UMTRI-2007-48 NOVEMBER 2007

EVALUATION OF 2006 GEORGIA CRASH DATA REPORTED TO MCMIS CRASH FILE

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November 2007

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTRI-2007-48		

4. Title and Subtitle	5. Report Date
Evaluation of 2006 Georgia Crash Data Reported to the MCMIS Crash File	November 2007
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Green, Paul E., and Matteson, Anne	UMTRI-2007-48

9. Performing Organization Name and Address	10. Work Unit no. (TRAIS)
The University of Michigan Transportation Research Institute 2901 Baxter Road Ann Arbor, Michigan 48109-2150 U.S.A.	052702
	11. Contract or Grant No. DTMC75-06-H-00003

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U.S. Department of Transportation Federal Motor Carrier Safety Administration 400 Seventh Street, SW Washington, D.C. 20590	Special report
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This report is part of a series evaluating the data reported to the Motor Carrier Management Information System (MCMIS) Crash File undertaken by the Center for National Truck and Bus Statistics at the University of Michigan Transportation Research Institute. Earlier studies showed that reporting to the MCMIS Crash File was incomplete. This report examines factors that are associated with reporting rates for the state of Georgia.

MCMIS Crash File records were matched to the Georgia Crash file to determine the nature and extent of underreporting. Overall, it appears that Georgia is reporting 68.1 percent of crash involvements that should be reported to the MCMIS Crash file. Due to instructions in the Georgia Instruction Guide for filling out accident reports, it appears that buses and some other qualifying vehicles such as government and rental vehicles are not being reported. Based on vehicle type, the reporting rate is 73.6 percent for all trucks and 3.1 percent for buses.

The reporting rate for tractor semi-trailers is 87.6 percent, but the estimated rate for single unit trucks is 55.4 percent. It also appears that many vehicles classified as panel trucks are not being reported even though GVWR for most of these vehicles exceeds 10,000 pounds.

Missing data percentages in the MCMIS Crash File are low for certain variables, but are high for certain others as noted. No vehicles are recorded as hazmat placarded vehicles in the MCMIS Crash file, yet 46 vehicles are coded with hazmat release.

17. Key Words	18. Distribution Statement
MCMIS, Georgia Crash File, accident statistics, underreporting	Unlimited

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	40	

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	$candela/m^2$	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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Evaluation of 2006 Georgia Crash Data Reported to the MCMIS Crash File

1. Introduction

The Motor Carrier Management Information System (MCMIS) Crash file has been developed by the Federal Motor Carrier Safety Administration (FMCSA) to serve as a census file of trucks and buses involved in traffic crashes meeting a specified selection criteria and crash severity threshold. FMCSA maintains the MCMIS file to support its mission to reduce crashes, injuries, and fatalities involving large trucks and buses. It is essential to assess the magnitude and characteristics of motor carrier crashes to design effective safety measures to prevent such crashes. The usefulness of the MCMIS Crash file depends upon individual states transmitting a standard set of data items on all trucks and buses involved in traffic crashes that meet a specific severity threshold.

The present report is part of a series evaluating the completeness and accuracy of the data in the MCMIS Crash file. Previous reports on a number of states showed underreporting due in large part to problems in interpreting and applying the reporting criteria. The problems were more severe in large jurisdictions and police departments. Each state also had problems specific to the nature of its system. Some states also had overreporting of cases, often due to technical problems with duplicate records. [See references 1 to 24.] The states are responsible for identifying and reporting qualifying crash involvements. Accordingly, improved completeness and accuracy must ultimately reside with the individual states.

In this report, we focus on MCMIS Crash file reporting by Georgia. In recent years, Georgia has reported from 5,470 to 7,850 involvements annually to the MCMIS Crash file. According to the 2002 Vehicle Inventory and Use Survey (the last available), in 2002, Georgia had over 153,000 trucks registered, ranking 12th among the states and accounting for 2.8 percent of all truck registrations [25]. Georgia is the 9th largest state by population [26] and generally ranks 4th in terms of the number of annual truck and bus fatal involvements [27,28].

The method employed in this study is similar to previous studies.

1. The complete police accident report file (PAR file hereafter) from Georgia was obtained for the most recent year available, 2006. This file was processed to identify all cases that qualified for reporting to the MCMIS Crash file.

2. All cases in the Georgia PAR file—those that qualified for reporting to the Crash file as well as those that did not—were matched to the cases actually reported to the MCMIS Crash file from Georgia.

3. Cases that should have been reported, but were not, were compared with those that were reported to identify the sources of underreporting.

4. Cases that did not qualify but which were reported were examined to identify the extent and nature of overreporting.

Police accident report (PAR) data recorded in Georgia's statewide files as of July 20, 2007, were used in this analysis. The 2006 PAR file contains the computerized records of 650,246 vehicles involved in 342,158 crashes that occurred in Georgia.

2. Data Preparation

The Georgia PAR file and MCMIS Crash file each required some preparation before the Georgia records in the MCMIS Crash file could be matched to the Georgia PAR file. In the case of the MCMIS Crash file, the only processing necessary was to extract records reported from Georgia and to eliminate duplicate records. The Georgia PAR file required more extensive work to create a comprehensive vehicle-level file from accident, vehicle, and occupant files. The following sections describe the methods used to prepare each file and some of the problems uncovered.

2.1 MCMIS Crash Data File

The 2006 MCMIS Crash file as of June 4, 2007 was used to identify records submitted from Georgia. For calendar year 2006 there were 7,164 cases. An analysis file was constructed using all variables in the file. The file was then examined for duplicate records (those involvements where more than one record was submitted for the same vehicle in the same crash; i.e., the report number and sequence number were identical). No such instances were found.

In addition, records were examined for identical values for accident number, accident date/time, county, street, vehicle license number, and driver license number, even though their vehicle sequence numbers were perhaps different. One would not expect two records for the same vehicle and driver within a given accident. One such duplicate pair was found. All variables were identical among the two records except for driver last name (driver first name and middle initial were the same, as well as vehicle identification number (VIN)). Thus, these were considered duplicate records. Since all of the upload/change dates were identical, the record with the lowest MCMIS-assigned Crash ID was deleted. After deleting the single duplicate record, the resulting MCMIS file contains 7,163 records.

2.2 Georgia Police Accident Report File

The Georgia PAR data for 2006 (as of July 20, 2007) were obtained from the state of Georgia. The data were stored as seven tables in a Microsoft Access database, representing Accident, Vehicle, and Person records. The files contain records for 342,158 crashes involving 650,246 vehicles. Data for the PAR file are coded from the Georgia Uniform Motor Vehicle Accident Report (form DOT-523) completed by police officers (Appendix B).

The PAR file was first examined for duplicate records. A search for records with identical case numbers and vehicle numbers found no such instances. In addition, inspection of case numbers verified that they were recorded in a consistent format, so there was no reason to suspect duplicate records based on similar, but not identical, case numbers (such as 60440316 and 6044-316, for example). However, cases were also examined to determine if there were any records that contained identical case number, time, place and vehicle/driver variables, even though their vehicle numbers were different. Two cases would not be expected to be identical on all variables. To investigate this possibility, records were examined for duplicate occurrences

based on the variables case number, accident date/time, crash county, road, vehicle identification number (VIN), vehicle license plate number, and driver license number.

Based on the above algorithm, a total of 214 duplicate instances were found, representing 107 unique occurrences of the examined variables. Further examination of the pairs revealed that most of the other variables were also identical. Thus, these records were considered duplicates. In these instances, one record may have been intended as an update to the original case, and mistakenly resulted in the addition of a second record. The member of the pair with the latest date in the Last_update field on the vehicle record was kept, and the other one deleted. The resulting PAR file contains 650,139 unique records.

3. Matching Process

The next step involved matching records from the Georgia PAR file to corresponding records from the MCMIS file. After removing the duplicate cases, there were 7,163 Georgia records from the MCMIS file available for matching, and 650,139 records from the Georgia PAR file. All records from the Georgia PAR data file were used in the match, even those that were not reportable to the MCMIS Crash file. This allowed the identification of cases in the MCMIS Crash file that did not meet the MCMIS Crash file reporting criteria.

Matching records in the two files requires finding combinations of variables common to the two files that have a high probability of uniquely identifying accidents and specific vehicles within the accidents. Microfilm Number, which is the identifier used to uniquely identify a crash in the Georgia PAR data, and Report Number in the MCMIS Crash file, are obvious first choices. Indeed, there is a correspondence between the two numbers, and case number was never unrecorded in either file. Microfilm Number in the Georgia PAR file is an eight-digit numeric value, while in the MCMIS Crash file Report Number is stored as a 12-character alphanumeric value, a combination of alphabetic characters and numbers. It appears that the report number in the MCMIS Crash file is constructed as follows: The first two columns contain the state abbreviation (GA, in this case), followed by ten digits. Since eight of these digits were consistent with the PAR Microfilm Number, the first eight digits of the MCMIS Report Number were extracted, and used in the match.

Other variables typically available for matching at the crash level include Crash Date, Crash Time (stored in military time as hour/minute), Crash County, Crash City, Crash Road and Reporting Officer's Identification number. Since Crash City and Officer Badge Number were always unrecorded in the MCMIS data, they could not be used.

Variables in the MCMIS file that distinguish one vehicle from another within the same crash include vehicle license plate number, driver license number, vehicle identification number (VIN), driver date of birth, and driver last name. VIN was unrecorded 4.7% of the time in the PAR data and was unknown in only 1.0% of MCMIS cases. In the PAR file, Vehicle Tag Number was unrecorded in 6.8% of cases and Driver License Number was missing in 8.8% of cases. Driver Last Name, however, was only unknown in less than 0.1% of PAR records.

Four separate matches were performed using the available variables. At each step, records in either file with duplicate values on all the match variables were excluded, along with records that were missing values on the match variables. The first match included the variables case number,

crash date (month, day), crash time (hour, minute), county, road name, VIN, driver license number, and vehicle license number. The second match step dropped road name, VIN, and driver license number, but added driver last name. The third match step matched on case number, crash date, hour, county, VIN, and driver last name. After some experimentation, the fourth match included variables case number, date, hour, road name, and driver last name. Cases in the fourth match were also hand-verified to ensure the match was valid. This process resulted in matching 99.7% of the MCMIS records to the PAR file.

Table 1 shows the variables used in each match step along with the number of records matched at each step. Matched records were verified using other variables common to the MCMIS and PAR file as a final check to ensure the match was valid. The above procedure resulted in 7,141 matches, representing 99.7% of the 7,163 non-duplicate records reported to MCMIS.

Table 1 Steps in MCMIS/Georgia PAR File Match, 2006

Step	Matching variables	Cases matched
Match 1	Case number, crash date, crash time, county, road name, VIN, driver license number, and vehicle license number	6,702
Match 2	Case number, crash date, crash time, county, driver last name, and vehicle license number	235
Match 3	Case number, crash date, crash hour, county, VIN, and driver last name	150
Match 4	Case number, crash date, crash hour, road name and driver last name	54
Total cases matched		7,141

Figure 1 shows the flow of cases in the matching process. Of the 7,141 matched cases, 1,132 are not reportable and 6,009 are reportable. The method of identifying cases reportable to the MCMIS Crash file is discussed in the next section.

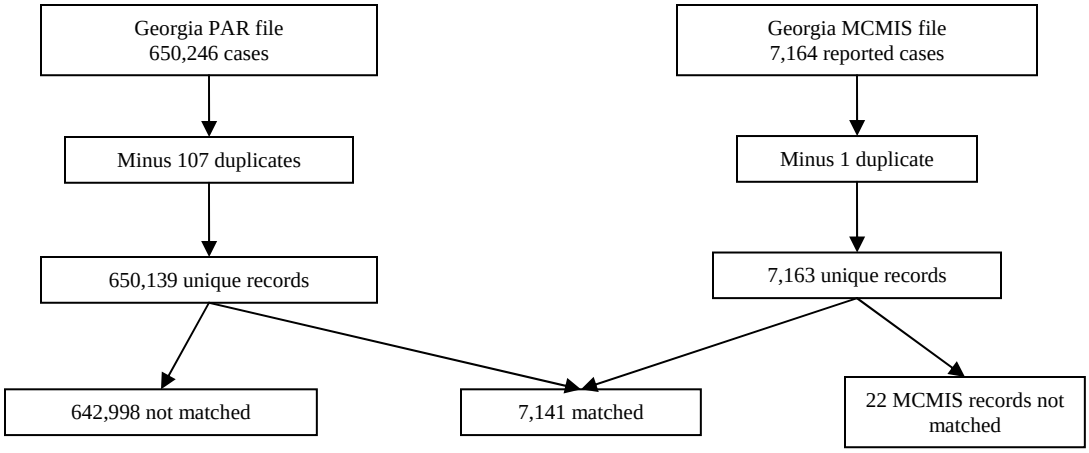

Figure 1 Case Flow in MCMIS/Georgia Crash File Match

4. Identifying Reportable Cases

The next step in data preparation is to identify records in the Georgia data that qualified for reporting to the MCMIS Crash file. Records are identified using the information available in the computerized crash files that were sent by Georgia. To identify reportable records, we use the information that is completed by the officers for all vehicles. That is, some police reports place certain data elements that are to be collected for the MCMIS file in a special section or supplemental form, with the instruction to the officer to complete that section if the vehicle and crash meets the MCMIS reporting criteria. For example, the Georgia PAR form has a commercial vehicle section (Appendix B). But since our goal is to evaluate the completeness of reporting, we attempt to identify all reportable cases, even those an officer may have overlooked. For this purpose, we use the data that is completed for all cases. The goal of the selection process is to approximate as closely as possible the reporting threshold of the MCMIS file. The MCMIS criteria for a reportable crash involving a qualifying vehicle are shown in Table 2.

Table 2 Vehicle and Crash Severity Threshold for MCMIS Crash File

Vehicle	Truck with GVWR over 10,000 or GCWR over 10,000, or Bus with seating for at least nine, including the driver, or Vehicle displaying a hazardous materials placard.
Accident	Fatality, or Injury transported to a medical facility for immediate medical attention, or Vehicle towed due to disabling damage.

Instructions are provided in the Georgia Uniform Vehicle Accident Report Instruction Guide [29] to aid officers in filling out the commercial vehicle (CMV) section. The instructions state that it is mandatory to complete this section if a commercial vehicle is involved in a crash. According to the definitions in the guide, the crash must involve:

1. A truck or truck/trailer combination or other vehicle combination having a manufacturer's gross weight rating (GVWR) or gross combination weight rating (GCWR) of 10,001 or more pounds.
2. A vehicle that is required to display a hazardous material placard, or
3. A bus with seating for more than 15 persons, including the driver.

Note that the bus criterion applies to 15 persons, including the driver, and appears to be outdated since it does not agree with the current standard of seating for at least nine, including the driver. Otherwise, the vehicle criteria are compatible with the MCMIS vehicle criteria. However, the definition of a commercial vehicle, according to the Georgia guide, does not include:

1. Government Vehicles – owned or operated by Federal, State, City, or County agencies.
2. School Buses – operated to transport school children and teachers to and from school functions.
3. Rental Vehicles – Vehicles used by individuals on occasion to transport personal property not for compensation or in the furtherance of a commercial enterprise. Commercial enterprise includes almost any business, including non-profit organizations.

These omissions are generally not compatible with the MCMIS vehicle criteria. In addition, there is a yes/no check box in the CMV section for a federally reportable crash (appendix B). Information in the Georgia guide instructs officers to check *yes* when a crash meets the threshold for a MCMIS reportable crash. However, as shown above, the definition of a CMV used by Georgia is generally not compatible with the requirements used for MCMIS reporting and there are differences between information collected from the main PAR form and information collected from the CMV section. Some of these differences are described below. For these reasons, and as stated above, the vehicle type variable on the main PAR form is used to identify qualifying vehicles.

The vehicle type variable in the Georgia PAR file is a 23-level variable that officers code with the aid of an overlay that folds to the front of the PAR form. Table 3 shows the relevant body styles used to identify MCMIS qualifying vehicles. The variable has codes for tractors with no trailers (bobtails), and tractors pulling one or two trailers. There are also codes for single unit trucks (SUTs), a general code for all buses, and a code for panel trucks. Unlike the information recorded in the CMV section, the code for buses on the main form includes school buses. It should be noted that 3,282 buses can be identified from the vehicle type variable on the main PAR form, but only 220 buses can be identified from the data coded in the CMV section.

There is a vehicle configuration variable with codes for SUTs with two axles and SUTs with three or more axles, but this variable is coded from the CMV section of the PAR form, and since the definition of a CMV used by Georgia does not generally agree with the criteria used for MCMIS evaluation, this variable is not considered. For example, a two-way frequency table between the vehicle type variable on the main PAR form and the vehicle configuration variable in the CMV section shows that 67 percent of SUTs are not coded in the CMV section. Similarly, there is a yes/no variable for identifying CMVs in the main PAR file. According to this variable, only about 50 percent of SUTs are coded as CMVs.

Table 3 Relevant Vehicle Body Style Codes on Georgia Accident Report Overlay

Tractor/ trailer
Tractor/ trailer (bobtail)
Tractor w/ twin trailers
Logging truck
Logging tractor/ trailer
Single unit truck
Bus
Panel Truck

As shown in Table 3, panel trucks are coded in the vehicle type variable. A question of interest is whether these vehicles satisfy the GVWR requirement for a qualifying vehicle. Of the 650,139 vehicles in the Georgia PAR file, 2,149 are coded as panel trucks. To check these vehicles, 100 vehicles coded as panel trucks were randomly selected and the vehicle identification numbers (VINs) were decoded. It was determined that the GVWR of 77 of these vehicles exceed 10,000 pounds, 18 were 10,000 pounds or less, and 5 VINs could not be decoded. Therefore, it is estimated that approximately 80 percent of vehicles coded as panel trucks in the Georgia PAR file are qualifying trucks. The majority of these vehicles are represented by a cab on a chassis with a box van body. For purposes of this study, vehicles coded as panel trucks are included as qualifying vehicles. As a reference, only 233 of the 2,149 panel trucks, or 10.8 percent, are coded in the CMV section of the PAR form.

In total, there were 28,781 vehicles identified as trucks, buses, or non-trucks displaying a hazardous materials placard in the Georgia PAR file. Table 4 shows the distribution of vehicle type. The great majority of qualifying vehicles are trucks, while about 11.4 percent are buses. As usual, non-trucks displaying a hazmat placard account for a small fraction of qualifying vehicles. Information for hazmat placarded vehicles can only be identified from information recorded in the CMV section of the PAR form, yet 14 non-trucks were identified. The 28,781 eligible vehicles represent 4.4 percent of all 650,139 vehicles in the PAR file. This result is consistent with other MCMIS evaluations in which the percentage of eligible vehicles has ranged from 2.6 percent to 6.1 percent.

Table 4 Vehicles Meeting MCMIS Vehicle Criteria, Georgia PAR File, 2006

Vehicle type	N	%
Trucks	25,485	88.5
Buses	3,282	11.4
Non-trucks with hazmat placard	14	0.1
Total	28,781	100.0

Having identified qualifying vehicles, the next step is to identify crashes of sufficient severity to qualify for reporting to the MCMIS Crash file. Qualifying crashes include either a fatality, an injury transported for immediate medical attention, or a vehicle towed from the scene due to disabling damage. Fatal crashes are readily identified. Whether a crash included an injured

person transported for medical attention can also be determined. The Georgia PAR file also has information for assessing the towed and disabled criterion.

The Georgia PAR form (Appendix B) has spaces for recording injury and whether any persons were transported for medical treatment. The injury codes are killed, serious, visible, complaint, and not injured, which closely match the usual KABCO definitions. Officers are instructed to record whether any injured parties were taken from the scene of a crash by any means to a medical facility for treatment, and this information is coded in the PAR data. Following the strict sense of the definition, an injured and transported variable was created from the injury severity and the facility taken to variables in the Occupant file. This variable was merged into the Vehicle file to create a crash-level injured and transported variable. Therefore, any crash involving an A, B, or C-injury, and a transported person satisfies the criterion.

Following the strict sense of the definition of the injured and transported criterion can lead to underestimation of the number of crashes actually satisfying the criterion. For example, the number of persons transported for medical attention may be underreported in State PAR files. Previous MCMIS evaluations have made note of this situation (see, for example [20]). The claim in this report is that even if injured/transported cases are underestimated, they tend to be captured by reportable towed/disabled cases, resulting in stable estimation of the *total* number of reportable vehicles to the MCMIS Crash file. Therefore, the overall reporting rate, to be shown in Section 5, tends to be robust, irrespective of small changes to the definition of the injured and transported criterion.

With respect to the towed/disabled criterion, the Georgia PAR data includes two sources of information to identify crashes in which a vehicle was towed due to disabling damage. The towed away variable is a yes/no variable indicating whether a vehicle was towed or not. The damage variable is an ordered variable with increasing levels of damage: none, slight, moderate, extensive, and fire present.

The damage variable does not have a level to indicate whether damage was disabling. Previous knowledge of the towed due to damage variable, using the manner of leaving scene (towed) variable in the 2005 General Estimates System (GES) database [30], for example, shows that about 27 percent of vehicles are towed due to damage. Other MCMIS evaluations tend to support this estimate [20, 22]. Based on these considerations, a vehicle is considered towed and disabled if the towed away variable indicates the vehicle was towed, and the damage variable was coded moderate, extensive, or fire present. This results in an estimated 22 percent of vehicles towed due to damage in the Georgia PAR file, which is less than the 27 percent standard described above. Inclusion of towed vehicles with *slight* damage gives 27 percent, but inclusion of vehicles with only slight damage may be hard to justify and may not be warranted. For this reason, vehicles with slight damage are not included, and a towed and disabled flag variable was created at the crash level to be used for estimating the number of qualifying vehicles satisfying this criterion.

Table 5 shows the numbers of qualifying vehicles that meet the threshold for a MCMIS reportable crash according to the MCMIS criteria. In total, it is estimated that 9,064 vehicles were reportable to the MCMIS Crash file. Of these, 260 were involved in fatal crashes and 3,362 or about 37.1 percent were involved in crashes where at least one person was transported for medical treatment. Based on the towed and disabled variable described above, it is estimated that

5,442 or about 60.0 percent of reportable vehicles were involved in crashes where at least one vehicle was towed due to disabling damage.

Table 5 Reportable Records in Georgia Crash File, 2006

Crash type	Total	%
Fatal	260	2.9
Injury transported for treatment	3,362	37.1
Vehicle towed due to damage	5,442	60.0
Total	9,064	100.0

Table 5 represents the MCMIS reportable vehicles discovered in this study based on evaluation of the Georgia PAR file. In the CMV section of the Georgia PAR form (Appendix B), there is space for officers to check yes/no boxes if in the officer's opinion a crash meets the threshold of a MCMIS reportable crash. A two-way frequency table, shown in Table 6 below, can be used to assess how the two methods compare. The totals on the right hand side of Table 6 are those shown in Table 5 and represent reportable vehicles identified in this study from the PAR data. Of the 9,064 vehicles estimated as reportable in this study, 6,305 were recorded as reportable according to the check box in the CMV section of the Georgia PAR form. In addition, 1,758 vehicles were recorded as reportable according to the check box method that are not considered reportable in this study. Therefore, the total number of reportable vehicles based on the check box in the CMV section is 8,063, which is 1,001 vehicles less than the number estimated in this study.

Table 6 Comparison of Reportable Vehicles from Two Sources, Georgia PAR File, 2006

	CMV section reportable crashes				
Reportable crashes (this study)	Yes	%	Not recorded	%	Total
Fatal	212	81.5	48	18.5	260
Injury transported for treatment	2,351	69.9	1,011	30.1	3,362
Vehicle towed due to damage	3,742	68.8	1,700	31.2	5,442
Total	6,305	69.6	2,759	30.4	9,064

Based on the results shown in Table 6, one might guess that the overall reporting rate for Georgia is close to 69.6 percent. It will be shown in the next section that this estimate is very close to the one calculated in this study. By including all vehicles coded as panel trucks, we recognize that the number of qualifying vehicles is slightly overestimated. Of the 2,149 panel trucks coded in the Georgia PAR file, it is estimated that 80 percent, or about 1,719 have GVWR greater than 10,000 pounds. The estimated 430 that are remaining most likely are not qualifying vehicles. However, to be reportable, a vehicle must also satisfy the crash severity criteria (fatal, injured and transported, or towed due to damage), so it is likely that many of the 430 are not reportable. We include all panel trucks as qualifying vehicles because previous MCMIS evaluations tend to suggest that smaller trucks, as well as crashes involving less injury severity, are less likely to be reported to the MCMIS Crash file and we want to capture sources of underreporting in this study. Note that 430 is 1.5 percent of all 28,781 qualifying vehicles identified in Table 4, and therefore inclusion of vehicles coded as panel trucks will not have great influence over the reporting rates presented in the next section. Many of the issues raised here will be evaluated in

greater detail in the next section which is devoted to exploring sources of underreporting and overreporting.

5. Factors Associated with Reporting

The procedure described in the previous section identified 9,064 vehicles involved in crashes as reportable to the MCMIS Crash file. The match process described in Section 3 determined that 7,163 unique cases were reported to the MCMIS Crash file, of which 7,141 could be matched to the Georgia PAR data. Of the 7,141 cases that could be matched, 6,176 were determined to meet the MCMIS Crash file reporting criteria. Therefore, of the 9,064 reportable crashes in 2006, Georgia reported 6,176, for an overall reporting rate of 68.1 percent[1]. In this section, some of the factors that affect the chance that a qualifying crash would be submitted through the SafetyNet system and appear in the MCMIS Crash file are identified. The results are presented in five subsections: overreporting, case processing, reporting criteria, reporting agency and area, and truck/bus fire and explosion occurrence. Analysis of overreporting attempts to identify why cases were submitted that do not meet the MCMIS reporting criteria as defined by Table 2. Case processing deals with timing issues in reporting such as crash month and time lag between crash date and uploading date to the MCMIS Crash file. Reporting criteria includes factors such as vehicle type and crash severity. Reporting agency is associated with differences in reporting rates due to the agency, such as state police or local police, while area investigates reporting by location, such as the county where the crash occurred. Truck/bus fire occurrence examines reportable cases of crashes involving fire or explosion.

5.1 Overreporting

MCMIS evaluations tend to focus on underreporting because sources of underreporting tend to be more prevalent than overreporting. However, almost all states overreport cases to some degree. Overreporting results when cases are submitted to the MCMIS Crash file that do not meet the criteria for a reportable crash. Since 7,141 MCMIS cases could be matched to the Georgia PAR data, and 6,176 were determined to meet the reporting criteria, the difference, or 965 cases, were not reportable, and should not have been reported.

Table 7 shows a two-way classification of vehicle type and crash severity, and provides some explanation as to why these vehicles should not have been reported to the MCMIS Crash file. Note that all 965 vehicles do not meet the crash severity threshold for a MCMIS reportable crash. In addition, 492 vehicles do not meet the vehicle criteria since they are not trucks, buses, or hazmat placarded vehicles. The 472 trucks and one bus are qualifying vehicles, but they were involved in crashes in which there were no fatalities, no persons were injured and transported for medical attention, and no vehicles were towed due to disabling damage.

[1] If panel trucks are completely removed from the analysis, the reporting rate is 70.7 percent, calculated as the ratio of 6,009 matched and reportable cases to 8,498 reportable cases identified in the Georgia PAR file.

Table 7 Distribution of Non-reportable Vehicles in MCMIS Crash File, Georgia 2006

Vehicle type	Crash severity				Total
	Fatal	Transported injury	Towed/disabled	Other crash severity	
Truck	0	0	0	472	472
Bus	0	0	0	1	1
Other vehicle (not transporting hazmat)	0	0	0	492	492
Total	0	0	0	965	965

5.2 Case Processing

Delays in transmitting cases may partially account for the incompleteness of the MCMIS Crash file. The time lag in extracting and submitting reports to the MCMIS Crash file might explain some portion of the unreported cases. All reportable crash involvements for a calendar year are required to be transmitted to the MCMIS Crash file within 90 days of the date of the crash. The 2006 MCMIS Crash file as of June 4, 2007 was used to identify records submitted from Georgia, so all 2006 cases should have been reported by that date.

Table 8 shows reporting rates according to month of the crash. Reporting rates tend to be lowest for crashes that occurred at the end of the year. In October, November, and December, rates are about ten percentage points below the overall rate. The smallest rate is 55.1 percent and occurred in December. The largest rate is 76.1 percent and occurred in July. In addition, the months at the end of the year have the highest percentages of total unreported cases. October, November, and December are the only months for which the percentages of total unreported cases exceed 10 percent.

Table 8 Reporting Rate by Accident Month, Georgia 2006

Crash month	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
January	748	68.4	236	8.2
February	719	72.5	198	6.9
March	847	71.7	240	8.3
April	795	72.2	221	7.7
May	777	69.6	236	8.2
June	813	74.5	207	7.2
July	702	76.1	168	5.8
August	807	72.1	225	7.8
September	690	68.0	221	7.7
October	805	58.9	331	11.5
November	680	56.0	299	10.4
December	681	55.1	306	10.6
Total	9,064	68.1	2,888	100.0

Figure 2 shows the median latency in case submission by month, where latency is the number of days between crash date and the date the case was uploaded to the MCMIS Crash file, minus the 90-day grace period. Therefore, a positive number for a month gives the median number of days that cases were submitted after the 90-day grace period. A negative number indicates that the median number of cases was submitted within the 90-day grace period for a month. Since all but one of the numbers is negative, cases tended to be uploaded to the MCMIS Crash file within the 90-day grace period. For some reason there is a large spike in the plot in February. In that month, cases tended to be uploaded about 71 days after the 90-day grace period.

The median latency is reported because the distributions for each month tend to be skewed to the right, meaning that there are a few reported cases with large latency values. These large values are influential and skew the mean (average value) to the right. The median is not influenced by these few large values. For example, over the twelve months the maximum latency (minus 90 days) is 360, while the minimum latency is -76. The plot is based on the 6,176 matched and reported Georgia cases. Therefore, the median for each month is calculated from approximately 500 vehicles.

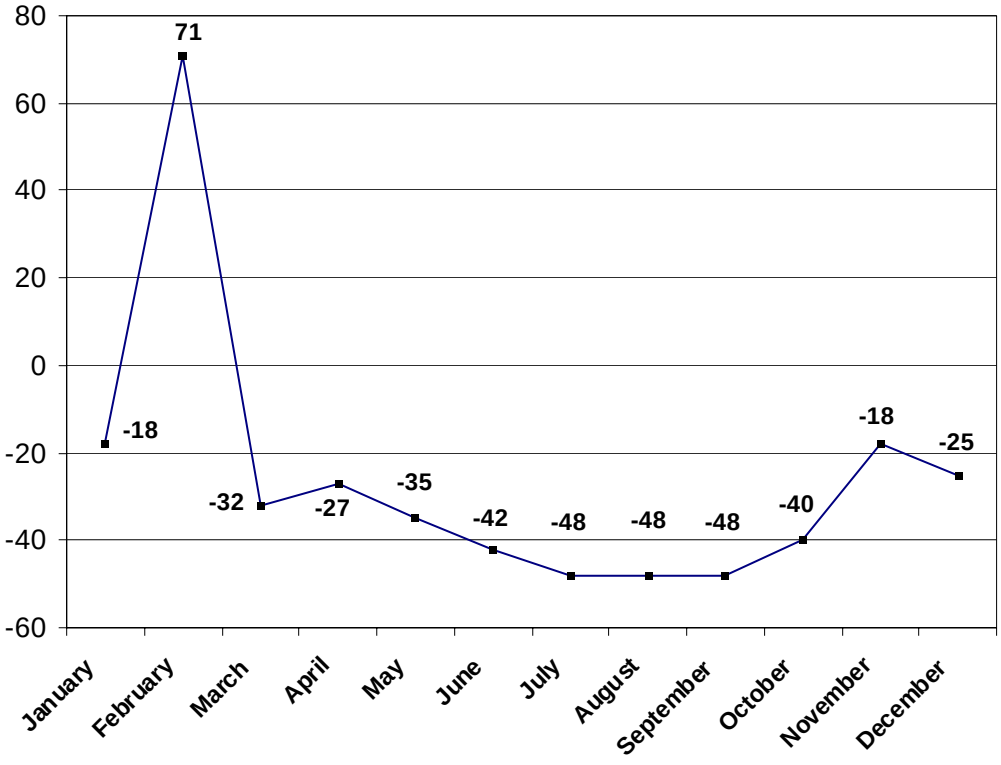

Figure 2 Median Latency (in Days, Minus 90) in Reporting to the MCMIS Crash File, Georgia Reported Cases, 2006

5.3 Reporting Criteria

In this section, reporting is investigated according to variables in the Georgia PAR file related to the reporting criteria for a MCMIS-reportable crash, as outlined in Table 2. Previous studies have consistently shown that trucks are more likely to be reported than buses and that fatal crashes are

more likely to be reported than injury involvements. Since the criteria revolve around attributes associated with the vehicle type and crash severity, calculating reporting rates for these two variables is a logical starting point for assessing where improvements can be gained.

Table 9 shows reporting rates by vehicle type. It is clear that trucks represent the great majority of reportable vehicles. Although 704 reportable buses is relatively small compared to 8,355 reportable trucks, the reporting rate for buses is only 3.1 percent. Examination of the Georgia Uniform Vehicle Accident Report Instruction Guide [29] provides a good explanation as to why the reporting rate for buses is so low. As described in Section 4, buses, government vehicles, and rental vehicles are excluded from the definition of a commercial vehicle. Therefore, it appears that the commercial vehicle section of the Georgia PAR form is not being filled out when buses are involved in qualifying crashes. Furthermore, it seems that filling out the commercial vehicle section acts as a trigger for reporting to the MCMIS Crash file. As shown in Table 9, the reporting for all trucks is 73.6 percent, and trucks represent 76.4 percent of total unreported cases. The five reportable hazmat vehicles were reported.

Table 9 Reporting Rate by Vehicle Type, Georgia 2006

Vehicle type	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Truck	8,355	73.6	2,206	76.4
Bus	704	3.1	682	23.6
Transporting hazardous materials	5	100.0	0	0.0
Total	9,064	68.1	2,888	100.0

Table 10 shows reporting rates by detailed vehicle body style and shows that certain types of trucks were much more likely to be reported than others. Tractors with trailers were most likely to be reported. The Georgia PAR data has classifications for logging vehicles and the reporting rate for logging tractors is 80.1 percent, while the rate for logging trucks is 73.8 percent. Smaller trucks such as single unit trucks (SUTs) and panel trucks show considerably smaller rates. The reporting rate for vehicles classified as SUTs is 55.4 percent, and the rate for panel trucks is 29.8 percent. It is recognized that the rate for panel trucks shown in Table 10 is artificially low since not all vehicles coded as panel trucks in the Georgia PAR file have GVWR greater than 10,000 pounds. However, by the arguments presented in Section 4, it is estimated that approximately 80 percent of these vehicles have GVWR greater than 10,000 pounds and are qualifying vehicles. Although the rate may not actually be as low as 29.8 percent, the results indicate that in general, reportable vehicles classified as panel trucks are not as likely to be reported as the other larger truck configurations.

Table 10 also shows that SUTs and panel trucks account for a large percentage of the total unreported cases. SUTs have the largest percentage of unreported cases at 37.3 percent, while the percentage for panel trucks is 13.8 percent, giving a combined total of 51.1 percent, or more than half of all unreported cases. In addition, because the reporting rate for buses is poor, buses account for a considerable percentage of all unreported cases.

The preceding discussion suggests that substantial improvement to the overall reporting rate in Georgia could be achieved if SUTs, panel trucks, and buses were reported with greater

frequency. Note that the rate for tractor semitrailers is 87.6 percent, so these vehicles are likely to be reported when they are involved in reportable crashes.

Table 10 Reporting Rate by Detailed Vehicle Body Style, Georgia 2006

Vehicle body type	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Tractor/trailer (bobtail)	295	76.9	68	2.4
Tractor/trailer	4,585	87.6	567	19.6
Tractor w/twin trailers	119	86.6	16	0.6
Logging truck	80	73.8	21	0.7
Logging tractor/trailer	292	80.1	58	2.0
Single unit truck	2,416	55.4	1,077	37.3
Panel truck	568	29.8	399	13.8
Vehicle with trailer	1	100.0	0	0.0
Bus	704	3.1	682	23.6
Other	4	100.0	0	0.0
Total	9,064	68.1	2,888	100.0

Previous MCMIS evaluations have shown that qualifying vehicles involved in fatal crashes are generally more likely to be reported than vehicles involved in injury-related or vehicle damage-related crashes. Table 11 shows reporting rates by crash severity. The reporting rate for fatal crashes is 78.8 percent and is about ten percentage points higher than for the other two categories. The reporting rate for the injured/transported criterion is 68.4 percent, and the rate for the towed/disabled criterion is 67.4 percent. Therefore, the rates for these two criteria do not differ greatly. As shown in Table 11, the total percentage of unreported cases is 61.4 percent for the towed/disabled criterion, and due to the large numbers of reportable and unreported cases, it largely influences the overall rate of 68.1 percent.

Table 11 Reporting Rate by Crash Severity, Georgia 2006

Crash severity	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Fatal	260	78.8	55	1.9
Injured/transported	3,362	68.4	1,061	36.7
Towed/disabled	5,442	67.4	1,772	61.4
Total	9,064	68.1	2,888	100.0

Table 12 shows reporting rates to the MCMIS Crash file by maximum injury severity in the crash. The fatal involvement results are identical to those shown in Table 11. There is no mention of the usual KABCO scale in the Georgia Uniform Vehicle Accident Report Instruction Guide [29], but the Georgia definitions shown in Table 12 match the usual KABCO definitions closely. Reporting rates tend to decrease as injury severity decreases. The largest numbers of reportable cases are those in crashes involving no injury. These cases represent 43.5 percent of the unreported cases and are reportable based on the towed/disabled criterion. The reporting rate for crashes involving complaint of injury is 63.9 percent and the percent of unreported cases for this category is 35.1 percent.

Table 12 Reporting Rate by Detailed Injury Severity, Georgia 2006

Crash severity	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Killed	260	78.8	55	1.9
Serious	414	71.7	117	4.1
Visible	1,658	73.1	446	15.4
Complaint	2,810	63.9	1,014	35.1
Not injured	3,922	68.0	1,256	43.5
Total	9,064	68.1	2,888	100.0

5.4 Reporting Agency and Area

Georgia has 159 counties, ranking second in number of counties only to Texas. Reporting rates may vary by geographic location because of differing work loads of police agencies and for other reasons. Previous studies have sometimes shown that heavily populated areas with high work loads tend to have lower reporting rates. Table 13 shows reporting rates for the top fifteen counties in Georgia, ranked in terms of the number of reportable cases. Fulton County, which includes the city of Atlanta, has the largest number of reportable cases, the lowest reporting rate of the top fifteen counties, and the largest percentage of unreported cases. Dekalb, Gwinnett, and Cobb Counties are neighboring counties of Fulton County. Table 13 shows that the reporting rate of the top fifteen counties is about 10 percentage points lower than the remaining counties and the top fifteen counties account for 63.5 percent of unreported cases.

Table 13 Reporting Rate by County, Georgia 2006

County	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Fulton	1,085	55.9	479	16.6
Dekalb	754	56.6	327	11.3
Gwinnett	584	63.2	215	7.4
Cobb	564	64.0	203	7.0
Chatham	317	65.3	110	3.8
Clayton	276	73.2	74	2.6
Bartow	217	77.0	50	1.7
Bibb	210	67.6	68	2.4
Henry	200	73.5	53	1.8
Douglas	155	74.2	40	1.4
Richmond	152	57.9	64	2.2
Hall	148	69.6	45	1.6
Cherokee	140	72.1	39	1.4
Whitfield	140	75.7	34	1.2
Coweta	117	72.6	32	1.1
Top 15 counties	5,059	63.8	1,833	63.5
Other counties	4,005	73.7	1,055	36.5
Total	9,064	68.1	2,888	100.0

Previous studies have also shown that reporting rates tend to vary by the type of reporting agency. Different agencies have different policing responsibilities, training, and experience. Table 14 shows reporting rates for the Atlanta Police Department, local police, state police, and sheriff's offices. The Atlanta Police Department has the lowest rate at 52 percent, but also has the lowest percentage of total unreported cases. Statewide, local police handle the majority of cases and have a reporting rate of 63.7 percent and account for 57.5 percent of the unreported cases. State police have the highest rate at 77.8 percent while accounting for 21.1 percent of unreported cases. The reporting rate for sheriff's offices is not too far from the overall total of 68.1 percent.

Table 14 Reporting Rate by Reporting Agency, Georgia 2006

Reporting agency	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Atlanta PD	573	52.0	275	9.5
Local police	4,578	63.7	1,662	57.5
Sheriff	1,169	70.7	343	11.9
State police	2,744	77.8	608	21.1
Total	9,064	68.1	2,888	100.0

5.5 Truck/Bus Fire or Explosion

There are three variables recorded in the Georgia PAR file that relate to occurrence of fire or explosion: first harmful event, most harmful event, and damage. There are spaces on the PAR form for each of the variables. First harmful event applies to the crash, while most harmful event and damage apply to individual vehicles. Of the 9,064 reportable vehicles, fire/explosion is recorded for five vehicles in the first harmful event and for 19 vehicles in the most harmful event. For the damage variable, fire present is coded for 62 vehicles. Table 15 shows the reporting rate according to fire or explosion for trucks and buses. The results shown in Table 15 include vehicles for which any of the three variables in the Georgia PAR file indicate that fire/explosion occurred or fire was present. The number of reportable vehicles is 67 which is very close to the total of 62 coded for the damage variable alone. The total number of reportable vehicles is 9,059 instead of 9,064 since five reportable vehicles are non-trucks with a hazmat placard. All five of these vehicles were reported (Table 5). For trucks, rates do not differ greatly according to the occurrence of fire. For buses, the numbers are too small to make definite conclusions, and in general, the reporting rate for buses is about three percent.

Table 15 Reporting Rate by Fire/explosion, Georgia 2006

Event	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Truck				
Fire/explosion	64	75.0	16	0.6
Other	8,291	73.6	2,190	75.8
Bus				
Fire/explosion	3	33.3	2	0.1
Other	701	3.0	680	23.5
Total	9,059	68.1	2,888	100.0

6. Data Quality of Reported Cases

In this section, the quality of data reported to the MCMIS crash file is considered. Two aspects of data quality are examined. The first is the amount of missing data. Missing data rates are important to the usefulness of a data file because records with missing data cannot contribute to an analysis. The second aspect of data quality considered here is the consistency of coding between records as they appear in the Georgia Crash file and in the MCMIS Crash file. Inconsistencies can indicate errors in translating information recorded on the crash report to the values in the MCMIS Crash file.

Table 16 shows missing data rates for selected, important variables in the MCMIS Crash file. Missing data rates are low for most variables, but high for others. On most fundamental, structural variables, such as date, time, number of fatalities and number of injuries, missing data rates are either zero or extremely low. Missing data rates for some other variables are higher. The citation issued and road access variables are completely missing, and for practical purposes so are number of vehicles and driver license class. The variable GVWR class is missing 68.4 percent and the variables light, road surface, road trafficway, and weather are each missing 64.6 percent. It is not unusual that the event variables two, three, and four have high percentages of missing data, but the event one variable in the Georgia MCMIS Crash file is 99.9 percent missing. Where the carrier is coded interstate, DOT number has 10.9 percent missing values.

Table 16 Missing Data Rates for Selected MCMIS Crash File Variables, Georgia, 2006

Variable	Percent unrecorded	Variable	Percent unrecorded
Report number	0.0	Fatal injuries	0.0
Accident year	0.0	Non-fatal injuries	0.0
Accident month	0.0	Interstate	0.0
Accident day	0.0	Light	64.6
Accident hour	0.0	Event one	99.9
Accident minute	0.0	Event two	100.0
County	0.0	Event three	100.0
Body type	0.0	Event four	100.0

Variable	Percent unrecorded	Variable	Percent unrecorded
Configuration	0.0	Number of vehicles	99.9
GVWR class	68.4	Road access	100.0
DOT number *	10.9	Road surface	64.6
Carrier state	0.0	Road trafficway	64.6
Citation issued	100.0	Towaway	0.0
Driver date of birth	1.5	Truck or bus	0.0
Driver license number	2.7	Vehicle license number	2.2
Driver license state	2.7	Vehicle license state	2.2
Driver license class	99.9	VIN	1.0
Driver license valid	0.0	Weather	64.6

* Based on cases where the carrier is coded interstate.

In previous MCMIS evaluations a table is usually included showing missing data percentages on various hazmat related variables in the MCMIS Crash file. The Georgia MCMIS file is missing 0.1 percent of the hazmat placard variable. However, no vehicles are coded as displaying a hazmat placard. Yet, 46 vehicles are coded with hazardous material release.

The values of variables in the MCMIS Crash file were also compared with the values of similar variables in the Georgia crash file. The purpose of this comparison is to identify any errors in translating variables from the values in the state crash file to the values required for Safetynet. Table 17 shows the coding of vehicle configuration in the MCMIS Crash file and the record as it appears in the Georgia PAR file for the 7,141 cases that were matched between the two files. The categories that Georgia uses for describing vehicle configuration are generally not compatible with the MCMIS Crash file categories. The other vehicle category is a category that was created from a generally small collection of vehicles that do not fall into any of the other categories shown.

There is general agreement between broad categories of vehicle types, but also some inconsistencies. The small number of buses is most likely due to non-reporting of buses to the MCMIS file in general. The majority of SUTs, whether with 2-axles or 3+ axles, are generally coded as single unit trucks, but some differences exist. Difficulties in determining identification of panel trucks have been discussed in Sections 4 and 5 of this report. Truck tractors in both files are in fairly good agreement. Note that Georgia has a category for logging trucks, which appear to be classified as SUTs in the MCMIS file, and a category for logging tractor/trailers which tend to be classified as tractor/trailers in the MCMIS file. Table 17 illustrates that while broad categories of vehicle types tend to agree, there is also some disagreement most likely attributed to differences in category definitions.

Table 17 Vehicle Configuration in Georgia and MCMIS Crash Files, 2006

Vehicle configuration			
MCMIS Crash file	Georgia Crash File	N	%
Bus (seats 9-15, incl dr)	Bus	3	0.0
Bus (seats >15, incl dr)	Bus	20	0.3
SUT, 2-axle, 6 tire	Single unit truck	474	6.6
	Panel truck	69	1.0
	Other	47	0.7
	Logging truck	25	0.4
	Car, pickup, van, other vehicle	31	0.4
SUT, 3+ axles	Single unit truck	567	7.9
	Other	86	1.2
	Panel truck	11	0.2
	Other vehicle	18	0.3
Truck trailer	Vehicle with trailer	31	0.4
	Logging truck	13	0.2
	Other vehicle	9	0.1
Truck tractor (bobtail)	Tractor/trailer (bobtail)	247	3.5
	Other	1	0.0
Tractor/semitrailer	Tractor/trailer	4,339	60.8
	Logging tractor/trailer	231	3.2
	Other vehicle	20	0.3
Tractor/double	Tractor w/twin trailers	111	1.6
	Logging tractor/trailer	1	0.0
Unk heavy truck>10,000	SUT	394	5.5
	Other	183	2.6
	Panel truck	102	1.4
	Pickup	28	0.4
	Vehicle with trailer	26	0.4
	Other vehicle	54	0.8
Total		7,141	100.0

There was also one case in which the number of fatal injuries in the crash differed between the two files. Table 18 shows that of the 7,141 matched cases, there was only one case in which the number of fatalities differed. In that case, the Georgia crash file record shows no fatality, while the MCMIS Crash file record indicates one fatality in the crash. This may be a case where the record was changed in the state crash file, but the change was not reflected in the MCMIS file. In general, however, this variable shows good agreement between the two files.

Table 18 Comparison of Fatals in Crash in MCMIS and Georgia Crash Files, 2006

Number of fatals in crash			
MCMIS Crash file	Georgia Crash file	N	%
0	0	6,927	97.0
1	0	1	< 0.1
1	1	188	2.6
2	2	21	0.3
3	3	3	< 0.1
4	4	1	< 0.1
Total		7,141	100.0

7. Summary and Discussion

This report is an evaluation of reporting to the MCMIS Crash file by the state of Georgia in 2006. Records were matched between the Georgia PAR file and the MCMIS Crash file using variables common to both files with low percentages of missing data. After removing duplicate records from both files, 650,139 unique records remained for matching from the PAR file and 7,163 unique records remained for matching from the MCMIS file. In total, 7,141, or 99.7 percent of the MCMIS records were matched (Figure 1).

The next step in the evaluation process focused on identifying reportable cases using the Georgia PAR file according to established vehicle and crash severity criteria. Overall, 28,781 vehicles were identified as qualifying trucks, buses, or non-trucks displaying a hazmat placard. Of qualifying vehicles, 88.5 percent are trucks, 11.4 percent are buses, and 14, or less than 0.1 percent, are non-trucks displaying a hazmat placard (Table 4).

Panel trucks are classified as one of the vehicle types in the Georgia PAR file. To determine whether vehicles in this category are qualifying vehicles, 100 vehicles were randomly sampled from the 2,149 vehicles classified as panel trucks in the PAR file. By decoding the Vehicle Identification Numbers (VINs), it was estimated that 80 percent of these vehicles have GVWR greater than 10,000 pounds. Due to the large percentage, panel trucks were included in the evaluation. Based on this decision, it is recognized that approximately 430 (2149*0.2) additional vehicles that are not qualifying trucks may be included for consideration as reportable vehicles in this study. However, these vehicles would also have to meet the crash severity threshold for a MCMIS reportable crash (Table 2) in order to be included in this analysis. Furthermore, previous MCMIS evaluations have shown that medium trucks such as SUTs are less likely to be reported than larger trucks such as tractor semitrailers.

After identifying qualifying vehicles, it is necessary to determine which of these vehicles meet the crash severity criteria for reporting to MCMIS. The Georgia Occupant file has an injury variable and a transported variable. These two variables were used to create an injured and transported variable at the crash level. The definitions that Georgia uses for describing injury severity (killed, serious, visible, complaint, not injured) are very similar to the usual KABCO definitions even though no reference to KABCO is made. Officers are instructed to record whether any injured parties were taken from the scene of a crash by any means to a medical facility for treatment, and this information is coded in the PAR data. In conjunction with the

injury variable, the transported variable made it possible to identify MCMIS-reportable crashes in the strict sense of the definition. In summary, the injured and transported criterion was satisfied if at least one person in the crash had injury severity equal to serious or visible or complaint, and the transported variable indicated that the person was transported for medical treatment.

With respect to the towed and disabled criterion, the Georgia PAR file has sufficient information contained in two separate variables. The towed away variable is a yes/no variable indicating whether a vehicle was towed or not. The damage variable is an ordered variable with increasing levels of damage: none, slight, moderate, extensive, and fire present. Because the damage variable does not have a level to indicate whether damage is disabling, a vehicle is considered towed and disabled if the towed away variable indicates the vehicle was towed, and the damage variable was coded moderate, extensive, or fire present. This results in an estimated 22 percent of vehicles towed due to damage in the Georgia PAR file, which is less than the approximate 27 percent standard found in other databases, such as the 2005 General Estimates System [30]. Inclusion of towed vehicles with *slight* damage gives 27 percent, but inclusion of vehicles with only slight damage may be hard to justify.

Using the procedure described above resulted in identification of 9,064 vehicles involved in crashes that were reportable to the MCMIS Crash file. Of these, 260 were involved in fatal crashes, 3,362 were involved in injury crashes where at least one person was transported for medical attention, and 5,442 were involved in crashes where at least one vehicle was towed due to disabling damage. Of the 7,141 records that were matched between the Georgia PAR file and the MCMIS Crash file, 6,176 were determined to meet the MCMIS Crash file reporting criteria. Therefore, the overall reporting rate in Georgia in 2006 is estimated at 6,176/9,064 = 68.1 percent. The difference between 7,141 and 6,176 suggests that 965 cases were overreported to the MCMIS Crash file. According to this analysis, all 965 cases did not meet the crash severity threshold for reporting to MCMIS (Table 7).

Since the overall reporting rate is estimated at 68.1 percent, specific variables were examined to identify sources of underreporting. Reporting rates were calculated and presented in four groups. The four groups are case processing, reporting criteria, reporting agency and area, and fire/explosion. Case processing considers timing issues, reporting criteria deals with vehicle and crash severity issues, agency and area are related to the reporting agency and the county of the crash, and fire/explosion considers fire or explosions in reportable vehicles.

Reporting rates tended to be lower than the overall rate in the months of October, November, and December by about 10 percent. These three months also accounted for 32.5 percent of the total unreported cases (Table 8). The median lag time between the date of a crash and the date the case was uploaded to the MCMIS Crash file was also evaluated. The median is used because distributions of lag time for each month tend to be skewed with a few large outliers. Cases tended to be uploaded within the 90-day grace period for all months except February. In February, cases were uploaded about 71 days after the end of the grace period.

It appears that due to instructions in the Georgia Uniform Vehicle Accident Report Instruction Guide [29], certain vehicles that satisfy the vehicle criteria for a MCMIS reportable crash are not being reported to the MCMIS Crash file. For example, according to the guide, a commercial vehicle does not include governmental vehicles, school buses, and rental vehicles. Therefore,

information for these vehicles is likely not recorded in the commercial vehicle section of the accident report. In addition, there is a check box in the commercial vehicle section for officers to check if the crash is federally reportable. The definition of a federally reportable crash in the guide matches the MCMIS crash severity threshold closely. It is possible that this check box acts as a trigger for reporting to the MCMIS Crash file. These instructions seem to have an effect on the reporting rates for certain vehicles. The biggest effect appears to be for buses. Only 22 of 704 reportable buses were reported, giving a reporting rate of 3.1 percent. The 682 unreported cases represent 23.6 percent of all unreported vehicles.

Smaller trucks also tend to have lower reporting rates than larger trucks. The reporting rate for single unit trucks (SUTs) is 55.4 percent, and SUTs represent 37.3 percent of all unreported vehicles. Together, buses and SUTs represent 60.9 percent of the unreported vehicles. In addition, the Georgia PAR file has a vehicle category for panel trucks. By decoding the vehicle identification numbers (VINs) of 100 of these vehicles selected at random, it was determined that about 80 percent of vehicles coded as panel trucks have GVWR greater than 10,000 pounds. When these vehicles are included in the analysis, the reporting rate for panel trucks is estimated at 29.8 percent. It is recognized that some vehicles coded as panel trucks are not qualifying vehicles, but inclusion of panel trucks does not substantially change the results (see discussion in 5.3).

On the other hand, larger trucks are likely to be reported. The reporting rate for tractor semi-trailers is 87.6 percent, and tractor semi-trailers represent about half of all reportable vehicles (Table 10). Therefore, it seems Georgia has good procedures in place for reporting vehicles when it is determined that a vehicle is in fact reportable to the MCMIS Crash file. Applying these procedures to buses, SUTs, and panel trucks could lead to an improved overall reporting rate.

There is no mention of the usual KABCO injury scale for defining injury in the Georgia PAR form or instruction guide, but the definitions shown in Table 12 match the KABCO definitions closely. The reporting rate for fatal crashes is 78.8 percent, which is about 10 percent higher than the overall rate. Injured and transported and towed and disabled rates are close to the overall rate of 68.1 percent. Reporting rates tend to decrease with decreasing levels of injury severity, as shown in Table 12.

Previous MCMIS evaluations have consistently shown that reporting rates in larger jurisdictions tend to be lower than those in smaller ones. Georgia has 159 counties, second in number only to Texas. Fulton County, which includes the city of Atlanta, has the lowest reporting rate among the top fifteen counties based on numbers of reportable vehicles. Other counties in close proximity to Atlanta, such as Dekalb and Gwinnett, tend to have rates that are lower than average. The reporting rate for the top fifteen counties is 63.8 percent, while the reporting rate for the remaining counties is 73.7 percent.

With respect to reporting agency, the Georgia PAR file distinguishes four agencies: Atlanta PD, local police, sheriff's offices, and state police. State police have the highest reporting rate at 77.8 percent. The reporting rate for local police departments is 63.7 percent and they account for 57.5 percent of the unreported cases. The reporting rate for sheriff's offices is 70.7 percent which is close to the overall rate. Although Atlanta PD handle the fewest number of reportable cases, they have the lowest rate at 52.0 percent.

There are three variables recorded in the Georgia PAR file that relate to occurrence of fire or explosion: first harmful event, most harmful event, and damage. Vehicles were included for which any of the three variables in the Georgia PAR file indicate that fire/explosion occurred or fire was present. There are 67 reportable vehicles, of which 64 are trucks and 3 are buses. As shown in Table 15, the reporting rate for trucks in which fire/explosion occurred is 75.0 percent, which does not differ much from the 73.6 percent reporting rate for other trucks.

Missing data percentages on certain variables in the MCMIS Crash file are generally low, but some variables have missing data that is not negligible. Table 16 shows that variables such as driver license class, road access, and number of vehicles are for practical purposes entirely missing. Other variables such as road surface, road trafficway, GVWR class, and light are missing more than 60 percent. Comparison of the 7,141 matched cases between the Georgia PAR file and the MCMIS file, shows that there is general agreement between trucks classified as tractors and SUTs, but also some differences in the category definitions.

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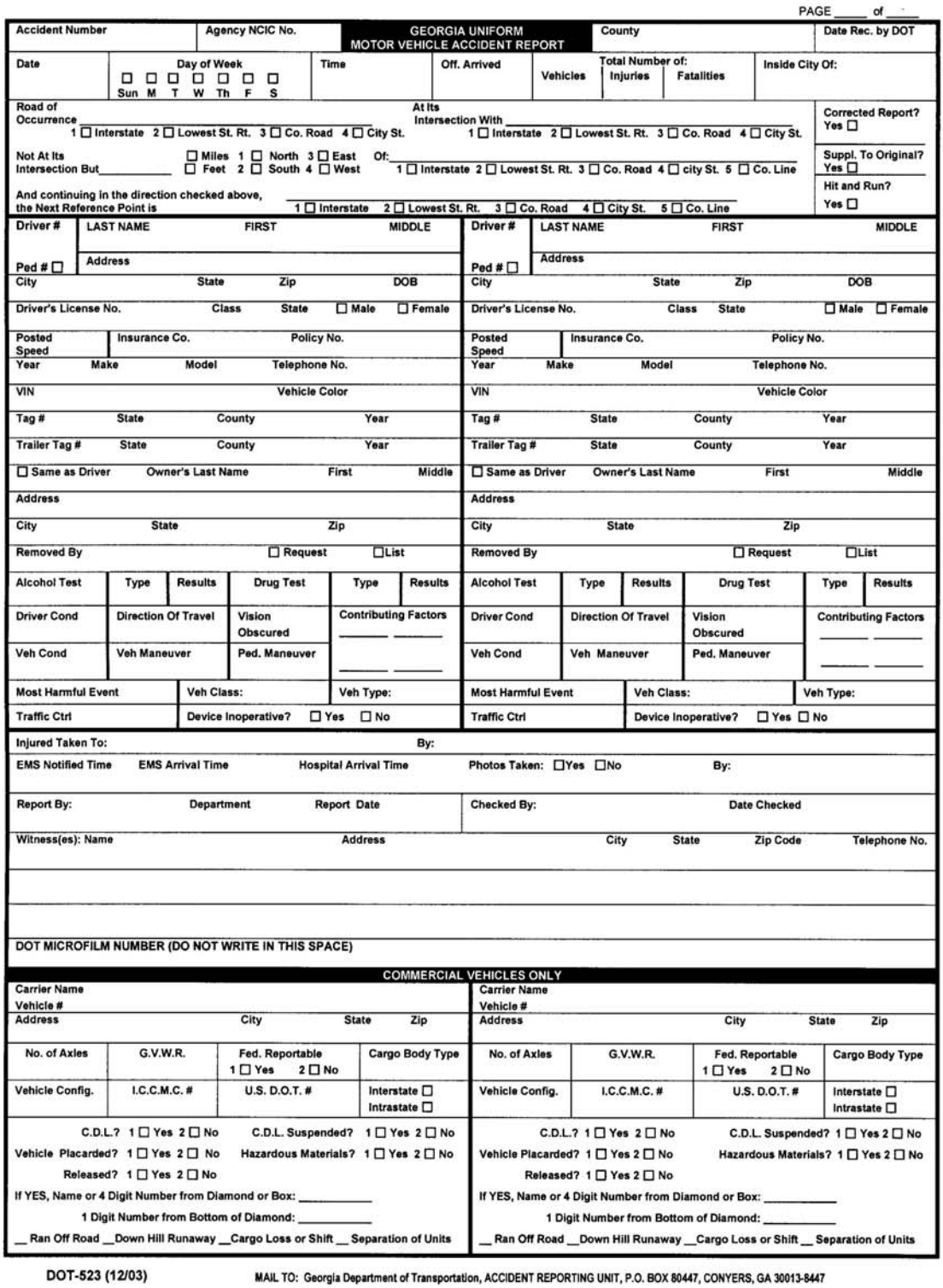
Appendix A Selection Algorithm to Identify Reportable Records

MCMIS Reporting Criteria	Implementation in Georgia PAR Data
Truck with GVWR over 10,000 or GCWR over 10,000	The type variable in the Georgia PAR file was used to identify medium/heavy trucks with GVWR 10,000 lbs or greater. The other truck category is believed to be comprised of single unit trucks (SUTs). vehicle type = 3 – Truck tractor(Bobtail) 4 – Tractor/trailer 5 – Tractor W/twin trailers 6 – Logging truck 7 – Logging tractor/trailer 8 – Single unit truck 9 – Panel truck
***or* Bus with seating for at least nine, including the driver**	The following codes were used to identify eligible buses: vehicle type = 13 – Bus
***or* Vehicle displaying a hazardous materials placard**	These vehicles were identified using the hazardous placard variable.
AND	
at least one fatality	The Georgia Occupant file contains an injury variable with the codes Injury = 0 – Not injured 1 – Killed 2 – Serious 3 - Visible 4 – Complaint

MCMIS Reporting Criteria	Implementation in Georgia PAR Data
***or* at least one person injured and transported to a medical facility for immediate medical attention**	It can be determined from the Georgia PAR file whether a person was transported for medical attention. Using the injury variable described above along with the transported information, an injured and transported variable was created. The injured/transported criterion was met by the following condition: Injured/transported = (maximum injury severity in (2 or 3 or 4) and (transported =yes)
***or* at least one vehicle towed due to disabling damage**	A towed away variable was used in conjunction with a damage severity variable. This criterion was met if at least one vehicle in the crash was towed and damage severity was moderate, extensive, or fire present. The damage severity variable has levels 1 – None 2 – Slight 3 – Moderate 4 – Extensive 5 – Fire present

Appendix B Georgia Traffic Accident Report



PAGE ____ of ____

Accident Number	Agency NCIC No.	GEORGIA UNIFORM MOTOR VEHICLE ACCIDENT REPORT	County	Date Rec. by DOT

Date	Day of Week ☐ Sun ☐ M ☐ T ☐ W ☐ Th ☐ F ☐ S	Time	Off. Arrived	Total Number of: Vehicles	Injuries	Fatalities	Inside City Of:

Road of Occurrence _____ 1 ☐ Interstate 2 ☐ Lowest St. Rt. 3 ☐ Co. Road 4 ☐ City St.

At Its Intersection With _____ 1 ☐ Interstate 2 ☐ Lowest St. Rt. 3 ☐ Co. Road 4 ☐ City St.

Corrected Report? Yes ☐

Not At Its Intersection But _____ ☐ Miles 1 ☐ North 3 ☐ East ☐ Feet 2 ☐ South 4 ☐ West Of: _____ 1 ☐ Interstate 2 ☐ Lowest St. Rt. 3 ☐ Co. Road 4 ☐ city St. 5 ☐ Co. Line

Suppl. To Original? Yes ☐

And continuing in the direction checked above, the Next Reference Point is _____ 1 ☐ Interstate 2 ☐ Lowest St. Rt. 3 ☐ Co. Road 4 ☐ City St. 5 ☐ Co. Line

Hit and Run? Yes ☐

Driver #	LAST NAME	FIRST	MIDDLE
Ped # ☐	Address		
City	State	Zip	DOB
Driver's License No.	Class	State	☐ Male ☐ Female
Posted Speed	Insurance Co.	Policy No.	
Year	Make	Model	Telephone No.
VIN	Vehicle Color		
Tag #	State	County	Year
Trailer Tag #	State	County	Year
☐ Same as Driver	Owner's Last Name	First	Middle
Address			
City	State	Zip	
Removed By	☐ Request	☐ List	

Alcohol Test	Type	Results	Drug Test	Type	Results
Driver Cond	Direction Of Travel	Vision Obscured	Contributing Factors		
Veh Cond	Veh Maneuver	Ped. Maneuver			
Most Harmful Event	Veh Class:	Veh Type:			
Traffic Ctrl	Device Inoperative? ☐ Yes ☐ No				

Driver #	LAST NAME	FIRST	MIDDLE
Ped # ☐	Address		
City	State	Zip	DOB
Driver's License No.	Class	State	☐ Male ☐ Female
Posted Speed	Insurance Co.	Policy No.	
Year	Make	Model	Telephone No.
VIN	Vehicle Color		
Tag #	State	County	Year
Trailer Tag #	State	County	Year
☐ Same as Driver	Owner's Last Name	First	Middle
Address			
City	State	Zip	
Removed By	☐ Request	☐ List	

Alcohol Test	Type	Results	Drug Test	Type	Results
Driver Cond	Direction Of Travel	Vision Obscured	Contributing Factors		
Veh Cond	Veh Maneuver	Ped. Maneuver			
Most Harmful Event	Veh Class:	Veh Type:			
Traffic Ctrl	Device Inoperative? ☐ Yes ☐ No				

Injured Taken To: By:

EMS Notified Time EMS Arrival Time Hospital Arrival Time Photos Taken: ☐Yes ☐No By:

Report By: Department Report Date Checked By: Date Checked

Witness(es): Name Address City State Zip Code Telephone No.

DOT MICROFILM NUMBER (DO NOT WRITE IN THIS SPACE)

COMMERCIAL VEHICLES ONLY

Carrier Name / Vehicle #	Address	City	State	Zip
No. of Axles	G.V.W.R.	Fed. Reportable 1 ☐ Yes 2 ☐ No	Cargo Body Type	
Vehicle Config.	I.C.C.M.C. #	U.S. D.O.T. #	Interstate ☐ Intrastate ☐	

C.D.L.? 1 ☐ Yes 2 ☐ No C.D.L. Suspended? 1 ☐ Yes 2 ☐ No
Vehicle Placarded? 1 ☐ Yes 2 ☐ No Hazardous Materials? 1 ☐ Yes 2 ☐ No
Released? 1 ☐ Yes 2 ☐ No
If YES, Name or 4 Digit Number from Diamond or Box: _____
1 Digit Number from Bottom of Diamond: _____
__ Ran Off Road __Down Hill Runaway __Cargo Loss or Shift __ Separation of Units

Carrier Name / Vehicle #	Address	City	State	Zip
No. of Axles	G.V.W.R.	Fed. Reportable 1 ☐ Yes 2 ☐ No	Cargo Body Type	
Vehicle Config.	I.C.C.M.C. #	U.S. D.O.T. #	Interstate ☐ Intrastate ☐	

C.D.L.? 1 ☐ Yes 2 ☐ No C.D.L. Suspended? 1 ☐ Yes 2 ☐ No
Vehicle Placarded? 1 ☐ Yes 2 ☐ No Hazardous Materials? 1 ☐ Yes 2 ☐ No
Released? 1 ☐ Yes 2 ☐ No
If YES, Name or 4 Digit Number from Diamond or Box: _____
1 Digit Number from Bottom of Diamond: _____
__ Ran Off Road __Down Hill Runaway __Cargo Loss or Shift __ Separation of Units

DOT-523 (12/03) MAIL TO: Georgia Department of Transportation, ACCIDENT REPORTING UNIT, P.O. BOX 80447, CONYERS, GA 30013-8447

PAGE ____ of ____

REMARKS:

INDICATE ON THIS DIAGRAM WHAT HAPPENED

INDICATE NORTH

CITATIONS – VEHICLE # ____

CITATIONS – VEHICLE # ____

First Harmful Event	Traffic-Way Flow	Weather	Surface Cond.	Light Cond.	Manner of Collision	Location at Area Of Impact	Road Comp.	Road Def.	Road Character	Construction / Maintenance Zone

	VEH # ____	VEH # ____
Number of Occupants		
Point of Initial Contact		
Damage To Vehicles		

SKID DISTANCE BEFORE IMPACT ____ VEH. AFTER ____ VEH. Width of Road

____ VEH. ____ VEH. ____

Damage Other Than Vehicle: **Owner:**

Occupants (list below): Driver # Or Pedestrian #

Driver # Or Pedestrian #

LAST NAME	FIRST	ADDRESS	CITY	STATE	ZIP	AGE	SEX	VEH #	POS	INJURY	TAKEN FOR TREAT.	EJECT	SAFETY EQUIP.	EXTRIC	AIR BAG
						X	X	X	X	XXXXX	XXXXX	XXXX	XXXXX	XXXXX	XXXX

DOT-523 (12/03) MAIL TO: Georgia Department of Transportation, ACCIDENT REPORTING UNIT, P.O. BOX 80447, CONYERS, GA 30013-8447

Accident Number	Agency NCIC	Accident Date	Georgia Uniform Motor Vehicle Report Continuation

OCCUPANTS: LAST NAME	FIRST	ADDRESS	CITY	STATE	ZIP	AGE	SEX	VEH #	POS	INJURY	TAKEN FOR TREAT.	EJECT	SAFETY EQUIP	EXTRIC	AIR BAG

Injured Taken To: **By:**

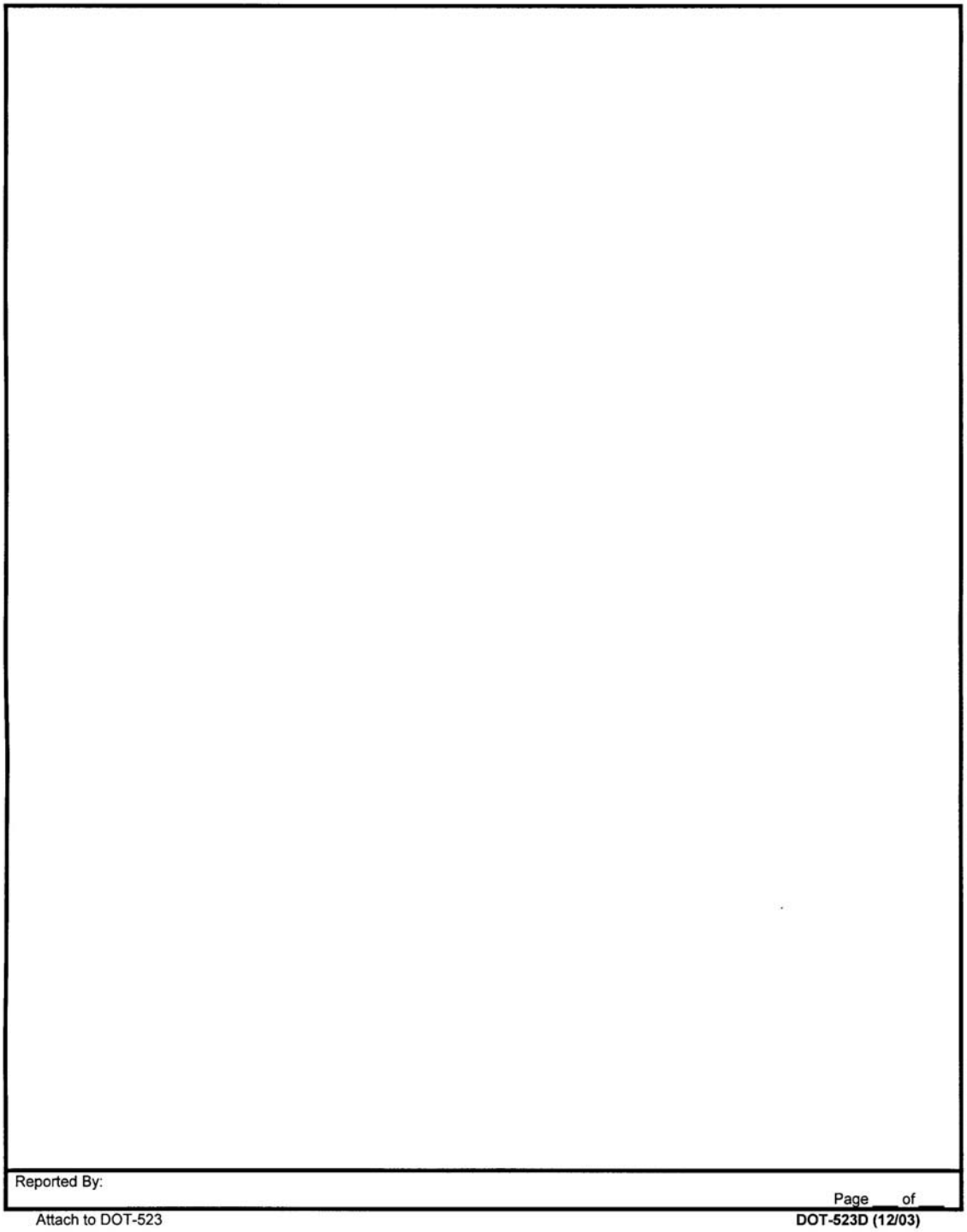
Witness – Name: **Address:**

Phone:

Additional Remarks:

Reported By: Page ____ of ____

Attach to DOT-523 **DOT-523C (12/03)**



Reported By:

Page ___ of ___

Attach to DOT-523

DOT-523D (12/03)