificate	424	2.8	12	0.4
Hours of service	2,079	13.9	648	19.9
All other driver	2,839	19.0	171	5.3
Total Driver Violations	5,342	35.7	831	25.6
(Total number placed OOS in parentheses)			(708)	
Driver OOS Violation Rate			0.0888	
Driver OOS Rate			0.0756	
Vehicle				
Brakes, out of adjustment	1,540	10.3	723	22.2
Brakes, all other	2,112	14.1	731	22.5
Coupling devices	235	1.6	77	2.4
Fuel system	55	0.4	20	0.6
Frames	287	1.9	86	2.6
Lighting	1,632	10.9	199	6.1
Steering mechanism	36	0.2	3	0.1
Suspension	624	4.2	212	6.5
Tires	759	5.1	135	4.2
Wheels, studs, clamps, etc.	241	1.6	79	2.4
All other vehicle	2,034	13.6	137	4.2
Total Vehicle Violations	9,555	63.9	2,402	73.9
(Total number placed OOS in parentheses)			(1,421)	
Vehicle OOS Violation Rate			0.4600	
Vehicle OOS Rate			0.2721	
Hazardous Materials				
Shipping paper	16	0.1	2	0.1
Improper placarding	26	0.2	12	0.4
No retest and inspection	3	0.0	0	0.0
No remote shutoff control	2	0.0	0	0.0
Use of nonspecification container	2	0.0	0	0.0
All other HM	10	0.1	5	0.2
Total Hazardous Materials Violations	59	0.4	19	0.6
Total Violations	14,956	100.0	3,252	100.0
(Total number placed OOS in parentheses)			(1,998)	
Overall OOS Violation Rate			0.3473	
Overall OOS Rate			0.2134	

Similarly, one can determine rates for each of the violation categories. The overall Driver OOS Violation Rate is 0.0888 and the Driver OOS Rate is 0.0756. When determining the Vehicle Violation and OOS Rates, only the number of Level I and II inspections should be considered as the Level III does not check the vehicle. Thus, the overall Vehicle OOS Violation Rate is 0.4600 and the Vehicle OOS Rate is 0.2721.

Tables 2, 3, and 4 give breakdowns of out-of-service violations found in fixed and roadside inspections, in the three main levels of inspections, and in interstate and intrastate vehicles respectively. Examining Table 2, it is clear that both the overall OOS Violation Rate and the overall OOS Rate are substantially higher for the fixed facility inspections than for the roadside facility ones (0.4452 versus 0.2534, and 0.2720 versus 0.1571 respectively).

Interestingly, although the overall violations and OOS rates are higher for the fixed facility inspections, the fixed facility Driver Violation Rate is 0.0831 (the Driver OOS Rate is 0.0720) compared to the roadside facility Driver OOS Violation Rate of 0.0942 (the Driver OOS Rate is 0.0791). This indicates that the roadside facility may be better at finding driver violations than the fixed facility. This is further evidenced by looking at the particular violations. Under the driver violation category, the roadside facility inspections find a greater percentage of every driver violation than the fixed facility. For example, 29.1 percent of all the OOS violations found at the roadside facilities are hours-of-service violations compared to only 14.5 percent for the fixed facility inspections.

The Vehicle violation category shows that the fixed facility inspections clearly dominate with 80.5 percent of all their violations found being attributed to the vehicle, compared to 62.6 percent of the roadside facility inspections. The overall Vehicle OOS Violation Rate for the fixed facility is 0.5066 (the Vehicle OOS Rate is 0.3039) compared to only a 0.3834 Vehicle OOS Violation Rate (0.2200 Vehicle OOS Rate) for the roadside facility. Here, the brake violations clearly define the difference with 53.7 percent of all the OOS violations found at the fixed facility being attributed to brakes while only 29.6 percent of violations at the roadside facility are.

Table 2. Out-of-Service Violations Found Out of 9,363 Inspections (4,584 at Fixed Facilities and 4,779 along the Roadside) Conducted in 1993 by Facility

Violation Category	Fixed Number	Percent of Total	Roadside Number	Percent of Total
Driver				
Medical certificate	5	0.2	7	0.6
Hours of service	296	14.5	352	29.1
All other driver	80	3.9	91	7.5
Total Driver OOS Violations	381	18.7	450	37.2
(Total placed OOS in parentheses)	(330)		(378)	
Driver OOS Violation Rate	0.0831		0.0942	
Driver OOS Rate	0.0720		0.0791	
Vehicle				
Brakes, out of adjustment	517	25.3	206	17.0
Brakes, all other	579	28.4	152	12.6
Coupling devices	42	2.1	35	2.9
Fuel system	13	0.6	7	0.6
Frames	31	1.5	55	4.5
Lighting	104	5.1	95	7.8
Steering mechanism	0	0.0	3	0.2
Suspension	129	6.3	83	6.9
Tires	87	4.3	48	4.0
Wheels, studs, clamps, etc.	64	3.1	15	1.2
All other vehicle	78	3.8	59	4.9
Total Vehicle OOS Violations	1,644	80.5	758	62.6
(Total placed OOS in parentheses)	(986)		(435)	
Vehicle OOS Violation Rate	0.5066		0.3834	
Vehicle OOS Rate	0.3039		0.2200	
Hazardous Materials				
Shipping paper	2	0.1	0	0.0
Improper placarding	10	0.5	2	0.2
All other HM	4	0.2	1	0.1
Total Hazardous Materials Violations	16	0.8	3	0.2
Total OOS Violations	2,041	100.0	1,211	100.0
(Total placed OOS in parentheses)	(1,247)		(751)	
OOS Violation Rate	0.4452		0.2534	
OOS Rate	0.2720		0.1571	

Table 3 shows a distinct difference in violations found at the different levels. The overall OOS Violation Rate for Level I is 0.5829, for Level II is 0.4065, and for Level III is 0.0831. The overall OOS Rates show the same pattern with Level I having an OOS Rate of 0.3354, Level II of 0.2532, and Level III of 0.0749.

The above seems to suggest Level I tests are preferable, as they have the greatest chance of finding an OOS violation. However, examining the breakdown between the driver and vehicle

violation categories gives some more insight. The Driver OOS Violation Rate for Level I is 0.0881, for Level II is 0.1234, and for Level III is 0.0831. The Driver OOS Rate is 0.0721 for Level I, 0.1000 for Level II, and 0.0749 for Level III. These numbers seem to indicate the Level II inspection is preferable for finding driver OOS violations.

Table 3. Out-of-Service Violations Found Out of 9,363 Inspections (4,452 Level I, 770 Level II, and 4,141 Level III) Conducted in 1993 by Level

Violation Category	Level I Number	Percent of Total	Level II Number	Percent of Total	Level III Number	Percent of Total
Driver						
Medical certificate	5	0.2	2	0.6	5	1.5
Hours of service	278	10.7	60	19.2	310	90.1
All other driver	109	4.2	33	10.5	29	8.4
Total Driver OOS Violations	392	15.1	95	30.4	344	100.0
(Total placed OOS in parentheses)	(321)		(77)		(310)	
Driver OOS Violation Rate	0.0881		0.1234		0.0831	
Driver OOS Rate	0.0721		0.1000		0.0749	
Vehicle						
Brakes, out of adjustment	722	27.8	1	0.3	0	0.0
Brakes, all other	693	26.7	38	12.1	0	0.0
Coupling devices	62	2.4	15	4.8	0	0.0
Fuel system	17	0.7	3	1.0	0	0.0
Frames	61	2.4	25	8.0	0	0.0
Lighting	163	6.3	36	11.5	0	0.0
Steering mechanism	3	0.1	0	0.0	0	0.0
Suspension	194	7.5	18	5.8	0	0.0
Tires	92	3.5	43	13.7	0	0.0
Wheels, studs, clamps, etc.	57	2.2	22	7.0	0	0.0
All other vehicle	125	4.8	12	3.8	0	0.0
Total Vehicle OOS Violations	2,189	84.4	213	68.1	0	0.0
(Total placed OOS in parentheses)	(1,290)		(131)			
Vehicle OOS Violation Rate	0.4917		0.2766		0.0000	
Vehicle OOS Rate	0.2898		0.1701		0.0000	
Hazardous Materials						
Shipping paper	2	0.1	0	0.0	0	0.0
Improper placarding	9	0.3	3	1.0	0	0.0
All other HM	3	0.1	2	0.6	0	0.0
Total Hazardous Materials Violations	14	0.5	5	1.6	0	0.0
Total OOS Violations	2,595	100.0	313	100.0	344	100.0
(Total placed OOS in parentheses)	(1,493)		(195)		(310)	
OOS Violation Rate	0.5829		0.4065		0.0831	
OOS Rate	0.3354		0.2532		0.0749	

The Vehicle OOS Violation Rate for Level I is 0.4917, and for Level II is 0.2766 (Level III does not check for vehicle violations, thus its rate is zero). Similarly, the Vehicle OOS Rate for Level I is 0.2898, and for Level II is 0.1701. Again, this shows Level I inspections are preferable for finding violations and putting vehicles out-of-service.

A more detailed analysis of particular violations indicates that the Level I inspection accounts for the most OOS brake violations, with 54.5 percent of all violations found in the Level I inspection falling in this category. Conversely, the Level III clearly finds the most hours-of-service violations, with 90.1 percent of all its violations found falling under this category. The Level II seems to find the most lighting and tires violations, and also a few hours-of-service violations.

Table 4 illustrates — as an interesting side note, not part of the overall objective of this project — differences in violations found between interstate and intrastate vehicles. The overall OOS Violation Rate is higher for the intrastate vehicles (0.3836 versus 0.3449), but the overall OOS Rate is lower (0.1977 versus 0.2145). This means that the interstate vehicles are more likely to be placed out-of-service, but the intrastate vehicles are more likely to have more violations found.

The Driver OOS Violation Rate for interstate vehicles is 0.0924 and for intrastate vehicles is 0.0352 (the Driver OOS Rates are 0.0787 and 0.0302 respectively). This trend is further illustrated by the percentage of driver violations found for each vehicle type. For interstate vehicles, 26.8 percent of all OOS violations fell under the driver category (21.2 percent hours-of-service). Conversely, only 9.2 percent of all intrastate vehicles' OOS violations were in the driver category (only 2.6 percent hours-of-service).

Table 4. Out-of-Service Violations Found Out of 9,363 Inspections (8,766 Interstate Vehicles and 597 Intrastate Vehicles) Conducted in 1993 by Vehicle

Violation Category	Interstate Number	Percent of Total	Intrastate Number	Percent of Total
Driver				
Medical certificate	11	0.4	1	0.4
Hours of service	642	21.2	6	2.6
All other driver	157	5.2	14	6.1
Total Driver OOS Violations	810	26.8	21	9.2
(Total placed OOS in parentheses)	(690)		(18)	
Driver OOS Violation Rate	0.0924		0.0352	
Driver OOS Rate	0.0787		0.0302	
Vehicle				
Brakes, out of adjustment	670	22.2	53	23.1
Brakes, all other	692	22.9	39	17.0
Coupling devices	71	2.3	6	2.6
Fuel system	17	0.6	3	1.3
Frames	76	2.5	10	4.4
Lighting	168	5.6	31	13.5
Steering mechanism	1	0.0	2	0.9
Suspension	196	6.5	16	7.0
Tires	104	3.4	31	13.5
Wheels, studs, clamps, etc.	73	2.4	6	2.6
All other vehicle	127	4.2	10	4.4
Total Vehicle OOS Violations	2,195	72.6	207	90.4
(Total placed OOS in parentheses)	(1,312)		(109)	
Vehicle OOS Violation Rate	0.4557		0.5111	
Vehicle OOS Rate	0.2724		0.2691	
Hazardous Materials				
Shipping paper	2	0.1	0	0.0
Improper placarding	11	0.4	1	0.4
All other HM	5	0.2	0	0.0
Total Hazardous Materials Violations	18	0.6	1	0.4
Total OOS Violations	3,023	100.0	229	100.0
(Total placed OOS in parentheses)	(1,880)		(118)	
OOS Violation Rate	0.3449		0.3836	
OOS Rate	0.2145		0.1977	

The Vehicle OOS Violation Rate for interstate vehicles is 0.4557 and for intrastate vehicles is 0.5111 (the Vehicle OOS Rates are 0.2724 and 0.2691 respectively). The majority (90.4 percent) of OOS Violations found on intrastate vehicles fall under the vehicle violation category, most being violations for brakes, lighting, and tires. The definite majority of vehicle violations found on interstate vehicles fall in the brake category, with only small percentages in the other

categories. Again, although the Vehicle Violation Rate is higher for intrastate vehicles, their Vehicle OOS Rate is lower.

Returning to the main objective of this project, the comparison between the fixed and roadside inspections, it is clear that a simple overall comparison is not appropriate. First, as was noted in the summary of the data, the fixed facilities conduct twice as many Level I inspections as the roadside facilities. Conversely, the roadside facilities conduct twice as many Level III inspections. As Table 3 illustrated, there is a definite difference in the type and number of violations found between these two levels (i.e., Level III is only driver oriented while Level I is more geared toward the vehicle). Thus, the only way to make an unbiased comparison between the fixed and roadside facilities is to examine each level of inspection individually.

Table 5 illustrates the fixed and roadside facility OOS violations found only in Level I inspections. Again, the fixed facility inspections result in a higher overall OOS Violation Rate (0.6025 versus 0.5455) and OOS Rate (0.3565 versus 0.2950) than the roadside facility inspections. These same results hold when only considering the Vehicle OOS Violation Rate and Vehicle OOS Rate, with the fixed facilities having rates of 0.5193 and 0.3124 respectively, and the roadside facilities having rates of 0.4388 and 0.2466 respectively. However, once again the Driver OOS Violation Rates and OOS Rates show the opposite pattern, with the roadside facilities rates being higher. Specifically, the roadside facilities had a Driver OOS Violation Rate of 0.1046 and OOS Rate of 0.0818, while the fixed facilities had rates of 0.0794 and 0.0671 respectively. As before, the roadside facilities appear to be more adept at finding driver violations, such as hours-of-service (the driver violations comprise 19.2 percent of all the violations found at the roadside facilities).

Table 5. Out-of-Service Violations Found Out of 4,452 Level I Inspections (2,923 at Fixed Facilities and 1,529 along the Roadside) Conducted in 1993 by Facility

Violation Category	Fixed Number	Percent of Total	Roadside Number	Percent of Total
Driver				
Medical certificate	1	0.1	4	0.5
Hours of service	173	9.8	105	12.6
All other driver	58	3.3	51	6.1
Total Driver OOS Violations	232	13.2	160	19.2
(Total placed OOS in parentheses)	(196)		(125)	
Driver OOS Violation Rate	0.0794		0.1046	
Driver OOS Rate	0.0671		0.0818	
Vehicle				
Brakes, out of adjustment	516	29.3	206	24.7
Brakes, all other	554	31.5	139	16.7
Coupling devices	35	2.0	27	3.2
Fuel system	11	0.6	6	0.7
Frames	16	0.9	45	5.4
Lighting	89	5.1	74	8.9
Steering mechanism	0	0.0	3	0.4
Suspension	116	6.6	78	9.4
Tires	62	3.5	30	3.6
Wheels, studs, clamps, etc.	49	2.8	8	1.0
All other vehicle	70	4.0	55	6.6
Total Vehicle OOS Violations	1,518	86.2	671	80.5
(Total placed OOS in parentheses)	(913)		(377)	
Vehicle OOS Violation Rate	0.5193		0.4388	
Vehicle OOS Rate	0.3124		0.2466	
Hazardous Materials				
Shipping paper	2	0.1	0	0.0
Improper placarding	7	0.4	2	0.2
All other HM	2	0.1	1	0.1
Total Hazardous Materials Violations	11	0.6	3	0.4
Total OOS Violations	1,761	100.0	834	100.0
(Total placed OOS in parentheses)	(1,042)		(451)	
OOS Violation Rate	0.6025		0.5455	
OOS Rate	0.3565		0.2950	

Examining only the Level II inspections in Table 6, one can see again that the fixed facilities have higher overall OOS Violation Rates and OOS Rates than the roadside facilities (0.5280 versus 0.3192 and 0.3230 versus 0.2031, respectively). Also once again, the Vehicle OOS Violation Rates and Vehicle OOS Rates are substantially higher for the fixed facilities than for roadside facilities (0.3913 versus 0.1942 and 0.2267 versus 0.1295, respectively). However, the Driver OOS Violation Rate for the fixed facilities is only a little lower for the Level II

inspections (0.1211 versus 0.1250) and the Driver OOS Rate is actually higher for the fixed facilities in this circumstance (0.1025 versus 0.0982). This suggests that the fixed facilities may be the best place to perform the Level II inspections to achieve the best out-of-service rates, and a safer highway environment.

Table 6. Out-of-Service Violations Found Out of 770 Level II Inspections (322 at Fixed Facilities and 448 along the Roadside) Conducted in 1993 by Facility

Violation Category	Fixed Number	Percent of Total	Roadside Number	Percent of Total
Driver				
Medical certificate	1	0.6	1	0.7
Hours of service	24	14.1	36	25.2
All other driver	14	8.2	19	13.3
Total Driver OOS Violations	39	22.9	56	39.2
(Total placed OOS in parentheses)	(33)		(44)	
Driver OOS Violation Rate	0.1211		0.1250	
Driver OOS Rate	0.1025		0.0982	
Vehicle				
Brakes, out of adjustment	1	0.6	0	0.0
Brakes, all other	25	14.7	13	9.1
Coupling devices	7	4.1	8	5.6
Fuel system	2	1.2	1	0.7
Frames	15	8.8	10	7.0
Lighting	15	8.8	21	14.7
Steering mechanism	0	0.0	0	0.0
Suspension	13	7.6	5	3.5
Tires	25	14.7	18	12.6
Wheels, studs, clamps, etc.	15	8.8	7	4.9
All other vehicle	8	4.7	4	2.8
Total Vehicle OOS Violations	126	74.1	87	60.8
(Total placed OOS in parentheses)	(73)		(58)	
Vehicle OOS Violation Rate	0.3913		0.1942	
Vehicle OOS Rate	0.2267		0.1295	
Hazardous Materials				
Shipping paper	0	0.0	0	0.0
Improper placarding	3	1.8	0	0.0
All other HM	2	1.2	0	0.0
Total Hazardous Materials Violations	5	2.9	0	0.0
Total OOS Violations	170	100.0	143	100.0
(Total placed OOS in parentheses)	(104)		(91)	
OOS Violation Rate	0.5280		0.3192	
OOS Rate	0.3230		0.2031	

As in the previous cases, the roadside facilities still found a greater percentage of driver violations in proportion to the violations found (39.2 percent of all violations found) as compared to the fixed facilities (22.9 percent of all violations found). But again, the fixed facilities performed better in terms of out-of-service rates.

Table 7. Out-of-Service Violations Found Out of 4,141 Level III Inspections (1,339 at Fixed Facilities and 2,802 along the Roadside) Conducted in 1993 by Facility

Violation Category	Fixed Number	Percent of Total	Roadside Number	Percent of Total
Driver				
Medical certificate	3	2.7	2	0.9
Hours of service	99	90.0	211	90.2
All other driver	8	7.3	21	9.0
Total Driver OOS Violations	110	100.0	234	100.0
(Total placed OOS in parentheses)	(101)		(209)	
Vehicle				
Brakes, out of adjustment	0	0.0	0	0.0
Brakes, all other	0	0.0	0	0.0
Coupling devices	0	0.0	0	0.0
Fuel system	0	0.0	0	0.0
Frames	0	0.0	0	0.0
Lighting	0	0.0	0	0.0
Steering mechanism	0	0.0	0	0.0
Suspension	0	0.0	0	0.0
Tires	0	0.0	0	0.0
Wheels, studs, clamps, etc.	0	0.0	0	0.0
All other vehicle	0	0.0	0	0.0
Total Vehicle OOS Violations	0	0.0	0	0.0
Hazardous Materials				
Shipping paper	0	0.0	0	0.0
Improper placarding	0	0.0	0	0.0
All other HM	0	0.0	0	0.0
Total Hazardous Materials Violations	0	0.0	0	0.0
Total OOS Violations	110	100.0	234	100.0
(Total placed OOS in parentheses)	(101)		(209)	
OOS Violation Rate	0.0822		0.0835	
OOS Rate	0.0754		0.0746	

Finally, Table 7 illustrates the comparison between the fixed and roadside facilities for Level III inspections. Of course, neither found any vehicle violations, as only the driver is checked in this level. Both facilities appear to be about equal in terms of out-of-service and

violation rates. The fixed facility inspections resulted in an 0.0822 Driver OOS Violation Rate and an 0.0754 Driver OOS Rate. This compares with a slightly higher Driver OOS Violation Rate of 0.0835 and slightly lower Driver OOS Rate of 0.0746 for the roadside facility inspections. The specific violations found are also similar, with both types of facilities finding approximately 90 percent hours-of-service violations. In this respect, it appears that both types of facilities do equally well.

SUMMARY AND CONCLUSIONS

A statistical summary of the violation and OOS rates discussed in the previous section are provided in Table 8. The only category where the roadside facility seems at all to dominate is in the Driver OOS Violation Rates. The roadside facilities have higher rates in this category across all three levels of inspections. However, considering Driver OOS Rates, they are only higher for the Level I inspections. In every other category, including overall, the fixed facilities have higher violation and out-of-service rates across all levels of inspections.

These results are somewhat surprising. One would think that if the fixed facilities represented a more "anticipated" inspection, while the roadside facilities represented a "spontaneous" one, there would be more violations found at the roadside facilities where drivers are not quite as prepared to be inspected. Obviously, this is not the case. In fact, the opposite was found in the majority of cases. One can only assume, therefore, that the roadside facility inspections are not truly "spontaneous" and that drivers probably do anticipate them somewhat (or that fixed facilities are somewhat spontaneous in nature), or that the inspectors at the fixed facilities are better trained to find violations.

Table 8. Overall Summary of OOS Rates Between Fixed and Roadside Facilities by Level

Category	Fixed Facility			Roadside Facility		
	Level I	Level II	Level III	Level I	Level II	Level III
Total Inspections (overall n = 9,363)	2,923	322	1,339	1,529	448	2,802
Total Driver OOS Violations (overall n = 831)	232	39	110	160	56	234
Driver OOS Violation Rate (overall = 0.0888 ¹)	0.0794	0.1211	0.0822	0.1046	0.1250	0.0835
Total Drivers OOS (overall n = 708)	196	33	101	125	44	209
Driver OOS Rate (overall = 0.0756 ²)	0.0671	0.1025	0.0754	0.0818	0.0982	0.0746
Total Vehicle OOS Violations (overall n = 2,402)	1,518	126	0	671	87	0
Vehicle OOS Violation Rate (overall = 0.4600 ³)	0.5193	0.3913	0.0000	0.4388	0.1942	0.0000
Total Vehicles OOS (overall n = 1,421)	913	73	0	377	58	0
Vehicle OOS Rate (overall = 0.2721 ⁴)	0.3124	0.2267	0.0000	0.2466	0.1295	0.0000
Total OOS Violations (overall n = 3,252)	1,761	170	110	834	143	234
Total OOS Violation Rate (overall = 0.3473)	0.6025	0.5280	0.0822	0.5455	0.3192	0.0835
Total Inspections Resulting in OOS (overall = 1,998)	1,042	104	101	451	91	209
Total OOS Rate (overall = 0.2134)	0.3565	0.3230	0.0754	0.2950	0.2031	0.0746

¹ Total driver OOS violations (831) divided by total number of Level I, II, and III inspections (9,363)

² Total drivers OOS (708) divided by total number of Level I, II, and III inspections (9,363)

³ Total vehicle OOS violations (2,402) divided by total number of Level I and II inspections (5,222)

⁴ Total vehicles OOS (1,421) divided by total number of Level I and II inspections (5,222)

In terms of any policy implications, these results appear to suggest that since the roadside facilities only seem to be able to compete with the fixed facilities in the driver violation categories,

maybe they should be confined to only conducting Level III inspections as much as possible. This is not necessarily a negative outcome since, according to one major study⁵, the Level III inspection is considered almost identical to the Level I in terms of influence on accident decline.

Although the above-mentioned study didn't consider differences between fixed and roadside facility inspections, it did compare the differences between the three levels of inspections in terms of potential for accident reduction balanced against the time and cost of conducting the inspections. The majority of the findings coincided with ones found in the present study. For example, Level I inspections revealed the highest average number of vehicle OOS violations, while Level III revealed the highest mean number of driver OOS violations. Also, Level I had the highest Total OOS Rate, followed by Level II, then Level III. In addition, the violations found during the different inspections differed in the same way. Level I was much better at discovering the brake violations, while Level III was superior in finding hours-of-service violations. All of these findings correlated with those in the present study.

In order to determine the "relative worth" of each level, the Jack Faucett Associates study examined how often a defect occurs in accidents and compared that with the probability that this defect is discovered in an inspection. They found that, based only on this comparison, Level I inspections are clearly the best. However, when the time and cost of conducting the inspection was considered, they found that Level III has the advantage (as it takes the shortest time on average to complete). Combining both of the factors above (the probability of detecting a defect that occurs often in accidents, and the time element), the conclusion was that Level I is much

⁵Jack Faucett Associates. *Adequacy and Effectiveness of Roadside Inspection Procedures: Relative Effectiveness of Level I, II, and III Roadside Inspections* DTFH61-90-C-00013, Washington, D.C.: Federal Highway Administration, July 1992.

preferred to Level II, but only slightly preferred to Level III. Further, Level III is preferred over Level II (due to its lower cost and higher probability of detecting an hours-of-service violation).

Based on the above, the study recommended performing a Level III inspection when it is not feasible to conduct a Level I, as they are very similar in their influence on accident reduction (this is due to driver-related factors being cited as the main cause of many accidents). According to the study, The Level II inspections, as they are conducted presently, are not as beneficial as the Level I or Level III, and thus should probably be modified or less stressed.

In conclusion, combining the results of the present study and the Jack Faucett Associates study, the obvious recommendation for future use of available MCSAP resources is to allow the fixed facilities to continue concentrating on Level I inspections and the roadside facilities on Level III inspections. These are the areas that they each are best suited for in terms of finding the most out-of-service violations, and both these levels are about equal in influencing declines in accidents. This policy could be established even more so than it is currently.