



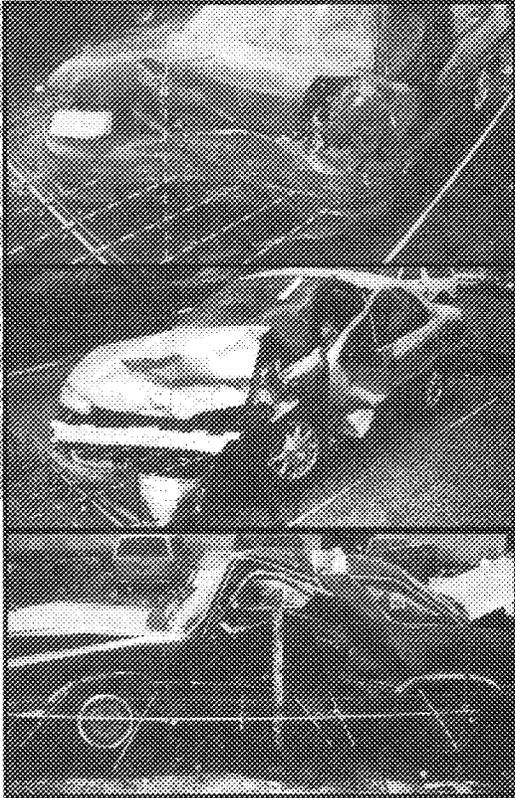
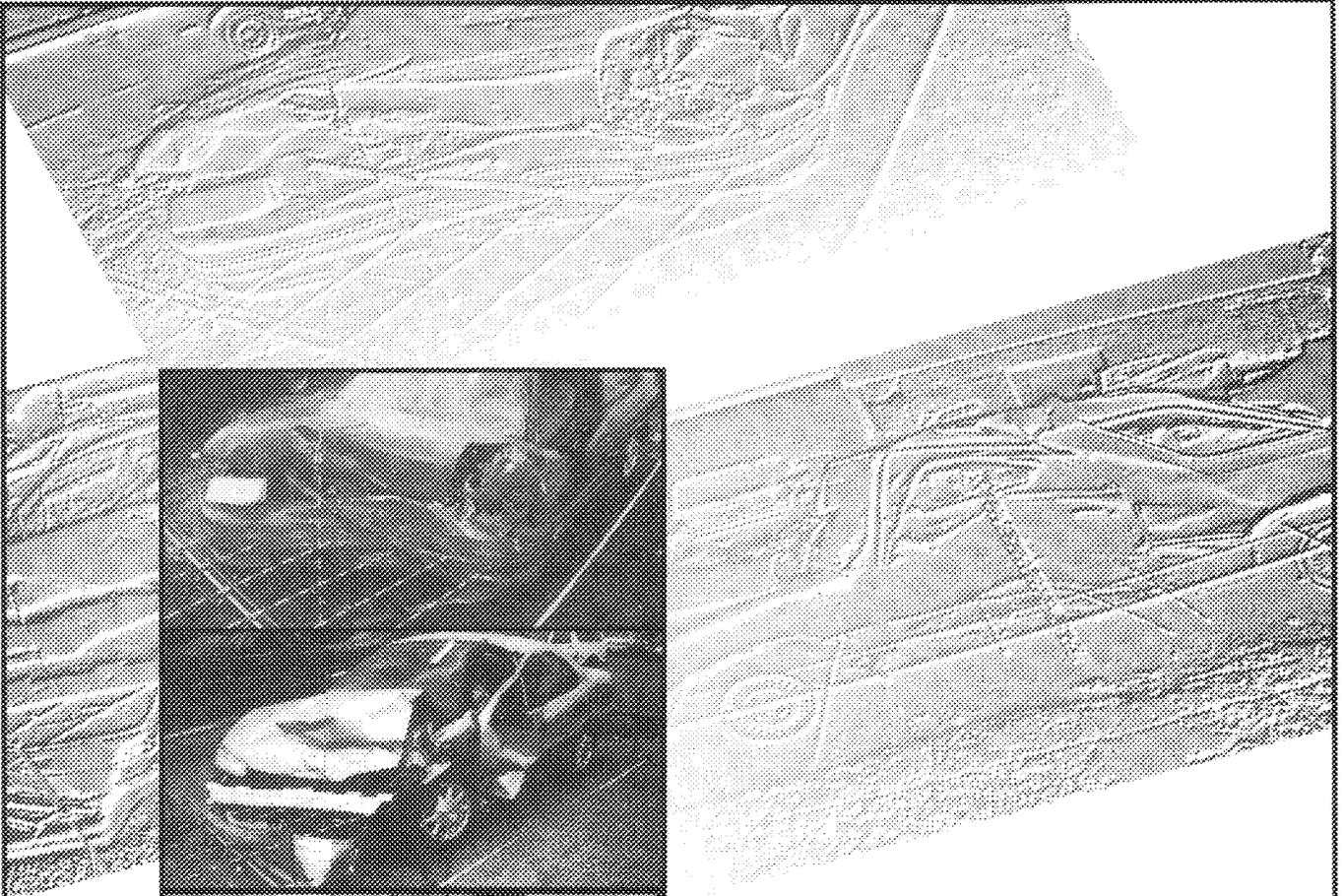
## **National Automotive Sampling System**

## **Crashworthiness Data System**

*1992-1994*



U.S. Department  
of Transportation  
National Highway  
Traffic Safety  
Administration



**National Automotive  
Sampling System**

**Crashworthiness  
Data System**

*1992-1994*



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of Transportation  
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Traffic Safety  
Administration

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## Executive Summary

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During the period 1992 through 1994, an estimated 10.9 million vehicles each year were involved in police-reported traffic crashes. Approximately 95 percent of these were automobiles, pickup trucks, vans, and sport/utility vehicles, collectively referred to as *passenger vehicles*. Pickup trucks, vans, and utility vehicles are collectively referred to as *light trucks*. Most of these vehicles were not seriously damaged; only 26 percent of them were towed from the crash scene due to damage sustained in the crash. Approximately 46,000 vehicles were involved in fatal crashes each year.

This report focuses attention on occupants of those passenger vehicles that were towed from the crash scene. NHTSA's National Automotive Sampling System (NASS)/Crashworthiness Data System (CDS) collects detailed information on towed passenger vehicle crashes, employing trained, professional crash investigation teams. The in-depth data collection, scientific protocols, and professionalism of those involved make the NASS/CDS database a valuable resource to many in the traffic safety community.

NASS data are used by government, industry, and the private sector to conduct research, identify injury patterns and mechanisms, provide a basis for regulatory decisionmaking, and provide a means of evaluating the association between occupant injury and various crash-related characteristics.

Some highlights of the report include:

- Passenger cars comprise the largest segment (about 76 percent) of the passenger vehicles found in the NASS/CDS, and hence, in police-reported towaway crashes. In the report, cars are treated separately from the remaining vehicles, which have been grouped together as light trucks.
- Occupancy patterns for towed crash-involved cars and light trucks were very similar: about two-thirds (about 66 percent) of the time, the only occupant of a towed crash-involved car or light truck was the driver. A front-seat passenger was present in the car about 21.0 percent of the time, with passengers in the second and further seats about 13.5 percent of the time. For occupants of light trucks, front-seat passengers were present 18.7 percent of the time, with passengers in the second and further seats about 15.5 percent of the time.
- One of the health-care consequences of motor vehicle crashes is the burden on emergency and health services. About 210,000 occupants of passenger vehicles were hospitalized each year as a result of police-reported traffic crashes. Another 976,000 occupants were transported to a medical facility and released, and 228,000 occupants were treated at the scene of the crash.
- Contact with the steering assembly accounted for about 11 percent of the minor injuries but about 16 percent of the serious-maximum (AIS 3+) injuries. A similar pattern was observed for contact with the interior side surface, comprising 6.4 percent of the minor injuries and about 19 percent of severe and greater injuries.

## Executive Summary

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- The percentage of injuries resulting from contact with the instrument panel decreased as injury severity increased; the same was true for contact with the windshield.
- Approximately 83,445 injuries to occupants resulted from contacting an air bag. About 99 percent were minor injuries, and about 1 percent were serious injuries.
- About 5 percent of the towed cars in crashes rolled over, compared with 13 percent of the towed light trucks.
- About 7 percent of car occupants in rollover crashes were ejected; the remaining crash types exhibited ejection rates in the range of 0.1 to 2.3 percent.
- The restraint use rate for all occupants of passenger vehicles was about 74 percent.
- The alcohol involvement rate for drivers of passenger cars in traffic crashes is highest for the age group 25-34 years. In comparison, for drivers of light trucks, the alcohol involvement rate is highest for drivers 35-44 years old.
- The alcohol involvement rate for all drivers of light trucks in traffic crashes is almost twice that for drivers of passenger cars.

# 1. Introduction

## Background

The National Automotive Sampling System (NASS)—formerly, the National Accident Sampling System—is the mechanism through which the National Highway Traffic Safety Administration (NHTSA) collects nationally representative data on motor vehicle traffic crashes to aid in the development, implementation, and evaluation of motor vehicle and highway safety countermeasures. The NASS was originally designed and implemented in 1979 to support highway and motor vehicle safety programs. The NASS program was reevaluated in the mid-1980s. The evaluation team concluded that the program should be redesigned to focus on enhanced in-depth analyses of passenger vehicle crash protection performance. This reevaluation resulted in changes that were implemented by NHTSA's National Center for Statistics and Analysis (NCSA) in January 1988.

To enhance its applicability in addressing crashworthiness issues, the NASS was divided into two parts: (1) the General Estimates System (GES), which collects data on an annual sample of approximately 50,000 police-reported traffic crashes; and (2) the Crashworthiness Data System (CDS), which collects additional detailed information on an annual sample of approximately 5,000 police-reported traffic crashes involving passenger vehicles towed from the crash scene due to damage resulting from the crash. In this report, the term *passenger vehicles* is used to refer to all cars, pickup trucks, vans, and sport/utility vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less. The term *light trucks* is used to refer to pickup trucks, vans, and sport/utility vehicles.

Unlike the CDS, the GES does not investigate crashes. Its only source of information is the police crash report. It does provide the data needed for assessments of the state of and trends in motor vehicle and traffic safety. An annual report is published each year that describes the data availability from the NASS/GES and the Fatal Analysis Reporting System (FARS). The FARS is a census of all fatal crashes that occur in the United States and Puerto Rico.

## Objective

The objective of this report is to illustrate the availability, resolution, and applicability of crash, vehicle, occupant, and casualty attributes for the characterization of vehicle crash protection performance on U.S. roads during the years 1992 through 1994, based on the NASS/CDS records for those years.

## Vehicles Under Consideration

This report addresses towed passenger cars, pickup trucks, vans, and sport/utility vehicles under 10,000 pounds GVWR. Sport/utility vehicles include jeeps, truck-based station wagons, utility vehicles, and other van- or truck-based motor vehicles under 10,000 pounds GVWR that are not cars, pickups, or vans. Motorcycles, bicycles, horse-drawn carriages, etc., are not included.

## Introduction

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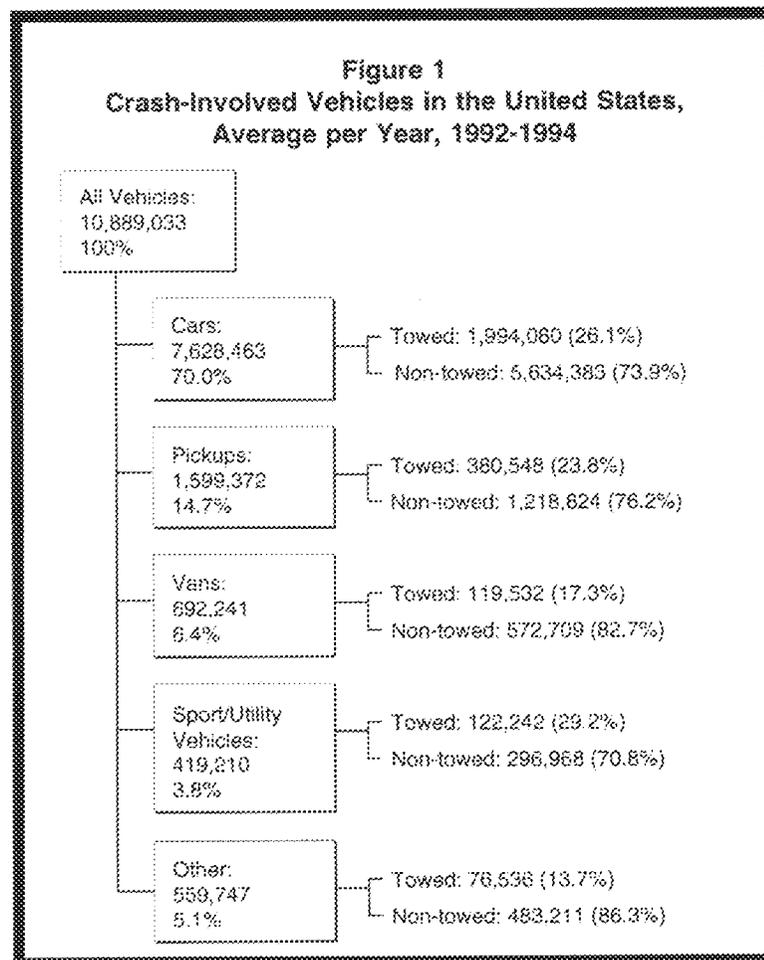
### **CDS Estimates**

Unless otherwise noted, all the CDS statistics presented in this report are estimates—not exact counts—generated from a sample of crashes that occurred in the 3-year period from 1992 through 1994. Descriptions of the CDS sample design and the procedure used to obtain the data shown in the tables are contained in Appendix B. Since the CDS is a probability sample, the sampling error of every CDS statistic can be estimated. Approximate sampling errors for the weighted average counts over the 1992-1994 period are provided in Appendix G.

## 2. Perspective

A perspective on crash-involved vehicles is illustrated in Figure 1, which shows annual incidence averaged over the years 1992-1994.

The number of all vehicle body types involved in police-reported crashes each year in the United States is about 10,900,000; about 95.0 percent of these are passenger cars, pickups, vans, and sport/utility vehicles. In this report, pickups, vans, and sport/utility vehicles are collectively referred to as "light trucks." Each of these body types is subdivided into towed and non-towed vehicles.



Note: While all vehicles are addressed by NASS/GES, only towed passenger vehicles are addressed by NASS/CDS.

Source: NASS/CDS and NASS/GES, 1992-1994.

## Perspective

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The towed vehicles shown in Figure 1 are investigated in the NASS/CDS, because of interest in the crashworthiness of vehicles involved in the more severe crashes. These are the subject of the following analyses and illustrations, with emphasis on cars. During the period 1992-1994, the average number of registered passenger vehicles per year, as reported by R.L. Polk & Co., was 177,764,864, of which 121,132,905 (68.1 percent) were passenger cars and 56,631,959 (31.9 percent) were light trucks.

# 3. Vehicle Crash Data

## Car Size

About 1,994,000 cars are towed away from the scene of traffic crashes every year. Table 1 shows the distribution of these cars by weight class. Passenger cars made up about 76 percent of all NASS/CDS towed vehicles; the remaining 24 percent were light trucks (see Table 5).

**Table 1**  
**Crash-Involved Towed Cars by Weight Class, 1992-1994**

Weight Class	Total Sample	Annual Average	
		Percent	Count
Small (<2,500 lbs)	4,812	32.9	655,298
Mid-Size (2,500-3,000 lbs)	5,133	36.1	719,277
Large (>3,000 lbs)	4,806	29.5	588,849
Unknown Size	285	1.5	30,655
<b>Total</b>	<b>15,036</b>	<b>100.0</b>	<b>1,994,080</b>

### Examples of Weight Class:

Small—Ford Tempo, Mercury Tracer, Saturn, Nissan Sentra, Honda Civic  
 Mid-size—Plymouth Sundance, Ford Probe, Honda Prelude, Toyota Celica  
 Large—Ford Taurus, Dodge Dynasty, BMW 3 series, Pontiac Grand Prix

## Car Crash Modes and Areas of Damage

Table 2 and Figure 2 show the distribution of towed cars among the primary crash modes and areas of damage. Frontal damage in nonrollover car crashes is the most frequent crash type, accounting for about 55 percent of all towed car crashes. Side damage and all other nonrollover crash types account for 29 percent and 12 percent, respectively. Rollover car crashes account for the remaining 5 percent.

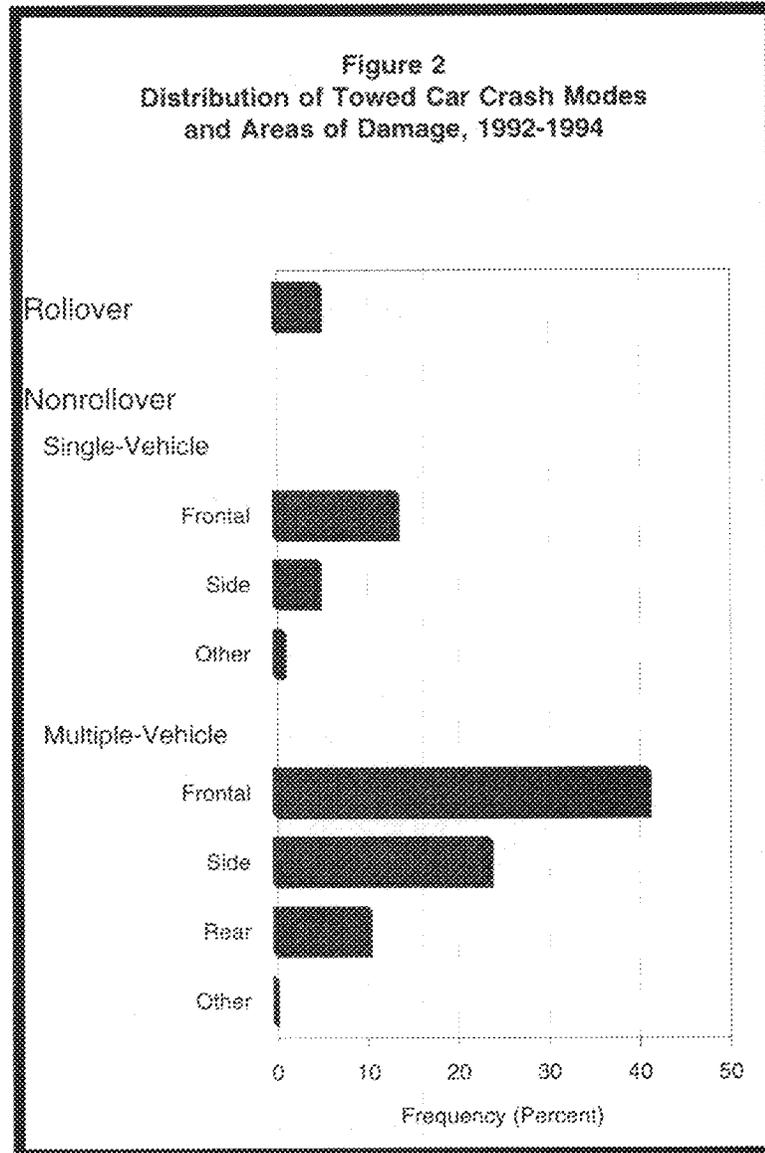
These crash frequencies do not reflect the distribution of harmful outcomes to the car occupants. Certain crash types are associated with higher proportions of injury. For example, although rollover occurs in about 5 percent of towed car crashes, it is responsible for about 14 percent of the harm-weighted injuries to car occupants in towed crashes. On the other hand, car crashes with rear damage account for about 12 percent of the cases but are responsible for about 5 percent of the harm-weighted injuries to occupants (see Table 21).

## Vehicle Crash Data

**Table 2**  
**Distribution of Towed Car Crash Modes and Areas of Damage, 1992-1994**

Crash Mode and Area of Damage	Total Sample	Annual Average	
		Percent	Count
<b>Rollover</b>			
1-3 Quarter Turns	656	3.3	66,668
4+ Quarter Turns	459	1.5	30,906
End Over End	47	0.1	2,736
<i>Total Rollover</i>	<i>1,162</i>	<i>5.0</i>	<i>100,310</i>
<b>Nonrollover</b>			
<b>Single-Vehicle</b>			
Frontal Damage	2,168	13.5	269,602
Side Damage	616	4.9	97,603
Rear, Top, or Under Damage	108	1.0	19,368
<i>Total Single-Vehicle</i>	<i>2,892</i>	<i>19.4</i>	<i>386,573</i>
<b>Multiple-Vehicle</b>			
Frontal Damage	6,203	41.2	820,617
Side Damage	3,551	23.9	476,708
Rear Damage	1,207	10.4	207,692
Top or Under Damage	21	0.1	2,180
<i>Total Multiple-Vehicle</i>	<i>10,982</i>	<i>75.6</i>	<i>1,507,197</i>
<i>Total Nonrollover</i>	<i>13,874</i>	<i>95.0</i>	<i>1,893,769</i>
<b>Total Towed Car Crashes</b>	<b>15,036</b>	<b>100.0</b>	<b>1,994,080</b>

Note: Damage Area "Unknown" has been imputed into the known damage areas.



Note: The "Other" category for single-vehicle crashes includes rear, top, and under damage. For multiple-vehicle crashes, "Other" includes top and under damage.

Source: NASS/CDS, 1992-1994.

## Vehicle Crash Data

### Car Crash Severity

Crash severity (delta-v in miles per hour) for cars varies generally in the range from 1 to 50 mph. Table 3 shows the distribution of towed cars by severity and area of damage. No crash severity, in terms of delta-v, can be defined for rollover crashes. Figure 3 illustrates the primary aspects of this distribution.

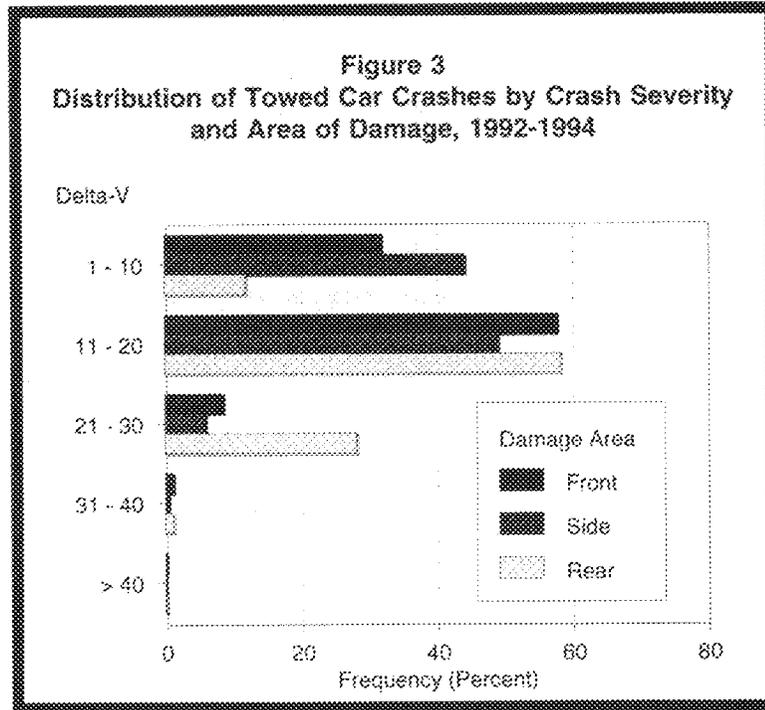
Crash frequency rises sharply to a peak located between 11 and 20 mph, as shown in Figure 3. This frequency drops sharply following the peak; cumulative frequency beyond 40 mph is about 0.2 percent. The same general pattern holds for all areas of damage in nonrollover crashes: front, side, and rear.

Great caution is recommended in the use and interpretation of crash severity data, for two reasons: (a) the large number of unknowns; and (b) the sharp reduction in the number of available cases as crash severity increases. For "Unknown" area of damage in Table 3, crash severity was calculated using the missing vehicle reconstruction algorithm (see Appendix E, "CRASHPC and OLDMISSPC Summary"). Area of damage "other" includes top and undercarriage, which are outside the scope of the reconstruction algorithm.

**Table 3**  
**Distribution of Towed Cars by Crash Severity (delta-v) and Area of Damage:**  
**Average per Year, 1992-1994**

Area of Damage	Crash Frequency by Crash Severity*						Total
	1-10 mph	11-20 mph	21-30 mph	31-40 mph	>40 mph	Unknown	
Front	125,897	227,700	33,726	4,842	922	405,406	798,496
	32.0%	57.9%	8.6%	1.2%	0.2%	50.8%	40.0%
Side	65,098	72,258	8,823	719	88	254,101	401,088
	44.3%	49.2%	6.0%	0.5%	0.1%	63.4%	20.1%
Rear	12,183	59,630	28,876	1,190	241	66,192	168,312
	11.9%	58.4%	28.3%	1.2%	0.2%	39.3%	8.4%
Other	NA	NA	NA	NA	NA	61,269	61,269
	--	--	--	--	--	100.0%	3.1%
Unknown	7,287	31,196	2,458	133	15	523,826	564,915
	17.7%	75.9%	6.0%	0.3%	0.0%	92.7%	28.3%
<b>Total</b>	<b>210,466</b>	<b>390,784</b>	<b>73,886</b>	<b>6,884</b>	<b>1,266</b>	<b>1,310,793</b>	<b>1,994,080</b>
	<b>30.8%</b>	<b>57.2%</b>	<b>10.8%</b>	<b>1.0%</b>	<b>0.2%</b>	<b>65.7%</b>	<b>100.0%</b>

\*For each area of damage and known crash severity, the first data row shows the number of vehicles, and the second row shows the percentage of the total number of vehicles for which crash severities were known. For the "Unknown" column, the second data row shows the percentage of the total for each area of damage. For the "Total" column, the second data row shows the percentage of the grand total. NA = not available.



Note: Data taken from Table 3 (percentage of the total number of vehicles for which crash severities were known).

Due to the sharp rise of outcome severity as crash severity increases, the distribution of injuries to car occupants vs. crash severity differs markedly from the distribution of the crash frequency. Specifically, the injury distribution rises to a peak much faster, and drops much more slowly thereafter, than does the crash frequency distribution. For example, the injury proportions (not shown) in the five crash severity intervals used in Table 3 and Figure 3 are 6 percent, 39 percent, 31 percent, 15 percent, and 8 percent for frontal impacts, compared with the corresponding crash proportions of 32 percent, 58 percent, 9 percent, 1 percent, and about 0 percent. However, although it is true that the injury proportions exceed the corresponding crash proportions at high crash severities, it is also true that the majority of the injuries occur at severities under 40 mph. For example, in frontal impacts 92 percent of the injuries to occupants occur at severities under 40 mph; the cumulative injury proportion under 40 mph is 98 percent for both side and rear impacts.

## Vehicle Crash Data

### Seating Position of Car Occupants

Every year, approximately 3 million people are involved in crashes as occupants of towed cars. Table 4 shows the distribution of occupant seating positions for towed cars from 1992 through 1994.

The distribution pattern—about 66 percent drivers, 21 percent right front passengers, and 13 percent all other—is roughly the same as for all cars regardless of crash involvement.

Car Occupants	Total Sample	Annual Average	
		Percent	Count
Drivers	14,994	65.6	1,985,766
Right Front Passengers	5,405	20.9	633,974
Second Seat Passengers	3,395	11.7	353,510
Other Passengers	520	1.8	55,200
<b>Total</b>	<b>24,314</b>	<b>100.0</b>	<b>3,028,449</b>

**Functional Class and Size of Light Trucks**

About 622,000 light trucks (pickups, vans, and sport/utility vehicles) under 10,000 pounds gross vehicle weight rating are towed away from the scene of traffic crashes every year. Table 5 shows the distribution of these vehicles by functional class and size. The annual average for these vehicles is 24 percent of all NASS/CDS towed vehicles. The remaining 76 percent are cars.

**Table 5**  
**Distribution of Towed Light Trucks by Vehicle Class and Size, 1992-1994**

Vehicle Category and Size	Total Sample	Annual Average	
		Percent	Count
Compact Pickup	1,302	28.7	178,642
Standard Pickup	1,180	31.4	195,442
Unknown Size Pickup	101	1.0	6,464
Minivan	543	9.4	58,573
Standard Van	446	9.3	58,160
Unknown Size Van	58	0.4	2,799
Compact Utility Vehicle	832	17.1	106,515
Standard Utility Vehicle	222	2.5	15,727
<b>Total</b>	<b>4,684</b>	<b>100.0</b>	<b>622,323</b>

## Vehicle Crash Data

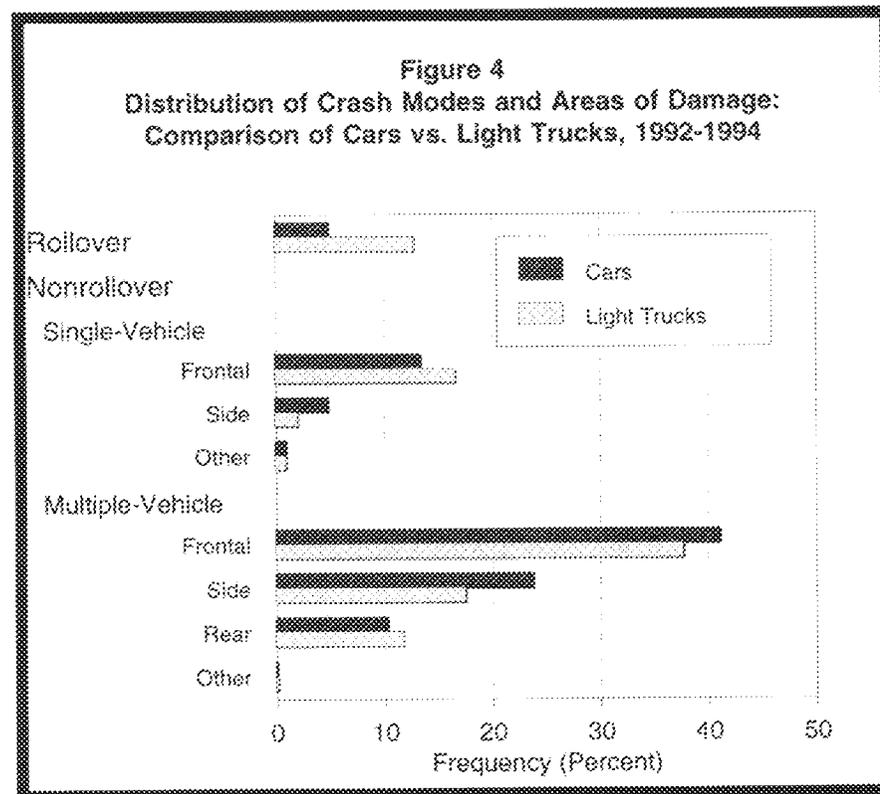
### Light Truck Crash Modes and Areas of Damage

Crash mode and area of damage distributions for towed light trucks involved in crashes are generally similar to those for towed cars, except for rollover crashes. The proportion of rollovers for light trucks is 2.6 times that for passenger cars. Table 6 shows the distribution of towed light trucks among the primary crash modes and areas of damage.

Crash Mode and Area of Damage	Total Sample	Annual Average	
		Percent	Count
<b>Rollover</b>			
1-3 Quarter Turns	502	8.6	53,374
4+ Quarter Turns	374	4.2	26,411
End Over End	27	0.1	798
<i>Total Rollover</i>	<i>903</i>	<i>12.9</i>	<i>80,583</i>
<b>Nonrollover</b>			
<b>Single-Vehicle</b>			
Frontal Damage	647	16.7	103,962
Side Damage	96	2.1	12,878
Rear, Top, or Under Damage	28	1.0	6,149
<i>Total Single-Vehicle</i>	<i>771</i>	<i>19.8</i>	<i>122,988</i>
<b>Multiple-Vehicle</b>			
Frontal Damage	1,915	37.8	234,982
Side Damage	756	17.6	109,402
Rear Damage	333	11.8	73,329
Top or Under Damage	6	0.2	1,039
<i>Total Multiple-Vehicle</i>	<i>3,010</i>	<i>67.3</i>	<i>418,753</i>
<i>Total Nonrollover</i>	<i>3,781</i>	<i>87.1</i>	<i>541,741</i>
<b>Total Crashes</b>	<b>4,684</b>	<b>100.0</b>	<b>622,323</b>

Figure 4 shows the distribution of crash modes and areas of damage for towed light trucks, compared with the distribution for towed cars for the years 1992 through 1994.

Most of the observations for car crash frequencies and injury as a function of crash mode and area of damage are also valid for these vehicles. Rollover is the major exception: rollover crashes for light trucks are both more frequent than car rollover crashes (13 percent and 5 percent, respectively) and result in a greater proportion of harmful outcomes to the vehicle occupants (41 percent and 14 percent, respectively). The proportion of harm-weighted injuries (41 percent) associated with rollover crashes is the average for three vehicle classes—pickups, vans, and sport/utility vehicles (see Table 22). For these three classes the proportion of harmful outcomes varies significantly: approximately 40 percent for pickups, 35 percent for vans, and 47 percent for sport/utility vehicles.



Note: The "Other" category for single-vehicle crashes includes rear, top, and under damage. For multiple-vehicle crashes, "Other" includes top and under damage.

## Vehicle Crash Data

### Light Truck Crash Severity

Table 7 shows the distribution of towed light truck crashes by crash severity (delta-v in miles per hour) and area of damage. Most of the observations made for towed car crash frequencies and injuries to occupants as a function of crash severity are also valid for these vehicles; the same general patterns are observed. For example, the injury proportions (not shown) in the five crash severity intervals used in Table 7 are 6 percent, 30 percent, 38 percent, 17 percent, and 9 percent for frontal impacts, and the corresponding crash proportions are 26 percent, 64 percent, 9 percent, 1 percent, and about 0 percent.

A large majority of the injuries to occupants in towed light truck crashes occur at crash severities under 40 mph. For example, in frontal impacts 70 percent of the injuries occur at severities under 40 mph. The cumulative injury proportion under 40 mph is 100 percent for both side and rear impacts.

The comment made in connection with car crash severities is even more important for these vehicles: great caution is recommended in the use and interpretation of crash severity data, for two reasons: (a) the large number of unknowns; and (b) the sharp reduction of the number of available cases as crash severity increases. For "Unknown" area of damage in Table 7, crash severity was calculated using the missing vehicle reconstruction algorithm.

**Table 7**  
**Distribution of Towed Light Trucks by Crash Severity (delta-v)**  
**and Area of Damage: Average per Year, 1992-1994**

Area of Damage	Crash Frequency by Crash Severity*						Total
	1-10 mph	11-20 mph	21-30 mph	31-40 mph	>40 mph	Unknown	
Front	23,826 25.9%	58,558 63.7%	8,140 8.9%	1,138 1.2%	272 0.3%	133,683 59.3%	225,617 36.3%
Side	12,464 49.2%	11,677 46.1%	1,166 4.6%	51 0.2%	0 0.0%	76,488 75.1%	101,845 16.4%
Rear	6,285 21.2%	23,127 78.1%	172 0.6%	38 0.1%	0 0.0%	20,887 41.4%	50,509 8.1%
Other	NA --	NA --	NA --	NA --	NA --	29,099 100.0%	29,099 4.7%
Unknown	1,433 22.8%	4,360 69.3%	496 7.9%	7 0.1%	0 0.0%	208,958 97.1%	215,253 34.6%
<b>Total</b>	<b>44,008</b> <b>28.7%</b>	<b>97,723</b> <b>63.8%</b>	<b>9,974</b> <b>6.5%</b>	<b>1,233</b> <b>0.8%</b>	<b>272</b> <b>0.2%</b>	<b>469,114</b> <b>75.4%</b>	<b>622,323</b> <b>100.0%</b>

\*For each area of damage and known crash severity, the first data row shows the number of vehicles, and the second row shows the percentage of the total number of vehicles for which crash severities were known. For the "Unknown" column, the second data row shows the percentage of the total for each area of damage. For the "Total" column, the second data row shows the percentage of the grand total. NA = not available.

**Seating Position of Light Truck Occupants**

Approximately 942,000 people are involved in crashes as occupants of towed light trucks every year. Table 8 shows the distribution of occupant seating positions for these vehicles from 1992 through 1994.

The distribution pattern—about 66 percent drivers, 20 percent right front passengers, and 14 percent all other—is roughly the same as for all light trucks regardless of crash involvement. It is also similar to the corresponding distribution for towed car crashes (Table 4).

Vehicle Occupants	Total Sample	Annual Average	
		Percent	Count
Drivers	4,665	65.7	619,583
Right Front Passengers	1,594	18.7	176,730
Second Seat Passengers	615	6.0	56,911
Other Passengers	622	9.5	90,025
<b>Total</b>	<b>7,496</b>	<b>100.0</b>	<b>943,248</b>

## 4. Occupant Injury Data

### Crash-Involved Occupants by Injury Severity

Approximately 3,028,000 occupants are involved in towed car crashes every year. About 52 percent of them are uninjured, and 48 percent are injured at various severity levels. Similarly, about 943,000 occupants are involved in towed light truck crashes per year, with about 58 percent uninjured and 42 percent injured.

Given that each injured occupant usually has more than one injury, the severity of the occupant's most harmful injury is used to characterize the seriousness of the injuries resulting from the crash. The Abbreviated Injury Scale (AIS) is used to compare injury severities, as follows:

AIS	Severity of Injury
0	Not injured
1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	Maximum
7	Injured, Severity Unknown

The AIS scale reflects primarily the threat to life: approximately 99 percent for AIS=6; about 46 percent for AIS=5; about 31 percent for AIS=4; declining rapidly to 0 percent for AIS=1. However, the scale is also used to reflect the gravity of consequences for survivors.

The distribution of injury severities for injured crash-involved occupants is shown in Table 9 for cars and in Table 10 for light trucks. The two distributions are compared in Figure 5, where it is evident that there are no major differences at any given level of injury severity.

Occupants coded as "unknown if injured" have been excluded from the detail in Tables 9 through 14, but have been included in the "Total" rows to reflect the total number of occupants involved in towed passenger vehicle crashes.

## Occupant Injury Data

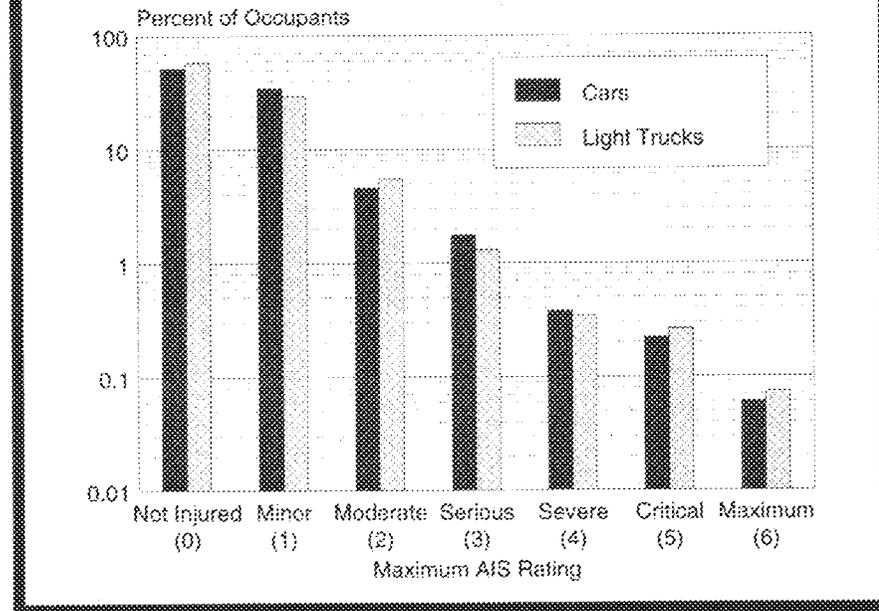
**Table 9**  
**Distribution of Crash-Involved**  
**Car Occupants by Maximum Injury Severity:**  
**Average per Year, 1992-1994**

Maximum AIS Rating	Count	Percent
Not Injured (0)	1,572,489	51.9
Minor (1)	1,035,888	34.2
Moderate (2)	138,987	4.6
Serious (3)	53,229	1.8
Severe (4)	11,485	0.4
Critical (5)	6,078	0.2
Maximum (6)	1,839	0.1
<i>Total, Known Severity</i>	<i>2,820,595</i>	<i>93.2</i>
Injured, Severity Unknown (7)	168,374	5.6
<b>Total</b>	<b>3,028,449</b>	<b>100.0</b>

**Table 10**  
**Distribution of Crash-Involved**  
**Light Truck Occupants by Maximum Injury Severity:**  
**Average per Year, 1992-1994**

Maximum AIS Rating	Count	Percent
Not Injured (0)	550,956	58.4
Minor (1)	275,870	29.2
Moderate (2)	51,819	5.5
Serious (3)	12,332	1.3
Severe (4)	3,249	0.3
Critical (5)	2,490	0.3
Maximum (6)	701	0.1
<i>Total, Known Severity</i>	<i>897,417</i>	<i>95.1</i>
Injured, Severity Unknown (7)	40,166	4.3
<b>Total</b>	<b>943,248</b>	<b>100.0</b>

**Figure 5**  
**Distribution of Crash-Involved Occupant Injuries**  
**by Maximum Injury Severity: Cars vs. Light Trucks, 1992-1994**



## Occupant Injury Data

### Use of Restraints

The annual distribution of injuries to crash-involved car occupants by maximum injury severity and restraint use is shown in Table 11. A similar joint distribution is shown in Table 12 for crash-involved light truck occupants.

**Table 11**  
**Distribution of Crash-Involved Car Occupants by Restraint Use**  
**and Maximum Injury Severity: Average per Year, 1992-1994**

Restraint Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
None	221,184 16.6%	298,600 30.4%	83,668 47.8%	24,020 47.1%	4,988 46.1%	3,326 54.2%	1,051 65.0%	32,863 34.3%	659,507 25.1%
Automatic Belt	266,024 20.0%	161,900 16.5%	20,325 15.3%	11,051 21.7%	1,408 13.0%	870 14.2%	250 15.5%	12,503 13.1%	475,166 18.1%
Manual Belt	795,959 59.9%	512,960 52.2%	49,022 36.8%	15,773 30.9%	4,395 40.6%	1,917 31.2%	302 18.7%	49,718 52.0%	1,436,286 54.7%
Belt With Child Seat	45,780 3.4%	8,134 0.8%	190 0.1%	165 0.3%	27 0.3%	26 0.4%	13 0.8%	583 0.6%	54,918 2.1%
<i>Total Restrained</i>	<i>1,107,763 83.3%</i>	<i>682,994 69.5%</i>	<i>69,537 52.2%</i>	<i>26,989 52.9%</i>	<i>5,830 53.9%</i>	<i>2,813 45.8%</i>	<i>565 35.0%</i>	<i>62,824 65.7%</i>	<i>1,968,372 74.9%</i>
<b>Total Known</b>	<b>1,328,947 84.5%</b>	<b>981,794 94.8%</b>	<b>133,205 95.8%</b>	<b>51,009 95.8%</b>	<b>10,617 94.2%</b>	<b>6,139 91.9%</b>	<b>1,516 87.9%</b>	<b>95,667 56.8%</b>	<b>2,525,879 86.7%</b>
Unknown	243,543 15.5%	54,095 5.2%	5,781 4.2%	2,219 4.2%	668 5.8%	538 8.1%	223 12.1%	72,687 43.2%	402,570 13.3%
<b>Total</b>	<b>1,572,489 51.9%</b>	<b>1,035,888 34.2%</b>	<b>138,987 4.6%</b>	<b>53,229 1.8%</b>	<b>11,485 0.4%</b>	<b>6,678 0.2%</b>	<b>1,839 0.1%</b>	<b>168,374 5.6%</b>	<b>3,028,449 100.0%</b>

\*For each known belt use category, the first data row shows the number of injuries and the second row shows the percentage of the "Total Known." For the "Total Known" and "Unknown" belt use categories, the first row shows the number of injuries and the second row shows the percentage of the column total. For the column totals, the first row shows the number of injuries and the second row shows the percentage of the total number of injuries. The row totals include the number of unknown injuries.

## Occupant Injury Data

Overall, restraint use is approximately 75 percent for passenger car occupants and 72 percent for occupants of light trucks. These belt use rates are in agreement with the belt use rates obtained by individual state surveys reported to NHTSA each year. Not all states report belt usage rates each year. Therefore, to calculate the national safety belt use rate from the individual state use rates, each state's most recent rate is weighted by the state's proportion of the total U.S. population. Average state belt use rates were reported as 62 percent in 1992, 66 percent in 1993, and 67 percent in 1994.

**Table 12**  
**Distribution of Crash-Involved Light Truck Occupants by Restraint Use**  
**and Maximum Injury Severity: Average per Year, 1992-1994**

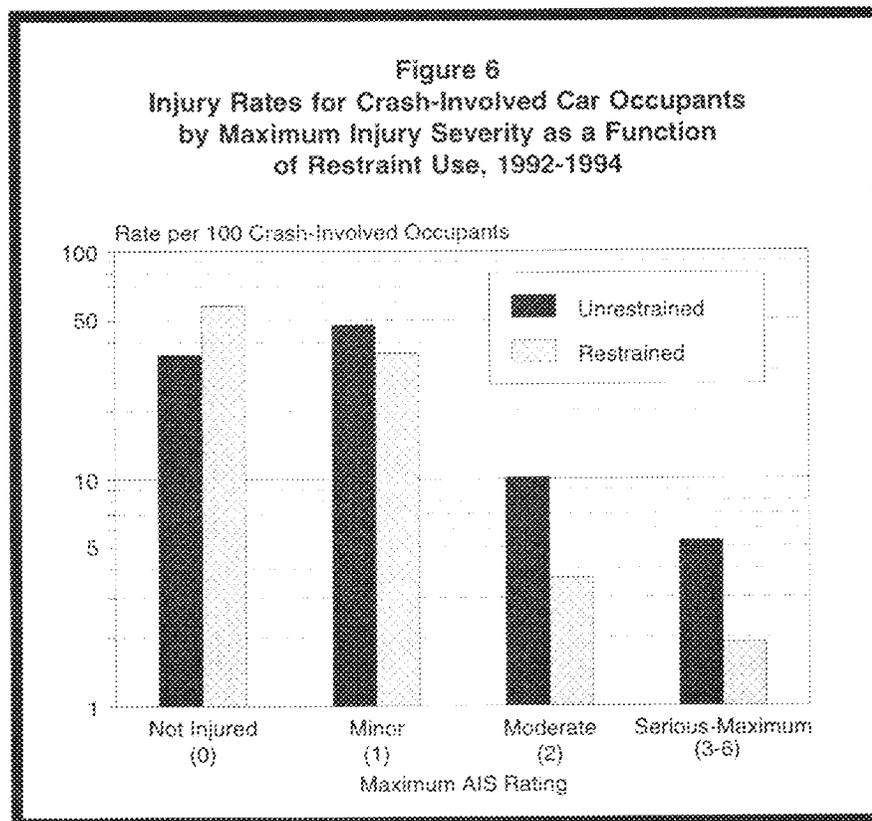
Restraint Use	Frequency of Injury by Maximum AIS Rating*								Injured, Severity Unknown (7)	Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)			
None	93,954 19.0%	96,423 36.3%	23,257 46.8%	7,463 64.3%	2,660 86.3%	2,158 87.5%	354 62.3%	9,609 39.8%	236,457 28.0%	
Automatic Belt	650 0.1%	315 0.1%	64 0.1%	9 0.1%	0 --	0 --	0 --	0 --	1,037 0.1%	
Manual Belt	375,436 76.0%	167,162 62.9%	26,170 52.8%	4,122 35.5%	420 13.6%	309 12.5%	206 36.4%	14,503 60.0%	588,566 68.8%	
Belt With Child Seat	23,894 4.9%	1,746 0.7%	72 0.1%	30 0.3%	3 0.1%	0 --	7 1.3%	46 0.2%	25,897 3.0%	
<i>Total, Restrained</i>	<i>400,080</i> <i>81.0%</i>	<i>169,213</i> <i>63.7%</i>	<i>26,306</i> <i>53.0%</i>	<i>4,161</i> <i>35.9%</i>	<i>423</i> <i>13.7%</i>	<i>309</i> <i>12.5%</i>	<i>213</i> <i>37.7%</i>	<i>14,548</i> <i>60.2%</i>	<i>615,492</i> <i>71.9%</i>	
<b>Total Known</b>	<b>494,034</b> <b>89.7%</b>	<b>265,635</b> <b>96.3%</b>	<b>49,563</b> <b>95.6%</b>	<b>11,624</b> <b>94.3%</b>	<b>3,084</b> <b>94.9%</b>	<b>2,467</b> <b>99.1%</b>	<b>569</b> <b>90.9%</b>	<b>24,157</b> <b>60.1%</b>	<b>854,949</b> <b>90.6%</b>	
Unknown	66,922 10.3%	10,234 3.7%	2,256 4.4%	708 6.7%	166 5.1%	29 0.9%	134 19.1%	16,008 39.9%	68,299 8.4%	
<b>Total</b>	<b>560,956</b> <b>58.4%</b>	<b>275,670</b> <b>29.2%</b>	<b>51,820</b> <b>5.5%</b>	<b>12,332</b> <b>1.3%</b>	<b>3,249</b> <b>0.3%</b>	<b>2,490</b> <b>0.3%</b>	<b>701</b> <b>0.1%</b>	<b>40,166</b> <b>4.3%</b>	<b>943,248</b> <b>100.0%</b>	

\*For each known belt use category, the first data row shows the number of injuries and the second row shows the percentage of the "Total Known." For the "Total Known" and "Unknown" belt use categories, the first row shows the number of injuries and the second row shows the percentage of the column total. For the column totals, the first row shows the number of injuries and the second row shows the percentage of the total number of injuries. The row totals include the number of unknown injuries.

### Effect of Restraint Use on Injury Risk

It is evident from Tables 11 and 12 that safety belt use reduces the risk of injury, especially serious injury. This is illustrated in Figure 6 for crash-involved car occupants. In this figure, AIS ratings 3, 4, 5, and 6 have been grouped together as "Serious-Maximum" in order to deal with the small sample sizes at these high severities. As seen in Figure 6, the risk of injury (expressed in injured people per 100 crash-involved car occupants) for occupants using restraints is lower than that for unrestrained occupants. Moreover, this advantage appears to increase as the injury severity increases.

A word of caution is necessary when interpreting the much lower risk associated with restrained versus unrestrained occupants at high injury severities. It is likely that restrained occupants, who usually have a higher awareness of safety than the unrestrained, are also the occupants who usually avoid crashes of high severities. Thus, the advantage of restrained occupants may be in part due to the fact that such occupants are exposed to lower crash severities, in addition to the crash protection provided by the restraints.



### Injury Severity and Outcome

As discussed above (see Table 9), not all crash deaths are associated with untreatable injuries (AIS=6). Rather, the probability of death increases sharply with injury severity, and many fatalities occur as a result of one or more injuries that are generally considered survivable. Crash injury outcomes—fatality, hospitalization, needed emergency medical care, first aid treatment, and no treatment needed—are generally a function of the severity of an occupant's most severe injury, plus other factors, such as the number, severity, and type of additional injuries; the person's age and overall health; extrication time; etc.

The primary determinant of an outcome is the maximum injury severity. Table 13 shows the distribution of injuries to crash-involved car occupants according to the AIS values of maximum injury severity and the pertinent outcomes of maximum injury severities. This table also includes the number of days an occupant was hospitalized for injuries sustained in the crash as a result of the crash. An occupant may be hospitalized for observation or due to a pre-existing medical condition, as directed by the attending physician, without having received any injuries in the crash. Fatal injuries with AIS=1 are the result of incomplete medical information by which to code the data. A similar distribution is shown in Table 14 for crash-involved light truck occupants.

## Occupant Injury Data

**Table 13**  
**Distribution of Crash-Involved Car Occupants by Treatment**  
**and Maximum Injury Severity: Average per Year, 1992-1994**

Treatment	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
None	1,493,935 85.6%	231,166 13.2%	1,587 0.1%	0 --	0 --	0 --	0 --	15,020 0.9%	1,745,398 57.6%
Treated at Scene	21,566 11.9%	136,484 75.6%	10,095 5.6%	117 0.1%	0 --	0 --	0 --	11,439 6.3%	180,562 6.0%
Transported and Released	51,759 6.6%	610,377 77.9%	70,218 9.0%	6,155 1.0%	89 0.0%	0 --	0 --	41,770 5.3%	783,369 25.9%
Hospitalized									
1-2 Days	2,908 3.3%	36,242 41.7%	26,086 30.0%	14,145 16.3%	1,366 1.6%	410 0.5%	0 --	5,824 6.7%	86,985 2.9%
3-7 Days	367 0.7%	8,843 17.7%	21,415 42.9%	16,120 32.3%	2,389 4.8%	245 0.5%	0 --	484 1.0%	49,865 1.6%
8-14 Days	47 0.3%	513 3.2%	5,360 33.3%	8,066 50.1%	1,370 8.6%	361 2.4%	0 --	357 2.2%	16,094 0.5%
15-30 Days	17 0.2%	667 8.9%	1,800 24.2%	2,941 39.1%	932 12.4%	1,096 14.6%	18 0.2%	29 0.4%	7,521 0.2%
>30 Days	0 --	11 0.3%	430 11.9%	1,347 37.2%	1,267 35.0%	514 14.2%	16 0.4%	35 1.0%	3,621 0.1%
Fatal	0 --	1,185 6.8%	1,675 9.6%	2,289 13.1%	4,072 23.3%	3,959 22.6%	1,305 10.3%	2,507 14.3%	17,495 0.6%
Unknown	1,869 1.4%	10,387 7.6%	299 0.2%	40 0.0%	0 --	73 0.1%	0 --	90,909 66.1%	137,538 4.5%
<b>Total</b>	<b>1,572,469</b> <b>51.9%</b>	<b>1,035,888</b> <b>34.2%</b>	<b>138,987</b> <b>4.6%</b>	<b>53,229</b> <b>1.8%</b>	<b>11,455</b> <b>0.4%</b>	<b>6,678</b> <b>0.2%</b>	<b>1,339</b> <b>0.1%</b>	<b>168,374</b> <b>5.6%</b>	<b>3,028,449</b> <b>100.0%</b>

\*For each treatment category, the first data row shows the number of injuries and the second row shows the percentage of the row total.

## Occupant Injury Data

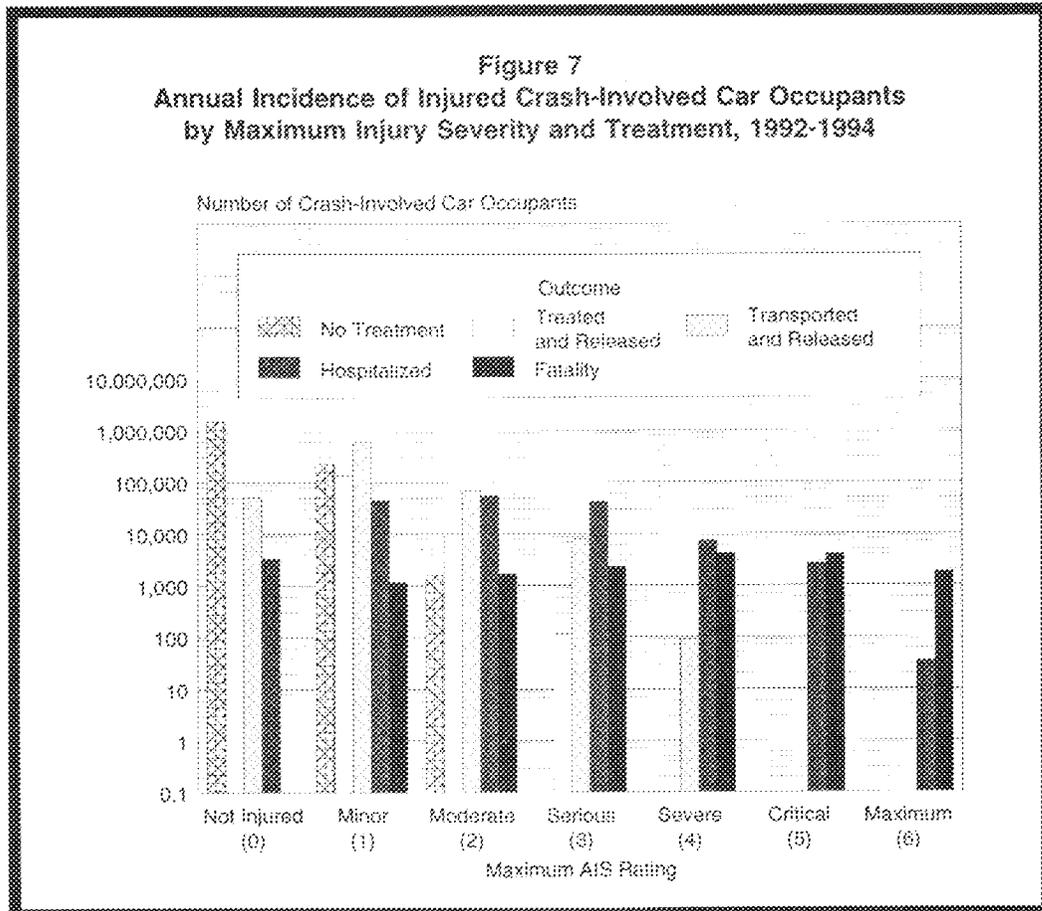
**Table 14**  
**Distribution of Crash-Involved Light Truck Occupants by Treatment**  
**and Maximum Injury Severity: Average per Year, 1992-1994**

Treatment	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
None	537,968 86.4%	76,804 12.3%	2,113 0.3%	0 --	0 --	0 --	0 --	5,081 0.8%	622,435 66.0%
Treated at Scene	6,320 13.3%	34,755 73.3%	4,082 8.6%	280 0.6%	0 --	0 --	0 --	1,871 3.9%	47,366 6.0%
Transported and Released	5,691 3.1%	152,161 78.9%	26,368 13.7%	1,507 0.8%	0 --	0 --	0 --	6,934 3.6%	192,906 20.5%
Hospitalized									
1-2 Days	144 0.7%	8,577 40.5%	7,559 35.7%	2,787 13.1%	314 1.5%	147 0.7%	0 --	1,630 7.7%	21,200 2.2%
3-7 Days	44 0.3%	2,296 14.2%	9,094 56.2%	3,696 22.8%	939 5.8%	35 0.2%	0 --	76 0.5%	16,182 1.7%
8-14 Days	0 --	70 1.8%	1,074 27.0%	2,160 54.2%	563 14.1%	116 2.9%	0 --	0 --	3,984 0.4%
15-30 Days	0 --	46 2.0%	1,067 43.5%	967 39.4%	233 9.5%	121 4.9%	0 --	16 0.7%	2,453 0.3%
>30 Days	0 --	58 3.5%	200 12.2%	257 15.7%	268 16.4%	762 46.6%	0 --	59 6.4%	1,634 0.2%
Fatal	0 --	501 10.0%	131 2.6%	666 13.0%	932 18.7%	1,308 26.2%	701 14.0%	755 15.1%	4,994 0.5%
Unknown	588 2.0%	597 2.0%	111 0.4%	12 0.0%	0 --	0 --	0 --	23,714 78.9%	30,074 3.2%
<b>Total</b>	<b>550,956</b> <b>58.4%</b>	<b>276,870</b> <b>29.2%</b>	<b>51,820</b> <b>5.5%</b>	<b>12,332</b> <b>1.3%</b>	<b>3,249</b> <b>0.3%</b>	<b>2,490</b> <b>0.3%</b>	<b>701</b> <b>0.1%</b>	<b>40,166</b> <b>4.3%</b>	<b>943,248</b> <b>100.0%</b>

\*For each treatment category, the first data row shows the number of injuries and the second row shows the percentage of the row total.

## Occupant Injury Data

The annual incidence of crash-involved car occupants as a function of maximum injury severity and injury outcome is shown in Figure 7. This figure illustrates how injury outcome progresses from "No Treatment" to "Fatality," as the maximum injury severity increases from "None" to "Untreatable" (Fatal). Similar comments apply for light truck occupants, as shown in Table 14.



### Effect of Alcohol Use on Injury Risk

The presence of alcohol in a motor vehicle driver increases (a) the likelihood of being involved in a crash, and (b) the severity of the crash. In this report, alcohol reporting is based on the police officer's assessment at the time of the crash.

Table 15 shows that, for drivers of passenger cars, those whose age is between 25 and 34 have the highest alcohol use rate, followed by the 21 through 24 age range and then the 35- through 44-year-old drivers. Table 16 shows that, for drivers of light trucks, those whose age is between 35 and 44 have the highest alcohol use rate, followed by drivers 45 through 64 years old and then by those 25 through 34 years old. Drivers of light trucks have almost twice the alcohol use rate of passenger car drivers. These percentages are based on the "Total Known."

Table 17 shows that, for drivers of passenger cars, as the severity of the injury increases so does the presence of alcohol. Drivers in towed passenger cars with alcohol present had MAIS 3-6 injury rates 3 times those for drivers with no alcohol present. Approximately 30 percent of the MAIS 6 injuries are the result of alcohol involvement, followed by 26 percent of the MAIS 4 injuries and 19 percent of the MAIS 5 injuries. Table 18 describes the same pattern for drivers of towed light trucks. Drivers in towed light trucks with alcohol present had MAIS 3-6 injury rates at least twice those for drivers with no alcohol present.

## Occupant Injury Data

**Table 15**  
**Distribution of Crash-Involved Car Drivers**  
**by Age Group and Alcohol Use: Average per Year, 1992-1994**

Police-Reported Alcohol Use	Age Group (Years)							Total
	15-20	21-24	25-34	35-44	45-64	>65	Unknown	
No Alcohol Present	350,519	272,481	379,975	252,572	249,514	155,559	5,443	1,676,053
	89.6%	83.2%	79.3%	84.4%	90.3%	94.2%	15.3%	84.4%
Alcohol Present	14,471	30,947	57,516	28,783	14,651	2,188	3,658	154,214
	3.7%	10.1%	12.0%	9.3%	5.3%	1.3%	10.3%	7.8%
Not Reported	22,875	15,946	30,015	16,301	10,850	6,714	14,295	116,995
	5.9%	4.9%	6.3%	5.2%	3.9%	4.1%	40.2%	5.9%
Not Coded	3,158	5,947	11,767	3,339	1,333	647	12,138	36,328
	0.8%	1.8%	2.5%	1.1%	0.5%	0.4%	34.2%	1.9%
<b>Total</b>	<b>391,022</b>	<b>327,321</b>	<b>479,272</b>	<b>310,995</b>	<b>276,348</b>	<b>165,108</b>	<b>35,533</b>	<b>1,985,600</b>
	19.7%	16.5%	24.1%	15.7%	13.9%	8.3%	1.8%	100.0%

\*For each police-reported alcohol category, the first data row shows the number of drivers and the second row shows the percentage of the row total.

**Table 16**  
**Distribution of Crash-Involved Light Truck Drivers**  
**by Age Group and Alcohol Use: Average per Year, 1992-1994**

Police-Reported Alcohol Use	Age Group (Years)							Total
	15-20	21-24	25-34	35-44	45-64	>65	Unknown	
No Alcohol Present	71,956	69,648	147,524	88,680	86,055	25,985	860	490,730
	88.9%	84.9%	79.7%	74.4%	75.8%	85.8%	9.1%	79.1%
Alcohol Present	6,295	9,391	22,928	27,924	21,994	3,186	147	91,868
	7.8%	11.4%	12.4%	23.4%	19.4%	10.5%	1.5%	14.8%
Not Reported	1,197	1,911	12,307	1,849	4,520	901	1,055	23,740
	1.5%	2.3%	6.6%	1.8%	4.0%	3.0%	10.9%	3.8%
Not Coded	1,490	1,093	2,310	702	908	201	7,600	14,305
	1.8%	1.3%	1.2%	0.5%	0.8%	0.7%	78.5%	2.3%
<b>Total</b>	<b>80,941</b>	<b>82,043</b>	<b>185,070</b>	<b>119,154</b>	<b>113,476</b>	<b>30,276</b>	<b>9,682</b>	<b>620,642</b>
	13.0%	13.2%	29.6%	19.2%	18.3%	4.9%	1.6%	100.0%

\*For each police-reported alcohol category, the first data row shows the number of drivers and the second row shows the percentage of the row total.

## Occupant Injury Data

**Table 17**  
**Distribution of Crash-Involved Car Drivers by Alcohol Use**  
**and Maximum Injury Severity: Average per Year, 1992-1994**

Police-Reported Alcohol Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
No Alcohol Present	865,087 51.8%	605,797 36.1%	76,349 4.6%	26,948 1.6%	4,356 0.3%	2,465 0.1%	419 0.0%	94,841 5.6%	1,676,063 84.4%
Alcohol Present	57,854 37.5%	53,406 34.6%	15,416 10.0%	7,471 4.8%	1,956 1.3%	803 0.5%	315 0.2%	16,993 11.0%	154,214 7.8%
Not Reported	44,578 38.1%	47,530 40.6%	5,752 4.9%	1,764 1.5%	389 0.3%	418 0.4%	141 0.1%	16,422 14.0%	116,995 5.9%
Not Coded	9,638 25.7%	12,765 33.3%	1,531 4.0%	1,800 4.7%	842 2.2%	534 1.4%	166 0.4%	10,851 28.3%	38,328 1.9%
<b>Total</b>	<b>977,358</b> 49.2%	<b>719,499</b> 36.2%	<b>99,048</b> 5.0%	<b>37,983</b> 1.9%	<b>7,543</b> 0.4%	<b>4,220</b> 0.2%	<b>1,041</b> 0.1%	<b>138,907</b> 7.0%	<b>1,985,603</b> 100.0%

\*For each police-reported alcohol use category, the first data row shows the number of drivers involved and the second row shows the percentage of the row total.

**Table 18**  
**Distribution of Crash-Involved Light Truck Drivers by Alcohol Use**  
**and Maximum Injury Severity: Average per Year, 1992-1994**

Police-Reported Alcohol Use	Frequency of Injury by Maximum AIS Rating*								Total
	Not Injured (0)	Minor (1)	Moderate (2)	Serious (3)	Severe (4)	Critical (5)	Maximum (6)	Injured, Severity Unknown (7)	
No Alcohol Present	276,633 56.4%	151,315 32.9%	20,795 4.2%	6,280 1.3%	1,591 0.3%	1,216 0.2%	209 0.0%	22,707 4.6%	490,730 79.1%
Alcohol Present	53,846 58.6%	25,327 27.6%	5,402 5.9%	2,281 2.5%	591 0.6%	367 0.4%	195 0.1%	3,929 4.3%	91,868 14.8%
Not Reported	10,549 44.4%	5,145 21.7%	6,270 26.4%	158 0.7%	57 0.2%	60 0.3%	67 0.3%	1,433 6.0%	23,740 3.6%
Not Coded	4,050 28.3%	2,247 15.7%	479 3.3%	548 3.8%	85 0.6%	120 0.8%	148 1.0%	6,827 46.3%	14,305 2.3%
<b>Total</b>	<b>345,078</b> 55.6%	<b>194,034</b> 31.3%	<b>32,946</b> 5.3%	<b>9,248</b> 1.5%	<b>2,324</b> 0.4%	<b>1,755</b> 0.3%	<b>560</b> 0.1%	<b>34,886</b> 5.6%	<b>620,642</b> 100.0%

\*For each police-reported alcohol use category, the first data row shows the number of drivers involved and the second row shows the percentage of the row total.

## Occupant Injury Data

### Body Regions Injured in Traffic Crashes

There are about 1,994,000 cars towed away from traffic crashes every year. The incidence of crash-involved occupants in these cars is about 3,028,000 per year. Of these, about 1,456,000 car occupants per year are injured, incurring about 3,623,000 injuries of various severities, in various body regions, and by various injury contacts. Table 19 shows the distribution of all injuries incurred by injured occupants of crash-involved cars (as opposed to each occupant's most severe injury, reported in Tables 9-18) as a function of injury severity and injured body region. Table 20 shows the same distribution for injured occupants of light trucks.

The numbers for "injured, severity unknown" (AIS=7) are lower in these tables than in tables using maximum AIS (MAIS), because of the level of information available for coding the injuries. An AIS of 7 is assigned to an injury when there is not sufficient information about the injury available. An MAIS of 7 is assigned to an occupant when it is known that the occupant was injured, but no information about the injury is available. Therefore, an occupant with an MAIS of 7 may not have any associated injuries coded.

**Table 19**  
**Distribution of All Injuries to Crash-Involved Car Occupants**  
**by Body Region and Severity: Average per Year, 1992-1994**

Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Head (Brain)	16,460 32.5% 0.5%	26,597 52.4% 9.8%	4,442 8.8% 4.4%	1,855 3.7% 8.7%	1,132 2.2% 11.6%	164 0.3% 8.1%	70 0.1% 0.3%	50,720
Head (Skull)	0 -- --	2,560 30.1% 1.0%	4,432 51.8% 4.4%	1,246 14.6% 5.8%	0 -- --	276 3.2% 13.7%	28 0.3% 0.1%	8,563
Head (Other)	29,896 28.6% 0.8%	30,311 36.3% 11.1%	9,883 11.9% 9.9%	5,737 6.9% 26.5%	3,266 3.9% 33.5%	371 0.5% 18.4%	9,965 11.9% 39.6%	83,428
Face	86,068 80.5% 2.7%	16,235 15.2% 5.0%	3,425 3.2% 3.4%	247 0.2% 1.2%	0 -- --	0 -- --	929 0.9% 3.7%	106,966
Neck	104,581 94.4% 3.3%	3,522 3.2% 1.3%	989 0.9% 1.0%	62 0.1% 0.3%	39 0.0% 0.4%	18 0.0% 0.9%	1,587 1.4% 6.3%	110,799
Chest	29,913 30.1% 0.9%	21,633 21.8% 7.9%	29,350 29.6% 29.3%	9,761 9.8% 45.5%	3,248 3.3% 33.3%	845 0.9% 41.8%	4,586 4.6% 18.3%	99,335
Shoulder and Back	353,902 86.2% 11.1%	41,472 10.3% 15.2%	3,321 0.8% 3.3%	0 -- --	0 -- --	0 -- --	2,549 0.6% 10.2%	401,244

\*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Abdomen	2,635 7.4% 0.1%	21,332 59.9% 7.8%	3,969 11.1% 4.0%	2,101 5.9% 9.8%	1,454 4.1% 14.9%	0 -- --	4,144 11.6% 15.6%	35,634
Spine	0 -- --	0 -- --	445 29.7% 0.4%	248 16.6% 1.2%	592 39.6% 6.1%	211 14.1% 10.4%	0 -- --	1,496
Upper Extremities	41,722 47.7% 1.3%	31,581 35.1% 11.6%	13,714 15.7% 13.7%	0 -- --	0 -- --	0 -- --	528 0.6% 2.1%	87,546
Pelvis	769 3.7% 0.0%	14,619 68.5% 5.4%	5,605 27.2% 5.8%	28 0.1% 0.1%	0 -- --	0 -- --	103 0.5% 0.4%	21,344
Lower Extremities	34,572 34.1% 1.1%	46,540 46.0% 17.1%	19,724 19.4% 19.7%	79 0.1% 0.4%	0 -- --	0 -- --	456 0.5% 1.8%	101,470
Skin	2,495,456 99.3% 78.2%	16,350 0.7% 6.0%	329 0.0% 0.3%	0 -- --	19 0.0% 0.2%	136 0.0% 6.7%	38 0.0% 0.2%	2,512,328
All Other	2,064 88.6% 0.1%	0 -- --	190 6.2% 0.2%	26 1.1% 0.1%	0 -- --	0 -- --	49 2.1% 0.2%	2,330
<b>Total</b>	<b>3,192,057</b>	<b>272,872</b>	<b>100,019</b>	<b>21,392</b>	<b>9,748</b>	<b>2,022</b>	<b>25,032</b>	<b>3,623,142</b>

\*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

## Occupant Injury Data

**Table 20**  
**Distribution of All Injuries to Crash-Involved Light Truck Occupants**  
**by Body Region and Severity: Average per Year, 1992-1994**

Body Region	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Head (Brain)	2,536 19.0% 0.3%	8,947 66.9% 9.1%	948 7.1% 3.4%	444 3.3% 6.6%	351 2.6% 10.9%	41 0.3% 5.7%	110 0.8% 1.8%	13,377
Head (Skull)	0 -- --	2,469 47.8% 2.5%	1,798 34.3% 6.4%	637 12.2% 9.4%	0 -- --	294 5.7% 41.0%	0 -- --	5,207
Head (Other)	11,078 32.1% 1.2%	14,166 41.0% 14.4%	9,225 9.3% 11.5%	2,002 5.8% 29.6%	1,358 3.9% 42.3%	62 0.2% 11.4%	2,634 7.6% 42.3%	34,544
Face	20,405 76.2% 2.2%	5,219 19.5% 5.3%	942 3.5% 3.4%	31 0.1% 0.5%	0 -- --	0 -- --	166 0.6% 2.7%	26,763
Neck	18,350 94.1% 2.0%	497 2.2% 0.4%	369 1.8% 1.3%	7 0.0% 0.1%	0 -- --	4 0.0% 0.6%	366 1.8% 5.7%	19,512
Chest	5,958 26.7% 0.7%	8,925 31.0% 7.0%	5,522 24.7% 19.7%	2,430 10.9% 35.9%	531 2.4% 16.8%	127 0.6% 17.8%	842 3.8% 13.5%	22,335
Shoulder and Back	73,527 82.8% 8.1%	12,979 14.6% 13.2%	1,650 1.9% 5.9%	0 -- --	0 -- --	0 -- --	587 0.7% 9.4%	88,743

\*For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

**Table 20 (Continued)**  
**Distribution of All Injuries to Crash-Involved Light Truck Occupants**  
**by Body Region and Severity: Average per Year, 1992-1994**

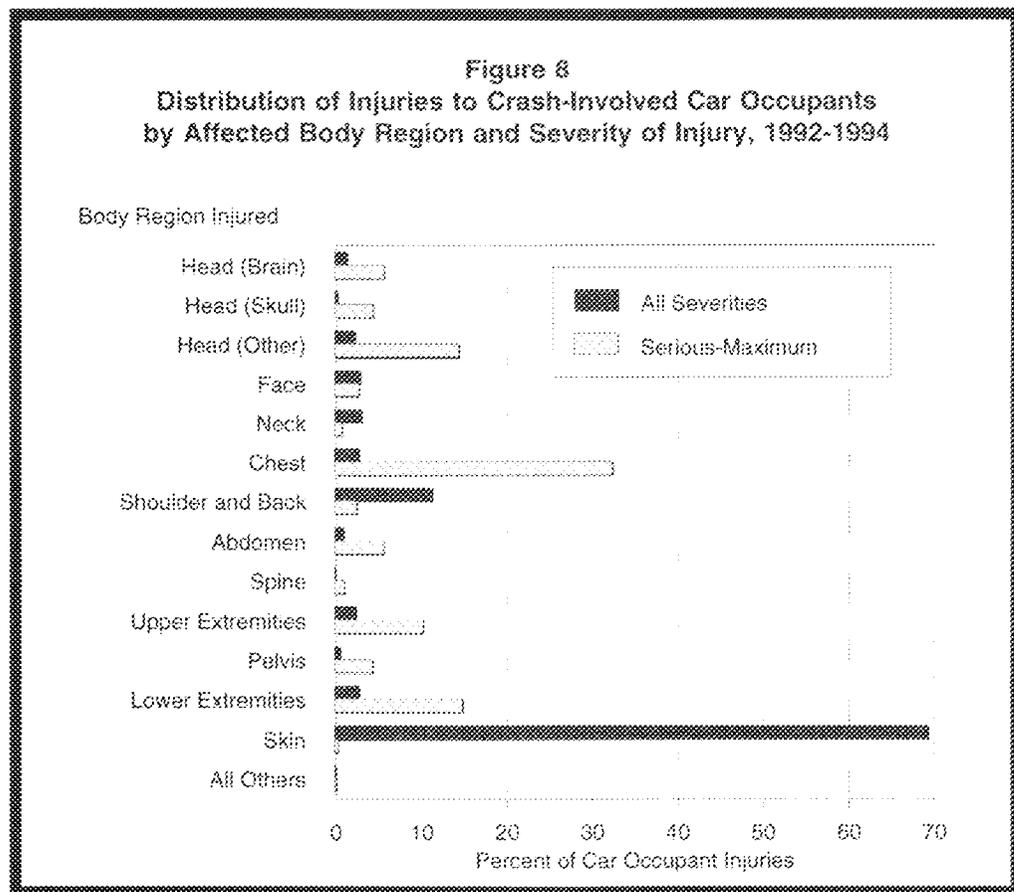
Body Region	Frequency of Injury by AIS Rating <sup>a</sup>							Total
	1	2	3	4	5	6	7	
Abdomen	698 4.8% 0.1%	7,831 62.9% 8.0%	1,339 10.8% 4.6%	1,011 8.1% 14.9%	771 6.2% 24.0%	32 0.3% 4.4%	971 7.0% 14.0%	12,451
Spine	0 -- --	0 -- --	159 36.1% 0.6%	111 25.2% 1.6%	164 37.3% 5.1%	7 1.5% 0.9%	0 -- --	440
Upper Extremities	11,051 39.0% 1.2%	13,257 46.8% 13.5%	3,919 13.8% 14.0%	0 -- --	0 -- --	0 -- --	100 0.3% 1.6%	28,326
Pelvic	496 7.6% 0.1%	3,639 55.7% 3.7%	2,338 35.8% 8.0%	57 0.9% 0.8%	0 -- --	0 -- --	0 -- --	6,529
Lower Extremities	7,050 25.2% 0.8%	14,646 52.4% 14.9%	5,710 20.4% 20.4%	24 0.1% 0.3%	0 -- --	0 -- --	547 2.0% 8.8%	27,977
Skin	760,736 98.9% 63.4%	7,959 1.0% 8.1%	93 0.0% 0.3%	0 -- --	15 0.0% 0.5%	130 0.0% 18.2%	0 -- --	768,935
All Other	461 85.3% 0.1%	0 -- --	28 5.2% 0.1%	13 2.3% 0.2%	20 3.7% 0.6%	0 -- --	19 3.5% 0.3%	541
<b>Total</b>	<b>912,246</b>	<b>98,494</b>	<b>26,016</b>	<b>6,785</b>	<b>3,210</b>	<b>717</b>	<b>6,230</b>	<b>1,055,679</b>

<sup>a</sup>For each body region, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

## Occupant Injury Data

It is apparent from Tables 19 and 20 that the body regions most frequently affected by injuries of all severities are markedly different from those most frequently affected by injuries of high severities (serious-maximum (AIS=3-6)). This is illustrated in Figure 8, where two distributions are shown: one for all severities and one for serious-maximum severities, each adding up to 100 percent.

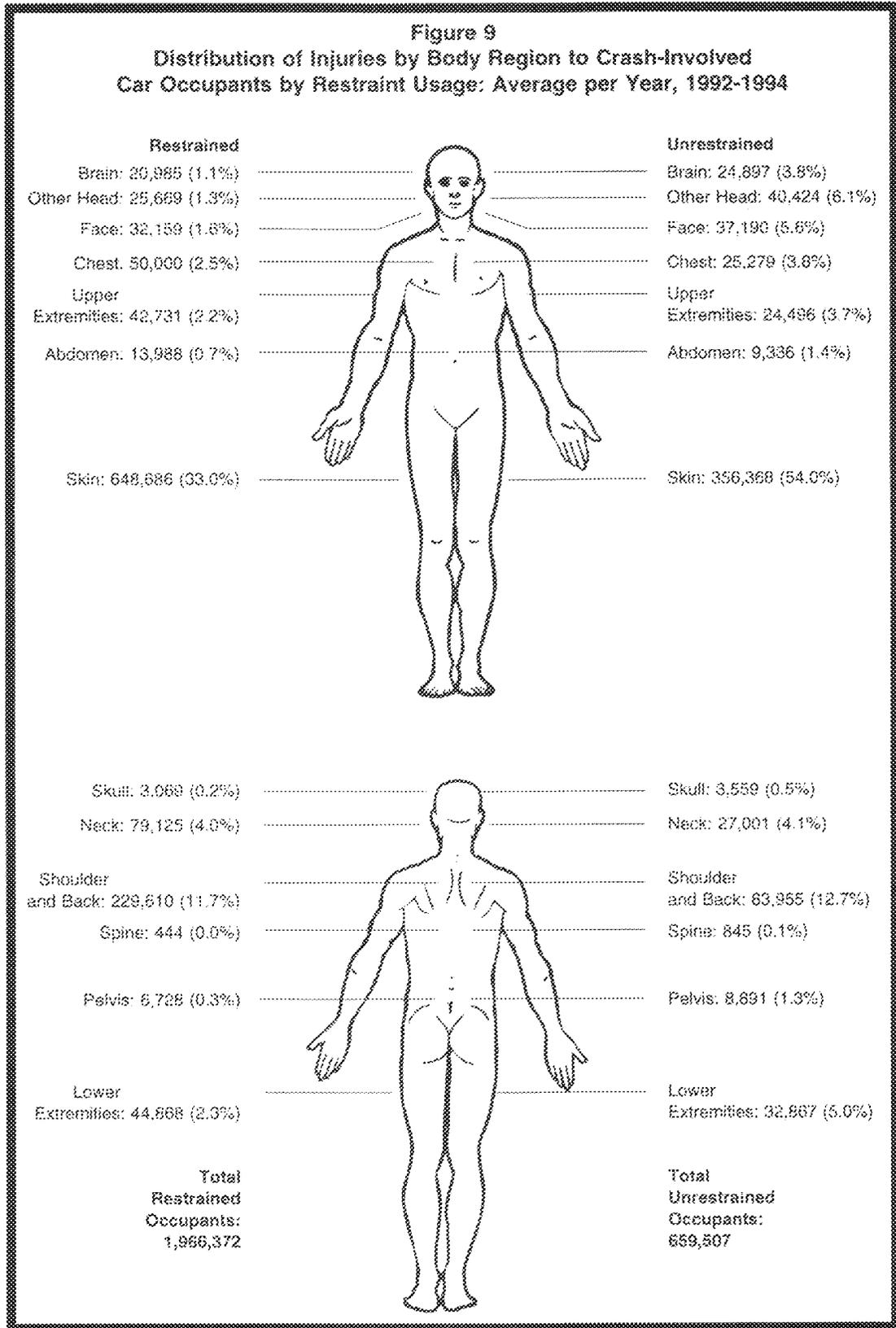
It is evident in this figure that body regions such as face, neck, shoulder and back, and skin are injured with a high frequency in general, but occur at very low frequencies for serious to maximum severities. Conversely, other body regions, such as the head (brain/skull), chest, spine, and abdomen are injured frequently at high severities, but occur less significantly when all severities are considered.



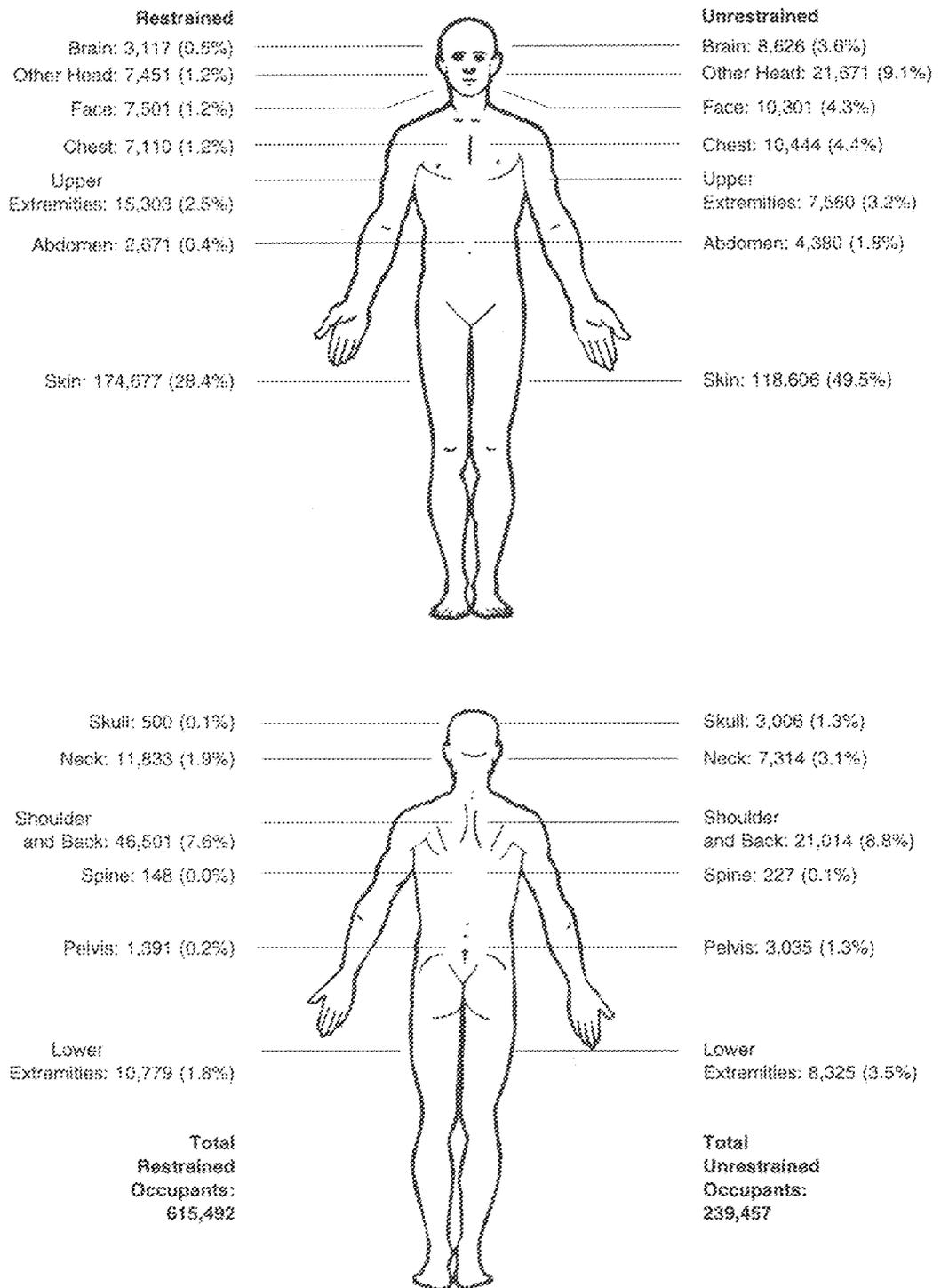
### Restraint Use and Body Regions Injured

Figure 9 shows the distribution of crash-involved car occupants by injured body region and belt usage. An occupant may receive more than one injury to a given body region; however, this figure represents one injury per body region per occupant. An occupant may also receive injuries across more than one body region. Therefore, the number for each body region will add up to more than the number of injured occupants. For example, an occupant may have a contusion to the left side of the brain and a laceration to the right side of the brain. The figure counts only one of the injuries to the brain. If the occupant in the example sustained a contusion to the left side of the brain and a skull fracture, then both injuries would be included in the figure, and one injury would be counted in the brain body region while the other injury would be counted in the skull body region. To determine the percent of belted occupants who sustained a brain injury, divide the number of occupants with a brain injury by the total number of occupants using a restraint system. The same methodology applies to the unbelted occupants. The percentages will not add to 100 percent, because the total number of occupants includes those who were not injured. Figure 10 shows a similar distribution of crash-involved occupants of light trucks by belt usage.

# Occupant Injury Data



**Figure 10**  
**Distribution of Injuries by Body Region to Crash-Involved**  
**Light Truck Occupants by Restraint Usage: Average per Year, 1992-1994**



## Occupant Injury Data

### Injury Contacts

In addition to data on injured body regions, crash protection practitioners need data concerning the various sources of injury (injury contacts). A summary of injury contacts for injuries to crash-involved occupants is presented in Table 21 for cars and in Table 22 for light trucks. Table 21 shows the distribution of all crash-involved car occupant injuries as a function of injury severity and injury contact. Table 22 shows the same distribution for light truck occupants.

**Table 21**  
**Distribution of All Injuries to Crash-Involved Car Occupants**  
**by Injury Contact and Severity: Average per Year, 1992-1994**

Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Steering Assembly	343,191	32,479	15,948	3,560	1,629	274	4,791	401,892
	85.4%	8.1%	4.0%	0.9%	0.4%	0.1%	1.2%	
	10.8%	11.9%	16.0%	16.7%	16.7%	13.5%	19.1%	
Instrument Panel	534,361	36,346	15,355	1,235	584	389	841	591,106
	90.4%	6.5%	2.6%	0.2%	0.1%	0.1%	0.1%	
	16.7%	14.1%	15.4%	5.8%	6.0%	19.2%	3.4%	
Windshield	316,293	27,907	4,595	1,307	259	92	2,750	353,243
	89.5%	7.9%	1.3%	0.4%	0.1%	0.0%	0.8%	
	9.9%	10.2%	4.6%	6.1%	2.7%	4.6%	11.2%	
Interior Side Surface	204,679	33,073	16,072	4,964	2,046	182	690	263,907
	77.6%	12.5%	6.8%	1.9%	0.8%	0.1%	0.3%	
	6.4%	12.1%	18.1%	23.2%	21.0%	9.0%	3.6%	
Pillars	52,623	8,637	5,448	1,716	652	92	565	69,933
	75.3%	12.4%	7.8%	2.5%	1.2%	0.1%	0.8%	
	1.7%	3.2%	5.5%	8.0%	6.7%	4.6%	2.3%	
Restraint (Belt) System	323,743	19,104	6,650	964	242	6	736	351,444
	92.1%	5.4%	1.9%	0.3%	0.1%	0.0%	0.2%	
	10.1%	7.0%	6.7%	4.5%	2.5%	0.3%	2.9%	
Child Seat	8,748	108	242	0	0	13	13	9,124
	95.9%	1.2%	2.7%	--	--	0.1%	0.1%	
	0.3%	0.0%	0.2%	--	--	0.6%	0.1%	
Air Bag	80,948	1,644	652	81	116	4	299	83,743
	96.7%	2.0%	0.8%	0.1%	0.1%	0.0%	0.4%	
	2.5%	0.6%	0.7%	0.4%	1.2%	0.2%	1.2%	
Head Restraints	26,189	2,584	396	289	24	0	145	29,727
	88.1%	9.0%	1.3%	1.0%	0.1%	--	0.5%	
	0.8%	1.0%	0.4%	1.4%	0.2%	--	0.6%	
Seat Back	137,411	8,899	2,669	450	453	54	720	150,656
	91.2%	5.9%	1.8%	0.3%	0.3%	0.0%	0.5%	
	4.3%	3.3%	2.7%	2.1%	4.7%	2.7%	2.9%	
Roof	56,426	13,579	4,210	1,423	1,276	149	1,241	78,302
	72.1%	17.3%	5.4%	1.8%	1.6%	0.2%	1.6%	
	1.8%	5.0%	4.2%	6.7%	13.1%	7.4%	5.0%	

\*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

**Table 21 (Continued)**  
**Distribution of All Injuries to Crash-Involved Car Occupants**  
**by Injury Contact and Severity: Average per Year, 1992-1994**

Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Floor	50,950 68.9% 1.6%	19,696 26.6% 7.2%	3,279 4.4% 3.3%	0 -- --	0 -- --	0 -- --	8 0.0% 0.0%	73,936
Non-Contact Injuries	410,015 96.9% 12.8%	3,217 0.8% 1.2%	624 0.2% 0.6%	45 0.0% 0.2%	7 0.0% 0.2%	0 -- --	836 0.2% 3.3%	414,743
Fire in Vehicle	631 62.8% 0.0%	54 5.3% 0.0%	74 7.4% 0.1%	53 5.2% 0.3%	19 1.9% 0.2%	136 13.6% 6.7%	38 3.8% 0.2%	1,005
Ground	29,145 75.2% 0.9%	5,093 13.1% 1.9%	2,790 7.2% 2.8%	792 2.0% 3.7%	259 0.7% 2.7%	81 0.2% 4.0%	604 1.6% 2.4%	38,767
Exterior (Occupant's Vehicle)	2,256 55.0% 0.1%	1,210 29.5% 0.4%	355 8.7% 0.4%	83 2.0% 0.4%	52 1.3% 0.5%	58 1.4% 2.9%	90 2.2% 0.4%	4,104
Exterior (Other Vehicle or Exterior Object)	6,852 47.2% 0.2%	2,780 19.1% 1.0%	2,837 19.6% 2.8%	1,159 8.0% 5.4%	560 4.6% 6.8%	112 0.6% 5.5%	112 0.8% 0.5%	14,510
Side and Rear Glazing	71,293 90.0% 2.2%	6,643 8.4% 2.4%	815 1.0% 0.8%	151 0.2% 0.7%	127 0.2% 1.3%	11 0.0% 0.6%	184 0.2% 0.7%	79,224
All Others	152,871 90.4% 4.8%	11,588 6.8% 4.3%	3,171 1.9% 3.2%	364 0.2% 1.7%	113 0.1% 1.2%	39 0.0% 1.9%	972 0.6% 3.9%	169,118
Unknown	383,433 66.2% 12.0%	35,129 8.1% 13.2%	11,834 2.7% 11.8%	2,737 0.6% 12.8%	1,031 0.2% 10.6%	331 0.1% 16.4%	9,159 2.1% 36.6%	444,654
<b>Total</b>	<b>3,192,067</b>	<b>272,872</b>	<b>100,019</b>	<b>21,392</b>	<b>9,748</b>	<b>2,022</b>	<b>25,032</b>	<b>3,623,142</b>

\*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

## Occupant Injury Data

**Table 22**  
**Distribution of All Injuries to Crash-Involved Light Truck Occupants**  
**by Injury Contact and Severity: Average per Year, 1992-1994**

Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Steering Assembly	80,529 82.0% 8.8%	10,877 10.9% 10.8%	4,228 4.3% 15.1%	816 0.8% 12.1%	725 0.7% 22.6%	53 0.1% 7.4%	1,230 1.3% 19.7%	98,255
Instrument Panel	127,490 85.8% 14.0%	14,968 10.1% 15.2%	5,650 3.9% 20.9%	101 0.1% 1.5%	127 0.1% 4.0%	8 0.0% 1.2%	27 0.0% 0.4%	148,571
Windshield	75,731 90.2% 8.3%	6,544 7.8% 6.6%	635 0.8% 2.3%	234 0.3% 3.5%	44 0.1% 1.4%	18 0.0% 2.2%	752 0.9% 12.1%	83,955
Interior Side Surface	60,054 83.7% 6.9%	8,201 10.9% 8.3%	3,164 4.2% 11.3%	707 0.9% 10.5%	117 0.2% 3.6%	0 -- --	91 0.1% 1.5%	75,323
Pillars	13,676 69.6% 1.5%	3,382 17.2% 3.4%	1,357 6.9% 4.8%	456 2.3% 6.7%	240 1.2% 7.5%	47 0.2% 6.5%	480 2.4% 7.7%	19,638
Restraint (Belt) System	89,890 94.4% 9.8%	4,508 4.7% 4.6%	573 0.6% 2.0%	85 0.1% 1.3%	7 0.0% 0.2%	0 -- --	124 0.1% 2.0%	95,187
Child Seat	2,223 98.4% 0.2%	7 0.3% 0.0%	28 1.3% 0.1%	0 -- --	0 -- --	0 -- --	0 -- --	2,258
Air Bag	5,719 86.1% 0.6%	911 13.7% 0.9%	17 0.3% 0.1%	0 -- --	0 -- --	0 -- --	0 -- --	6,546
Head Restraints	1,773 98.3% 0.2%	33 1.8% 0.0%	15 0.6% 0.1%	0 -- --	0 -- --	0 -- --	20 1.1% 0.3%	1,841
Seat Back	26,680 95.5% 2.9%	848 3.0% 0.9%	274 1.0% 1.0%	0 -- --	0 -- --	0 -- --	131 0.5% 2.1%	27,933
Roof	30,231 76.7% 3.3%	7,009 17.8% 7.1%	1,316 3.3% 4.7%	224 0.6% 3.0%	158 0.4% 4.9%	204 0.6% 28.4%	300 0.8% 4.8%	39,442

\*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

## Occupant Injury Data

**Table 22 (Continued)**  
**Distribution of All Injuries to Crash-Involved Light Truck Occupants**  
**by Injury Contact and Severity: Average per Year, 1992-1994**

Injury Contact	Frequency of Injury by AIS Rating*							Total
	1	2	3	4	5	6	7	
Floor	10,462	3,292	343	0	0	0	0	14,097
	74.2%	23.4%	2.4%	--	--	--	--	
	1.2%	3.3%	1.2%	--	--	--	--	
Non-Contact Injuries	92,366	934	140	13	22	0	58	93,532
	96.8%	1.0%	0.2%	0.0%	0.0%	--	0.1%	
	10.1%	1.0%	0.5%	0.2%	0.7%	--	0.9%	
Fire in Vehicle	204	13	11	0	13	130	0	371
	54.9%	3.4%	3.0%	--	3.6%	35.1%	--	
	0.0%	0.0%	0.0%	--	0.4%	18.2%	--	
Ground	47,744	10,303	2,872	1,812	657	60	326	63,776
	74.9%	16.1%	4.5%	2.8%	1.0%	0.1%	0.5%	
	5.2%	10.5%	10.3%	28.8%	20.5%	8.4%	5.3%	
Exterior (Occupant's Vehicle)	3,671	2,698	1,387	604	309	20	1	8,690
	42.2%	31.0%	16.0%	7.0%	3.6%	0.2%	0.0%	
	0.4%	2.7%	5.0%	8.9%	9.6%	2.8%	0.0%	
Exterior (Other Vehicle or Exterior Object)	17,238	3,415	795	381	168	119	10	22,126
	77.9%	15.4%	3.6%	1.7%	0.8%	0.5%	0.0%	
	1.9%	3.5%	2.8%	5.6%	5.2%	16.6%	0.2%	
Side and Rear Glazing	30,742	3,448	715	61	23	0	124	35,111
	67.6%	9.8%	2.0%	0.2%	0.1%	--	0.3%	
	3.4%	3.5%	2.6%	0.9%	0.7%	--	2.0%	
All Others	48,206	2,968	439	151	23	0	39	51,826
	93.0%	5.7%	0.9%	0.3%	0.0%	--	0.1%	
	5.3%	3.0%	1.6%	2.2%	0.7%	--	0.0%	
Unknown	144,618	14,340	3,870	1,120	578	60	2,515	167,102
	86.6%	8.6%	2.3%	0.7%	0.3%	0.0%	1.5%	
	15.9%	14.6%	13.8%	16.6%	18.0%	8.4%	40.4%	
<b>Total</b>	<b>912,246</b>	<b>98,494</b>	<b>28,016</b>	<b>6,765</b>	<b>3,210</b>	<b>717</b>	<b>6,230</b>	<b>1,055,679</b>

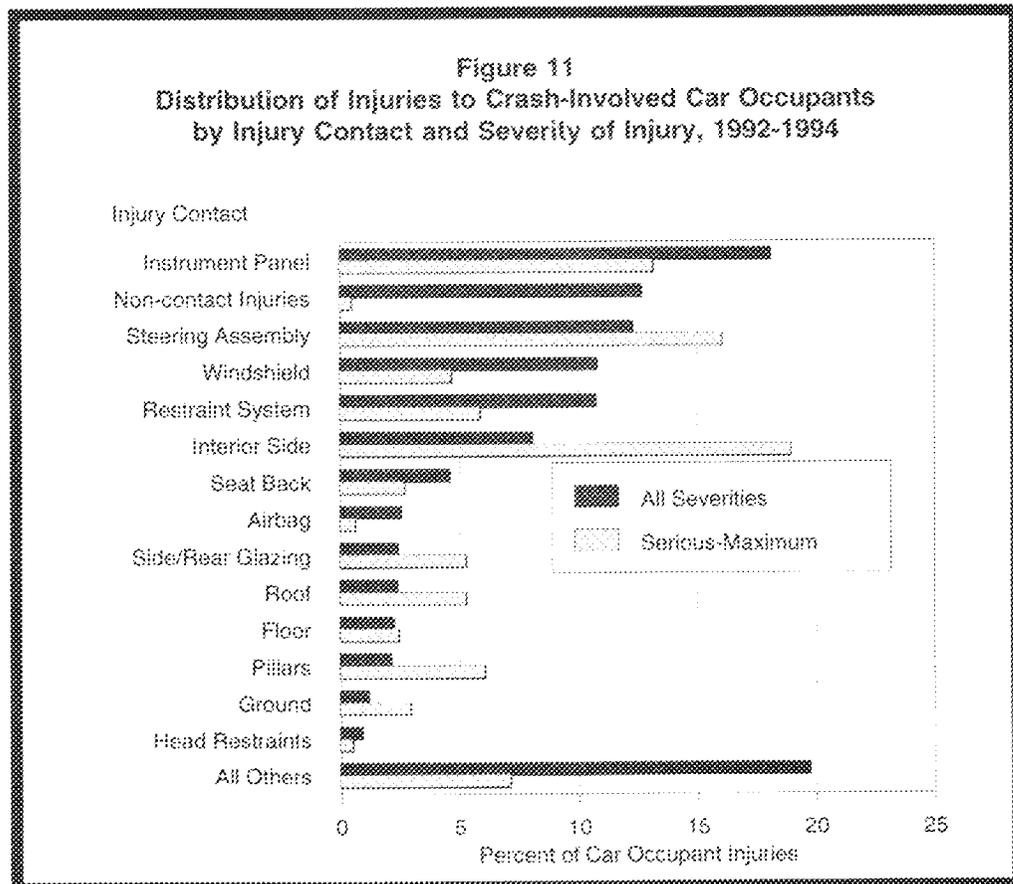
\*For each injury contact, the first data row shows the number of injuries, the second row shows the percentage of the row total, and the third row shows the percentage of the column total.

## Occupant Injury Data

It is evident from Tables 21 and 22 that the most frequent injury contacts for injuries of all severities (AIS 1-7) are not necessarily the same as those that are most frequently involved in serious to maximum injuries (AIS 3-6). This is illustrated in Figure 11, where two distributions are shown: one for all severities and one for serious to maximum severities, each adding up to 100 percent.

As can be seen in this figure, the restraint system and windshield as injury contacts have high frequencies in general but relatively low frequencies for serious to maximum injuries. The converse is observed for the interior side, floor, roof, and pillars.

A large disparity between all severities and serious-maximum severities is also observed for other injury contacts. Included in Figure 11 under "Other" are exterior contacts (e.g., the ground when occupants are ejected from the crash-involved vehicle), which generate a significant fraction of critical injuries.



### Occupant Ejection and Entrapment

Table 23 shows the rates of occupant ejections from and entrapment in crash-involved towed cars. Two degrees of ejection are distinguished: complete and partial. The results in Table 23 are shown by primary crash modes and areas of damage. Similar data for light trucks are shown in Table 24. Ejection rates by degree of ejection are also shown in Figure 12. Ejection occurs most frequently in rollover crashes, followed by side impacts.

<b>Crash Mode and Area of Damage</b>	<b>Complete Ejection</b>	<b>Partial Ejection</b>	<b>Entrapment</b>	<b>Total</b>
<b>Rollover</b>	8,346 5.2%	2,810 1.8%	808 0.5%	158,936 5.3%
<b>Nonrollover</b>				
<b>Single-Vehicle</b>				
<b>Front</b>	59 0.0%	23 0.1%	1,921 0.5%	415,577 13.7%
<b>Side</b>	2,088 1.5%	1,153 0.8%	2,541 1.8%	137,744 4.5%
<b>Rear, Top, or Under</b>	13 0.1%	6 0.0%	0 --	24,777 0.8%
<b>Multiple-Vehicle</b>				
<b>Front</b>	1,047 0.1%	1,254 0.1%	1,910 0.2%	1,224,167 40.4%
<b>Side</b>	1,637 0.2%	2,945 0.4%	2,789 0.4%	701,909 23.2%
<b>Rear</b>	215 0.1%	274 0.1%	79 0.0%	360,734 11.9%
<b>Top or Under</b>	0 --	0 --	10 0.3%	3,605 0.1%
<b>Total</b>	14,177 0.5%	12,167 0.4%	10,059 0.3%	3,028,449 100.0%

\*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Note. Damage Area "Unknown" has been imputed into the known damage areas.

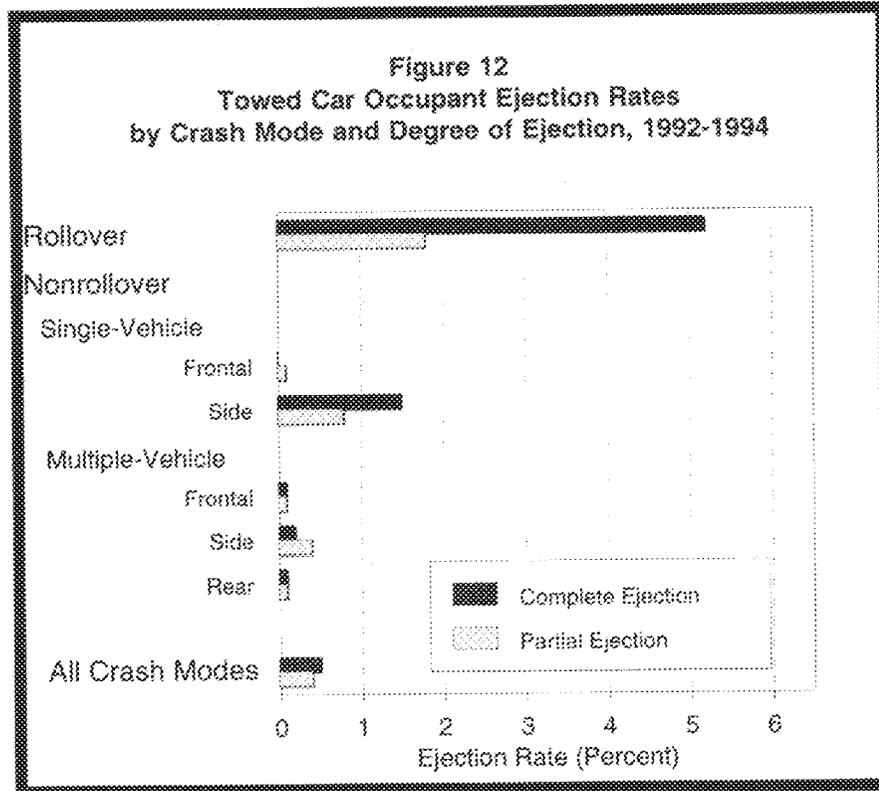
## Occupant Injury Data

**Table 24**  
**Occupant Ejection and Entrapment in Crash-Involved Towed Light Trucks**  
**by Degree of Ejection, Crash Mode, and Area of Damage:**  
**Average of Nationally Weighted Counts per Year, 1992-1994**

Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	12,658 10.3%	2,590 2.1%	744 0.6%	123,157 13.1%
Nonrollover				
Single-Vehicle				
Front	493 0.3%	696 0.5%	280 0.2%	139,022 14.7%
Side	590 3.0%	281 1.4%	82 0.4%	19,668 2.1%
Rear, Top, or Under	13 0.1%	616 6.6%	6 0.0%	12,313 1.3%
Multiple-Vehicle				
Front	445 0.1%	476 0.1%	534 0.2%	350,728 37.2%
Side	689 0.5%	179 0.1%	283 0.2%	140,140 14.9%
Rear	652 0.4%	259 0.2%	0 --	154,212 16.3%
Top or Under	0 --	5 0.1%	6 0.2%	4,008 0.4%
<b>Total</b>	<b>15,541</b> 1.7%	<b>5,303</b> 0.6%	<b>1,935</b> 0.2%	<b>943,246</b> 100.0%

\*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

Note: Damage Area "Unknown" has been imputed into the known damage areas.



## Occupant Injury Data

The ejection rates shown in Tables 23 and 24 are generally small, except in car rollovers. However, due to the very harmful outcomes of occupant ejections, the rate of injuries associated with occupant ejections is significantly higher, as shown in Tables 25 and 26, which show injury-weighted (using Harm—see Appendix F) ejection and entrapment data for crash-involved towed vehicles, and Figure 13, which shows ejection-induced injury rates for towed vehicles. Crashes that involve ejection are generally more severe crashes; therefore, injuries to ejected occupants may be due to higher crash forces as well as the ejection itself.

**Table 25**  
**Injury-Weighted Occupant Ejection and Entrapment Rates**  
**for Crash-Involved Towed Cars**  
**by Degree of Ejection, Crash Mode, and Area of Damage:**  
**Average of Nationally Weighted Counts per Year, 1992-1994**

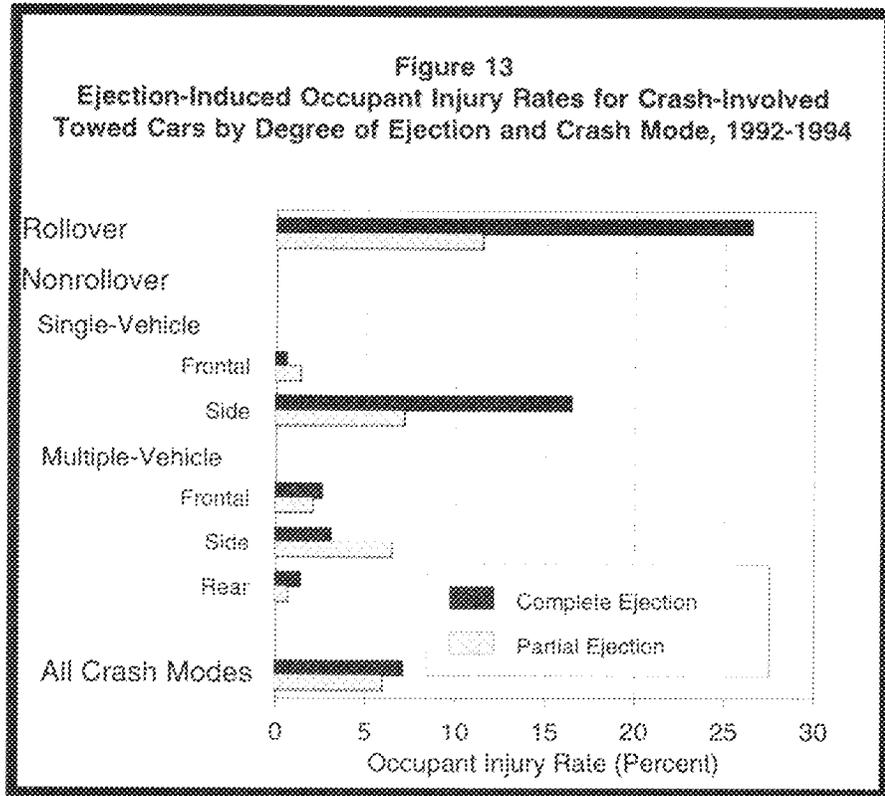
Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	904,242 26.5%	393,124 11.5%	165,952 4.9%	3,406,992 13.9%
Nonrollover				
Single-Vehicle				
Front	157,716 0.6%	345,294 1.4%	236,042 1.0%	3,786,629 15.4%
Side	236,133 16.5%	102,570 7.2%	192,738 13.5%	1,428,695 5.8%
Rear, Top, or Under	8,811 5.6%	2,103 1.4%	0 --	155,106 0.6%
Multiple-Vehicle				
Front	201,759 2.6%	161,117 2.1%	475,698 6.2%	7,637,496 31.1%
Side	213,304 3.1%	452,058 6.5%	482,952 7.0%	6,951,950 28.3%
Rear	16,207 1.4%	7,495 0.7%	25,594 2.2%	1,153,060 4.7%
Top or Under	0 --	0 --	6,527 48.6%	13,431 0.1%
<b>Total</b>	<b>1,737,973</b> 7.1%	<b>1,463,767</b> 6.0%	<b>1,585,502</b> 6.5%	<b>24,540,000</b> 100.0%

\*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.

**Table 26**  
**Injury-Weighted Occupant Ejection and Entrapment Rates**  
**for Crash-Involved Towed Light Trucks**  
**by Degree of Ejection, Crash Mode, and Area of Damage:**  
**Average of Nationally Weighted Counts per Year, 1992-1994**

Crash Mode and Area of Damage	Complete Ejection	Partial Ejection	Entrapment	Total
Rollover	1,472,555 51.0%	341,911 11.9%	283,872 9.8%	2,898,304 41.0%
Nonrollover				
Single-Vehicle				
Front	63,246 7.6%	16,548 2.0%	44,426 5.3%	835,711 11.9%
Side	30,071 16.4%	21,679 11.8%	11,314 6.2%	183,506 2.6%
Rear, Top, or Under	273 0.4%	17,219 23.8%	354 0.5%	72,459 1.0%
Multiple-Vehicle				
Front	66,923 2.0%	62,040 3.3%	91,308 4.8%	1,894,377 26.9%
Side	137,043 14.7%	32,857 3.5%	59,711 6.4%	931,144 13.2%
Rear	7,023 3.1%	1,987 0.9%	0 --	224,132 3.2%
Top or Under	0 --	354 2.9%	5,051 41.1%	12,295 0.3%
<b>Total</b>	<b>1,747,132</b> <b>24.8%</b>	<b>494,595</b> <b>7.0%</b>	<b>496,036</b> <b>7.0%</b>	<b>7,038,928</b> <b>100.0%</b>

\*For each crash mode, the first data row shows the number of occupants ejected or entrapped and the second row shows the percentage of the row total.



## Appendix A. Glossary

### **AIS (Abbreviated Injury Scale)**

An integer scale developed by the Association for the Advancement of Automotive Medicine to rate the severity of individual injuries. The AIS includes: 1=minor, 2=moderate, 3=serious, 4=severe, 5=critical, and 6=maximum (virtually untreatable). The scale does not explicitly denote a fatal injury. An AIS rating of 7 (injured, severity unknown) is used when sufficient information about an injury is not available.

### **Body Type**

Refers to the individual classifications of motor vehicles by their design structure based on definitions developed by the Society of Automotive Engineers.

### **Crash**

An event that produces injury and/or damage, involves a motor vehicle in transport, and occurs on a trafficway or while the vehicle is still in motion after running off the trafficway. In this report, crash and motor vehicle crash are synonymous. To qualify for the CDS, all crashes must be reported by the police to the state and involve a towed CDS applicable vehicle.

### **Crash Severity (delta-v is used as a measure of crash severity)**

CRASHPC and OLDMISSPC are computer models that provide a measure of crash severity in terms of delta-v (see Appendix E). In vehicle-to-vehicle crashes, the models assume that the two vehicles approach each other at an impact velocity, reach a common velocity, and then separate. Delta-v is equal to the impact velocity minus the separation velocity. Other factors being equal, the greater the delta-v during a collision, the greater the potential for occupant injury.

### **Crashworthiness Data System Applicable Motor Vehicle**

Refers to those motor vehicles classified as automobiles, automobile derivatives and short utility vehicles, van-based light trucks, and light conventional trucks where the qualifying trucks must have a gross vehicle weight rating (GVWR) of less than or equal to 10,000 pounds.

### **Ejection**

Refers to persons being completely or partially thrown from the vehicle as a result of an impact or rollover. Partial ejection refers to a situation where part of the occupant's body remains *in* the vehicle. This does not apply to occupants who are not initially in the seating compartment of the vehicle (e.g., persons riding in pickup beds, boots of convertibles, or open tailgates), since any ejection for them is coded as complete ejection.

## Glossary

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### **Entrapment**

Refers to persons being partially or completely *in* the vehicle and mechanically restrained by a damaged vehicle component. Jammed doors and immobilizing injuries, by themselves, do not constitute entrapment. Occupants pinned by cargo shift are not considered to be entrapped. Occupants who are completely or partially ejected and subsequently become pinned by their own vehicle and any surface other than their own vehicle are not considered entrapped. An occupant whose seat belt buckle release mechanism is jammed as a result of a crash is not considered entrapped.

### **Fatally Injured Occupant**

A death caused by injuries sustained by an occupant within 30 days of a CDS applicable motor vehicle crash.

### **Fatal Motor Vehicle Traffic Crash**

A crash in which at least one occupant of a CDS applicable motor vehicle dies within 30 days of the crash as a result of injuries sustained in the crash.

### **Fixed Object**

An object attached to the terrain (trees, abutments) or stationary objects intentionally placed for a particular purpose (e.g., poles, barriers).

### **Gross Vehicle Weight Rating (GVWR)**

The maximum capacity of a vehicle, including the weight of the base vehicle, all added equipment, driver and passengers, and all cargo loaded into or onto the vehicle. Actual weight may be less than or greater than GVWR.

### **Injured Occupant**

Occupant of a CDS applicable motor vehicle sustaining any type of injury as a result of a crash, including injuries from non-impact forces.

### **Light Trucks**

Includes utility vehicles, pickups, vans, and truck-based station wagons, with a GVWR less than 10,000 pounds.

### **Maximum AIS**

Represents the highest AIS level sustained by an injured occupant of a CDS applicable motor vehicle.

### **Motor Vehicle in Transport**

A CDS applicable motor vehicle on a roadway or in motion within a trafficway.

### **Non-Fixed Objects**

Objects that are movable or moving but are not motor vehicles, pedestrians, pedalcyclists, animals, or trains.

### **Occupant**

Any person who is in a CDS applicable motor vehicle in transport.

**Passenger Car**

Any motor vehicle that is an automobile, auto-based pickup, large limousine, or three-wheel automobile or automobile derivative.

**Passenger Vehicles**

Includes passenger cars, pickup trucks, vans, and sport/utility vehicles with a GVWR less than 10,000 pounds. Equivalent to CDS applicable vehicles.

**Police-Reported Crash**

A crash investigated or reported by a police officer, documented with a completed form which is signed by the investigating officer, and reported to the state. Driver reports submitted only to motor vehicle officials are excluded.

**Primary Sampling Unit (PSU)**

A city, county, or group of contiguous counties with an aggregate population of at least 50,000 which defines a geographic area for crash investigation. PSU selection is the first stage in the probability sampling of crashes for the CDS.

**Restraint Usage**

Manually operated restraint systems include shoulder belts, lap belts, lap and should belt combinations, or child safety seats. Automatic restraint systems include passive belts.

**Roadway**

That part of a trafficway used for motor vehicle travel or, where travel by various classes of motor vehicles is segregated, that part of a trafficway used by a particular class. The roadway excludes shoulders, designated parking lanes, and median areas.

**Serious-Maximum Injury**

Injury severity of AIS 3-6, including, for example, compound fractures and internal organ injuries. Unless otherwise noted, summary statistics in this report include all fatally injured persons as seriously injured, but exclude those with unknown injury severity level (see AIS).

**Towaway Crash**

A crash which is noted on the police report as involving at least one CDS applicable vehicle that was towed from the crash scene as a result of damage from the crash. For those crashes involving injury or fatality, the injured or killed person must be an occupant of the towed CDS applicable vehicle to qualify for the CDS.

**Towed Vehicle**

A CDS applicable motor vehicle that was involved in a crash and removed from the crash scene due to damage resulting from the crash by means other than its own power.

## Glossary

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### **Trafficway**

Any right-of-way open to the public as a matter of right or custom for moving persons or property from one place to another, including the entire width between property lines or other boundaries.

### **Vehicle Type**

Refers to a series of CDS applicable motor vehicle body types that have been grouped together because of design similarities. The principal vehicle types used in this report are passenger cars, pickup trucks, vans, and sport/utility vehicles.

## Appendix B. NASS/CDS Sample Design

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The crashes investigated in NASS/CDS are a probability sample of all police-reported crashes in the United States. Each such crash that occurs within a CDS team's area has a chance of being included in the sample. This design makes it possible to compute not only national estimates but also probable errors associated with those estimates. Many other features of the design have a significant impact on CDS data analysis, the most important of which are highlighted in this appendix.

The selection of sample crashes for CDS is accomplished in stages. The first stage is the selection of geographic areas called primary sample units (PSUs). Each PSU is composed of a large city, a county, or a group of contiguous counties. The United States was divided into 1,195 PSUs. The PSUs were then grouped into 12 categories described by geographic region and degree of urbanization. Two PSUs were selected from each category with probability proportional to its 1983 population. These 24 PSUs are the first stage in the selection of CDS sample crashes.

If every crash in each of the 24 PSUs were investigated, a national estimate could be obtained by weighting each crash in the PSU by the inverse of the probability of selection of the PSU. For example, if a sample PSU had 1 chance in 40 of being selected, then each crash from the PSU would be weighted by a factor of 40. This is called the first-stage expansion factor.

It is not practical to investigate every crash in each sample PSU, so additional stages of sampling are performed. The police agencies in a PSU are categorized by the number and type of police crash reports they process. Sample police agencies are then selected randomly from each category. The fraction of the agencies selected increases as the number and severity of crashes reported by the agency increases. This is called the second-stage expansion factor.

The final stage of sampling is the selection of crashes from all crashes reported in the sample police agencies. A simple random selection of all reported towaway crashes would result in a large percentage of sample crashes with property damage and few injuries, since these constitute such a large fraction of all crashes. This type of sample would not be effective in providing the detailed and accurate information needed for the mitigation of crash consequences. Rather, a substantial sample of serious injury crashes is needed for NASS/CDS.

The procedure used to obtain the desired sample by type and severity of crashes is an unequal probability selection. This required listing police crash reports in categories defined by most severe police-reported injury to an occupant of a towed CDS applicable motor vehicle, disposition of the injured, and model year of the towed CDS applicable motor vehicle. A weighting factor was assigned to crashes in each category to increase or decrease the probability of selection. A random selection was made from the total crashes listed in all categories. In addition to the probabilities of selection varying by type of crash, other factors affected the selection probabilities at this stage, such as the number of crashes listed, the date and time of the crash, and the police agencies from which the

## NASS/CDS Sample Design

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crash was listed. The result was that each sampled crash from a PSU has a unique selection probability.

The inverse of this probability is called the third-stage expansion factor. If each sample crash in a PSU is multiplied by its second- and third-stage expansion factors, an unbiased estimate of the total number of crashes in the PSU is obtained. To produce the national estimates, the PSU level estimates are inflated by the first-stage expansion factor. Thus, the national expansion factor is the product of the first-, second-, and third-stage expansion factors.

The national estimates equal the inverse of the probability of the PSUs being selected, the probability of the police agencies being selected, and the probability of the crash being selected for that day. Since the number of crashes in the sample is predetermined, the national estimate for each crash within a stratum is different. To account for this bias, a ratio weight was developed. The ratio weight is the national estimate multiplied by a ratio factor. For each stratum, this ratio factor is equal to the total number of crashes listed in all of the police jurisdictions (sampled and non-sampled) divided by the number of crashes selected. There are instances where very few or no crashes are listed. To account for this, the similar PSUs were grouped together, based on the stratum from which they were originally selected.

## Appendix C. NASS/CDS Zone Centers and Primary Sampling Units

### Zone Centers

Buffalo, NY  
Indiana University, IN

### Primary Sampling Units

Bibb and Tuscaloosa Counties, AL  
Gila, Graham, and Greenlee Counties, AZ  
Yuma and LaPaz Counties, AZ  
Los Angeles, CA  
Gilpen and Jefferson Counties, CO  
Fort Lauderdale and Hollywood Cities, FL  
Chicago, IL  
Lake County, IN  
Charles and Prince Georges Counties, MD  
Genesee County, MI  
Muskegon County, MI  
Washtenaw County, MI  
Douglas County, NE  
Wake County, NC  
Ocean County, NJ  
Kings County, NY  
Ulster County, NY  
Allegheny County, PA  
Montgomery County, PA  
Philadelphia, PA  
Knox County, TN  
Dallas, TX  
King County, WA  
Seattle, WA

# NASS/CDS Data Elements



U.S. Department of Transportation  
National Highway Traffic Safety  
Administration

## GENERAL VEHICLE FORM

NATIONAL ACCIDENT SAMPLING SYSTEM  
CRASHWORTHINESS DATA SYSTEM

<p>1. Primary Sampling Unit Number _____</p> <p>2. Case Number - Stratum _____</p> <p>3. Vehicle Number _____</p>	<p>11. Police Reported Alcohol Presence _____                  (0) No alcohol present                  (1) Yes (alcohol present)                  (7) Not reported                  (8) No driver present                  (9) Unknown</p> <p>Note: See variables 37 through 55 (Page 4) for information on Other Drugs</p>
<b>VEHICLE IDENTIFICATION</b>	
<p>4. Vehicle Model Year _____                  Code the last two digits of the model year                  (99) Unknown</p> <p>5. Vehicle Make (specify): _____                  _____                  Applicable codes are found in your                  NASS Data Collection, Coding and                  Editing Manual.                  (99) Unknown</p> <p>6. Vehicle Model (specify): _____                  _____                  Applicable codes are found in your                  NASS Data Collection, Coding and                  Editing Manual.                  (999) Unknown</p> <p>7. Body Type _____                  Note: Applicable codes may be found on                  the back of this page.</p> <p>8. Vehicle Identification Number _____                  _____                  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17                  Left justify; Slash zeros and letter Z (0 and Z)                  No VIN--Code all zeros                  Unknown--Code all nines</p>	<p>12. Alcohol Test Result For Driver _____                  Code actual value (decimal implied                  before first digit--0.xx)                  (95) Test refused                  (96) None given                  (97) AC test performed, results unknown                  (98) No driver present                  (99) Unknown</p> <p>Source: _____</p>
<b>ACCIDENT RELATED</b>	
<p>9. Police Reported Vehicle Disposition _____                  (0) Not towed due to vehicle damage                  (1) Towed due to vehicle damage                  (9) Unknown</p> <p>10. Police Reported Travel Speed _____                  _____                  Code to the nearest kph (NOTE: 000 means                  less than 0.5 kph)                  (160) 159.5 kph and above                  (999) Unknown                  _____ mph X 1.6093 = _____ kph</p>	<p>13. Speed Limit _____                  (000) No statutory limit                  Code posted or statutory speed limit                  in kph                  (999) Unknown                  _____ mph X 1.6093 = _____ kph</p> <p>14. Attempted Avoidance Manuever _____                  (01) No avoidance actions                  (02) Braking (no lockup)                  (03) Braking (lockup)                  (04) Braking (lockup unknown)                  (05) Releasing brakes                  (06) Steering left                  (07) Steering right                  (08) Braking and steering left                  (09) Braking and steering right                  (10) Accelerating                  (11) Accelerating and steering left                  (12) Accelerating and steering right                  (97) No driver present                  (98) Other action (specify): _____                  (99) Unknown</p> <p>15. Accident Type _____                  Applicable codes may be found on the                  back of page two of this field form                  (00) No impact                  Code the number of the diagram that                  best describes the accident circumstance                  (98) Other accident type (specify): _____                  (99) Unknown</p>
<b>OFFICIAL RECORDS</b>	

\*\*\*\* SKIP TO VARIABLE GV37 IF GV07 DOES NOT EQUAL 01-49 \*\*\*\*



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National Accident Sampling System-Crashworthiness Data System: General Vehicle Form

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OCCUPANT RELATED			
16. Driver Presence in Vehicle _____ (0) Driver not present (1) Driver present (9) Unknown	24. Rollover _____ (0) No rollover (no overturning)  <i>Rollover (primarily about the longitudinal axis)</i> (1) Rollover, 1 quarter turn only (2) Rollover, 2 quarter turns (3) Rollover, 3 quarter turns (4) Rollover, 4 or more quarter turns (specify): _____  (5) Rollover--end-over-end (i.e., primarily about the lateral axis) (9) Rollover (overturn), details unknown		
17. Number of Occupants This Vehicle _____ (00-96) Code actual number of occupants for this vehicle (97) 97 or more (99) Unknown			
18. Number of Occupant Forms Submitted _____			
VEHICLE WEIGHT ITEMS			
19. Vehicle Curb Weight _____ 0 _____ Code weight to nearest 10 kilograms. (045) Less than 450 kilograms (610) 6,100 kilograms or more (999) Unknown  _____ lbs X .4536 = _____ kgs  Source: _____	<th colspan="2" style="background-color: #cccccc;">OVERRIDE/UNDERRIDE (THIS VEHICLE)</th>	OVERRIDE/UNDERRIDE (THIS VEHICLE)	
20. Vehicle Cargo Weight _____ 0 _____ Code weight to nearest 10 kilograms. (000) Less than 5 kilograms (450) 4,500 kilograms or more (999) Unknown  _____ lbs X .4536 = _____ kgs	25. Front Override/Underride (this Vehicle) _____  26. Rear Override/Underride (this Vehicle) _____  (0) No override/underride, or not an end-to-end impact  <i>Override (see specific CDC)</i> (1) 1st CDC (2) 2nd CDC (3) Other not automated CDC (specify): _____  <i>Underride (see specific CDC)</i> (4) 1st CDC (5) 2nd CDC (6) Other not automated CDC (specify): _____  (7) Medium/heavy truck or bus override (9) Unknown		
RECONSTRUCTION DATA			
21. Towed Trailing Unit _____ (0) No towed unit (1) Yes--towed trailing unit (9) Unknown			
22. Documentation of Trajectory Data for This Vehicle _____ (0) No (1) Yes			
23. Post Collision Condition of Tree or Pole (For Highest Delta V) _____ (0) Not collision (for highest delta V) with tree or pole (1) Not damaged (2) Cracked/sheared (3) Tilted < 45 degrees (4) Tilted ≥ 45 degrees (5) Uprooted tree (6) Separated pole from base (7) Pole replaced (8) Other (specify): _____  (9) Unknown	<th colspan="2" style="background-color: #cccccc;">HEADING ANGLE AT IMPACT FOR HIGHEST DELTA V</th>	HEADING ANGLE AT IMPACT FOR HIGHEST DELTA V	
	Values: (000)-(359) Code actual value (997) Noncollision (998) Impact with object (999) Unknown		
	27. Heading Angle For This Vehicle _____  28. Heading Angle For Other Vehicle _____		

Category	Configuration	ACCIDENT TYPES (Includes Intent)					
I Single Driver	A Right Roadside Departure	01 DRIVE OFF ROAD	02 CONTROL/ TRACTION LOSS	03 AVOID COLLISION WITH VEH. PED. ANIM.	04 SPECIFICS OTHER	05 SPECIFICS UNKNOWN	
	B Left Roadside Departure	06 DRIVE OFF ROAD	07 CONTROL/ TRACTION LOSS	08 AVOID COLLISION WITH VEH. PED. ANIM.	09 SPECIFICS OTHER	10 SPECIFICS UNKNOWN	
	C Forward Impact	11 PARKED VEH	12 BTA OBJECT	13 PEDESTRIAN/ ANIMAL	14 SHO DEPARTURE	15 SPECIFICS OTHER	16 SPECIFICS UNKNOWN
II Same Trafficway Same Direction	D Rear End	20 STOPPED 21 22 23	22 SLOWER 23 24 25 26 27	26 DECEL 27 28 29 30 31	(EACH + 32) SPECIFICS OTHER	(EACH + 33) SPECIFICS UNKNOWN	
	E Forward Impact	34 CONTROL/ TRACTION LOSS	35 CONTROL/ TRACTION LOSS	36 AVOID COLLISION WITH VEH.	40 AVOID COLLISION WITH OBJECT	(EACH + 42) SPECIFICS OTHER	(EACH + 43) SPECIFICS UNKNOWN
	F Sideswipe Angle	44 LATERAL MOVE	45 LATERAL MOVE	46 LATERAL MOVE	47 LATERAL MOVE	(EACH + 48) SPECIFICS OTHER	(EACH + 48) SPECIFICS UNKNOWN
III Same Trafficway Opposite Direction	G Head On	60 LATERAL MOVE	61 LATERAL MOVE	(EACH + 62) SPECIFICS OTHER	(EACH + 63) SPECIFICS UNKNOWN		
	H Forward Impact	64 CONTROL/ TRACTION LOSS	65 CONTROL/ TRACTION LOSS	66 AVOID COLLISION WITH VEH.	67 AVOID COLLISION WITH OBJECT	(EACH + 68) SPECIFICS OTHER	(EACH + 69) SPECIFICS UNKNOWN
	I Sideswipe Angle	68 LATERAL MOVE	(EACH + 66) SPECIFICS OTHER	(EACH + 67) SPECIFICS UNKNOWN			
IV Change Trafficway Vehicle Turning	J Turn Across Path	71 INITIAL OPPOSITE DIRECTIONS	72 INITIAL SAME DIRECTIONS	73 INITIAL SAME DIRECTIONS	(EACH + 74) SPECIFICS OTHER	(EACH + 75) SPECIFICS UNKNOWN	
	K Turn Into Path	77 TURN INTO SAME DIRECTION	78 TURN INTO SAME DIRECTION	79 TURN INTO OPPOSITE DIRECTIONS	80 TURN INTO OPPOSITE DIRECTIONS	(EACH + 81) SPECIFICS OTHER	(EACH + 82) SPECIFICS UNKNOWN
V Intersecting Paths (Vehicle Damage)	L Straight Paths	87 STRAIGHT PATHS	88 STRAIGHT PATHS	(EACH + 89) SPECIFICS OTHER	(EACH + 90) SPECIFICS UNKNOWN		
VI Miscel Intersect	M Backing Etc	92 BACKING VEH.	93 OTHER VEH. OR OBJECT	94 Other Accident Type	95 Unknown Accident Type	96 No Impact	

# NASS/CDS Data Elements

<p>29. Basis for Total Delta V (highest) _____</p> <p><i>Delta V Calculated</i></p> <p>(1) CRASH program—damage only routine                  (2) CRASH program—damage and trajectory routine                  (3) Missing vehicle algorithm</p> <p><i>Delta V Not Calculated</i></p> <p>(4) At least one vehicle (which may be this vehicle) is beyond the scope of an acceptable reconstruction program, regardless of collision conditions.                  (5) All vehicles within scope (CDC applicable) of CRASH program but one of the collision conditions is beyond the scope of the CRASH program or other acceptable reconstruction technique, regardless of adequacy of damage data.                  (6) All vehicle and collision conditions are within scope of one of the acceptable reconstruction programs, but there is insufficient data available.</p>	<p style="text-align: right;">Highest</p> <p>32. Lateral Component of Delta V <math>\frac{+}{-}</math> _____</p> <p>_____ Nearest kph (highest)</p> <p>_____ Nearest kph (secondary)</p> <p>(NOTE: ___000 means greater than -0.5 kph and less than +0.5 kph)                  (<math>\pm 160</math>) <math>\pm 159.5</math> kph and above                  (___999) Unknown</p> <p>33. Energy Absorption _____, _____ 0 0</p> <p>_____ Nearest 100 joules (highest)</p> <p>_____ Nearest 100 joules (secondary)</p> <p>(NOTE: 0000 means less than 50 joules)                  (9997) 999,650 joules or more                  (9999) Unknown</p>
COMPUTER GENERATED DELTA V	
<p style="text-align: right;">Highest</p> <p>30. Total Delta V _____</p> <p>_____ Nearest kph (highest)</p> <p>_____ Nearest kph (secondary)</p> <p>(NOTE: 000 means less than 0.5 kph)                  (150) 159.5 kph and above                  (999) Unknown</p>	<p>34. Confidence in Reconstruction Program Results (For Highest Delta V) _____</p> <p>(0) No reconstruction                  (1) Collision fits model — results appear reasonable                  (2) Collision fits model — results appear high                  (3) Collision fits model — results appear low                  (4) Borderline reconstruction — results appear reasonable</p> <p>35. Type of Vehicle Inspection _____</p> <p>(0) No inspection                  (1) Complete inspection                  (2) Partial inspection (specify): _____</p>
<p>31. Longitudinal Component of Delta V <math>\frac{+}{-}</math> _____</p> <p>_____ Nearest kph (highest)</p> <p>_____ Nearest kph (secondary)</p> <p>(NOTE: ___000 means greater than -0.5 kph and less than +0.5 kph)                  (<math>\pm 160</math>) <math>\pm 159.5</math> kph and above                  (___999) Unknown</p>	<p>36. Is this an AOPS Vehicle? _____</p> <p>(0) No                  (1) Yes - researcher determined                  (2) VIN determined air bag system                  (3) VIN determined automatic (passive) belts                  (4) VIN determined air bag and automatic (passive) belts</p>
<p><b>IS OLDMISS APPLICABLE FOR THIS VEHICLE? [ ] YES [ ] NO</b></p> <p><b>IF YES: IS A COMPLETED OLDMISS PROGRAM SUMMARY INCLUDED? [ ] YES [ ] NO</b></p>	

37. Police Reported Other Drug Presence \_\_\_\_\_  
 (0) No other drug(s) present  
 (1) Yes (other drug(s) present)  
 (7) Not reported  
 (8) No driver present  
 (9) Unknown

38. Police Reported Drug Evaluation Classification \_\_\_\_\_  
 (DEC) Test For Driver  
 (0) No DEC process available or given  
 (1) DEC process given, results known  
 (2) DEC process given, results unknown  
 (3) DEC process available, unknown if given  
 (8) No driver present

39. Other Drug Specimen Test Type For Driver \_\_\_\_\_  
 (0) No specimen test given  
 (1) Blood test  
 (2) Urine test  
 (3) Other specimen tests (specify): \_\_\_\_\_  
 (7) Unspecified specimen test  
 (8) No driver present  
 (9) Unknown if specimen test given

**DRUG EVALUATION CLASSIFICATION**  
**OTHER DRUGS TEST RESULTS FOR DRIVER**

	DEC Test Results	Specimen Test Results
Narcotic Drug	40. _____	41. _____
Depressant Drug	42. _____	43. _____
Stimulant Drug	44. _____	45. _____
Hallucinogen Drug	46. _____	47. _____
Cannabinoid Drug	48. _____	49. _____
Phencyclidine (PCP)	50. _____	51. _____
Inhalant Drug	52. _____	53. _____
Other Drug (Excluding Nicotine, Aspirin, Alcohol, Drugs Administered Post-Crash)	54. _____	55. _____

Codes For DEC Test Results

- (0) No DEC test given
- (1) Passed DEC test
- (2) Failed DEC test
- (3) DEC test given—results unknown
- (8) No driver present
- (9) Unknown if DEC test given

Codes for Specimen Test Results

- (0) No specimen test given
- (1) Drug not found in specimen
- (2) Drug found in specimen
- (7) Specimen test given, results unknown or not obtained
- (8) No driver present
- (9) Unknown if specimen test given

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OTHER DATA			
<p>56. Driver's Zip Code _____</p> <p>(00000) Driver not present                      (00001) Driver not a resident of U.S. or territories                      _____ Code actual 5-digit zip code                      (99999) Unknown</p> <p>57. Driver's Race/Ethnic Origin _____</p> <p>(0) Driver not present                      (1) White (non-Hispanic)                      (2) Black (non-Hispanic)                      (3) White (Hispanic)                      (4) Black (Hispanic)                      (5) American Indian, Eskimo or Aleut                      (6) Asian or Pacific Islander                      (8) Other (specify): _____                      (9) Unknown</p> <p>58. Vehicle Special Use (This Trip) _____</p> <p>(0) No special use                      (1) Taxi                      (2) Vehicle used as school bus                      (3) Vehicle used as other bus                      (4) Military                      (5) Police                      (6) Ambulance                      (7) Fire truck or car                      (8) Other (specify): _____                      (9) Unknown</p>	<p>61. Rollover Initiation Object Contacted _____</p> <p>62. Location on Vehicle Where Initial Principal Tripping Force Is Applied _____</p> <p>(0) No rollover                      (1) Wheels/tires                      (2) Side plane                      (3) End plane                      (4) Undercarriage                      (5) Other location on vehicle (specify): _____                      (8) Non-contact rollover forces (specify): _____                      (9) Unknown</p> <p>63. Direction of Initial Roll _____</p> <p>(0) No rollover                      (1) Roll right - primarily about the longitudinal axis                      (2) Roll left - primarily about the longitudinal axis                      (5) End-over-end (i.e., primarily about the lateral axis)                      (9) Unknown roll direction</p>		
ROLLOVER DATA			
<p>If GV07 (Body Type) ≠ 1-49, leave GV59-GV63 blank.                      If GV24 (Rollover) = 0, then GV59-GV63 must equal 0.                      If GV24 = 9, then GV59-GV63 must equal 9.</p>			
<p>59. Rollover Initiation Type _____</p> <p>(0) No rollover                      (1) Trip-over                      (2) Flip-over                      (3) Turn-over                      (4) Climb-over                      (5) Fall-over                      (6) Bounce-over                      (7) Collision with another vehicle                      (8) Other rollover initiation type (specify): _____                      (9) Unknown rollover initiation type</p> <p>60. Location of Rollover Initiation _____</p> <p>(0) No rollover                      (1) On roadway                      (2) On shoulder—paved                      (3) On shoulder—unpaved                      (4) On roadside or divided trafficway median                      (9) Unknown</p>	<th colspan="2" style="background-color: #cccccc;">PRECRASH DATA</th>	PRECRASH DATA	
<p>64. Pre-Event Movement (Prior to Recognition of Critical Event) _____</p> <p>(01) Going straight                      (02) Slowing or stopping in traffic lane                      (03) Starting in traffic lane                      (04) Stopped in traffic lane                      (05) Passing or overtaking another vehicle                      (06) Disabled or parked in travel lane                      (07) Leaving a parking position                      (08) Entering a parking position                      (09) Turning right                      (10) Turning left                      (11) Making a U-turn                      (12) Backing up (other than for parking position)                      (13) Negotiating a curve                      (14) Changing lanes                      (15) Merging                      (16) Successful avoidance maneuver to a previous critical event                      (87) Other (specify): _____                      (98) No driver present                      (99) Unknown</p>			

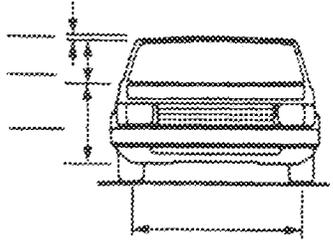
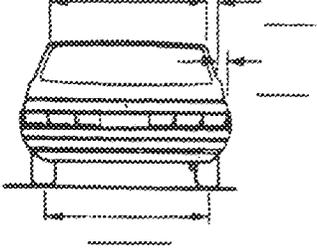
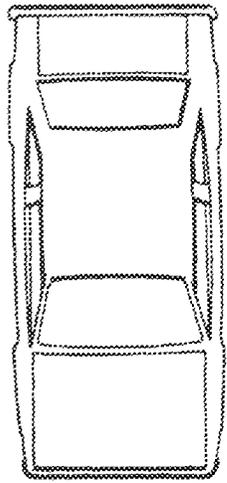
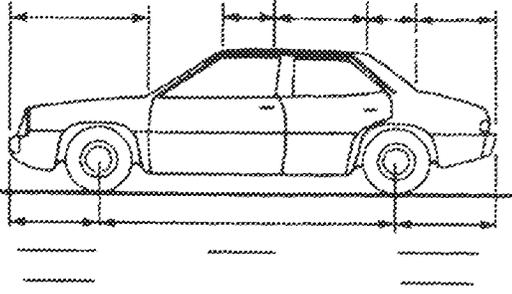
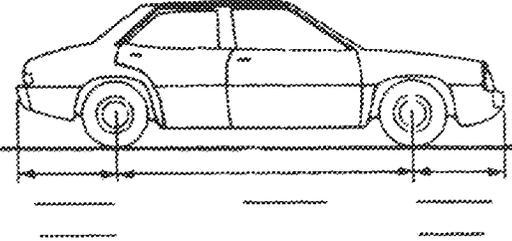
**CODES FOR ROLLOVER INITIATION OBJECT CONTACTED**

- (00) No rollover
- (01-30) -- Vehicle Number
  
- Noncollision
  - (31) Turn-over -- fall-over
  - (33) Jackknife
  
- Collision With Fixed Object
  - (41) Tree ( $\leq$  10 cm in diameter)
  - (42) Tree ( $>$  10 cm in diameter)
  - (43) Shrubby or bush
  - (44) Embankment
  
  - (45) Breakaway pole or post (any diameter)
  
- Nonbreakaway Pole or Post
  - (50) Pole or post ( $\leq$  10 cm in diameter)
  - (51) Pole or post ( $>$  10 cm but  $\leq$  30 cm in diameter)
  - (52) Pole or post ( $>$  30 cm in diameter)
  - (53) Pole or post (diameter unknown)
  
  - (54) Concrete traffic barrier
  - (55) Impact attenuator
  - (56) Other traffic barrier (includes guardrail) (specify): \_\_\_\_\_
  
- (57) Fence
- (58) Wall
- (59) Building
- (60) Ditch or culvert
- (61) Ground
- (62) Fire hydrant
- (63) Curb
- (64) Bridge
- (68) Other fixed object (specify): \_\_\_\_\_
- (69) Unknown fixed object
  
- Collision with Nonfixed Object
  - (71) Motor vehicle not in-transport
  - (76) Animal
  - (77) Train
  - (78) Trailer, disconnected in transport
  - (79) Object fell from vehicle in-transport
  - (88) Other nonfixed object (specify): \_\_\_\_\_
  - (89) Unknown nonfixed object
  
  - (98) Other event (specify): \_\_\_\_\_
  - (99) Unknown event or object

<b>PRECRASH DATA (Continued)</b>	
<p>65. Critical Precrash Event _____</p> <p><i>This Vehicle Loss of Control Due To:</i></p> <p>(01) Blow out or flat tire                      (02) Stalled engine                      (03) Disabling vehicle failure (e.g., wheel fell off) (specify): _____                      (04) Non-disabling vehicle problem (e.g., hood flew up) (specify): _____                      (05) Poor road conditions (puddle, pot hole, ice, etc.) (specify): _____                      (06) Traveling too fast for conditions                      (08) Other cause of control loss (specify): _____                      (09) Unknown cause of control loss</p> <p><i>This Vehicle Traveling</i></p> <p>(10) Over the lane line on left side of travel lane                      (11) Over the lane line on right side of travel lane                      (12) Off the edge of the road on the left side                      (13) Off the edge of the road on the right side                      (14) End departure                      (15) Turning left at intersection                      (16) Turning right at intersection                      (17) Crossing over (passing through) intersection                      (19) Unknown travel direction</p> <p><i>Other Motor Vehicle in Lane</i></p> <p>(50) Stopped                      (51) Traveling in same direction with lower speed (i.e., lower steady speed or decelerating)                      (52) Traveling in same direction with higher speed                      (53) Traveling in opposite direction                      (54) in crossover                      (55) Backing                      (59) Unknown travel direction of other motor vehicle in lane</p> <p><i>Other Motor Vehicle Encroaching Into Lane</i></p> <p>(60) From adjacent lane (same direction)—over left lane line                      (61) From adjacent lane (same direction)—over right lane line                      (62) From opposite direction—over left lane line                      (63) From opposite direction—over right lane line                      (64) From parking lane                      (65) From crossing street, turning into same direction                      (66) From crossing street, across path                      (67) From crossing street, turning into opposite direction                      (68) From crossing street, intended path not known                      (70) From driveway, turning into same direction                      (71) From driveway, across path                      (72) From driveway, turning into opposite direction                      (73) From driveway, intended path not known                      (74) From entrance to limited access highway                      (78) Encroachment by other vehicle—details unknown</p>	<p><i>Pedestrian or Pedalcyclist, or Other Nonmotorist</i></p> <p>(80) Pedestrian in roadway                      (81) Pedestrian approaching roadway                      (82) Pedestrian—unknown location                      (83) Pedalcyclist or other nonmotorist in roadway (specify): _____                      (84) Pedalcyclist or other nonmotorist approaching roadway (specify): _____                      (85) Pedalcyclist or other nonmotorist—unknown location (specify): _____</p> <p><i>Object or Animal</i></p> <p>(87) Animal in roadway                      (88) Animal approaching roadway                      (89) Animal—unknown location                      (90) Object in roadway                      (91) Object approaching roadway                      (92) Object—unknown location</p> <p>(88) Other critical precrash event (specify): _____                      (99) Unknown</p> <p style="text-align: center;">For Corrective Actions Attempted see variable GV14 (Attempted Avoidance Maneuver)</p> <p>66. Precrash Stability After Avoidance Maneuver _____</p> <p>(0) No avoidance maneuver                      (1) Tracking                      (2) Skidding longitudinally—rotation less than 30 degrees                      (3) Skidding laterally—clockwise rotation                      (4) Skidding laterally—counterclockwise rotation                      (7) Other vehicle loss-of-control (specify): _____</p> <p>(8) No driver present                      (9) Precrash stability unknown</p> <p>67. Precrash Directional Consequences of Avoidance Maneuver (Corrective Action) _____</p> <p>(0) No avoidance maneuver                      (1) Vehicle stayed in travel lane where avoidance maneuver was initiated                      (2) Vehicle stayed on roadway but left travel lane where avoidance maneuver was initiated                      (3) Vehicle stayed on roadway, not known if left travel lane where avoidance maneuver was initiated                      (4) Vehicle departed roadway                      (5) Avoidance maneuver initiated off roadway                      (8) No driver present                      (9) Directional consequences unknown</p>
<p>*** IF THE CDS APPLICABLE VEHICLE WAS NOT INSPECTED (I.E., GV35 = 0), ***                      DO NOT COMPLETE THE EXTERIOR AND INTERIOR VEHICLE FORMS.</p> <p>*** IF GV07 DOES NOT EQUAL 01-49, DO NOT COMPLETE ***                      THE EXTERIOR VEHICLE, INTERIOR VEHICLE,                      OCCUPANT ASSESSMENT, AND OCCUPANT INJURY FORMS.</p>	



ORIGINAL SPECIFICATIONS WORK SHEET				
Wheelbase	_____	_____	inches x 2.54 =	_____ cm
Overall Length	_____	_____	inches x 2.54 =	_____ cm
Maximum Width	_____	_____	inches x 2.54 =	_____ cm
Curb Weight	_____	_____	pounds x .4536 =	_____, _____ kg
Average Track	_____	_____	inches x 2.54 =	_____ cm
Front Overhang	_____	_____	inches x 2.54 =	_____ cm
Rear Overhang	_____	_____	inches x 2.54 =	_____ cm
Undeformed End Width	_____	_____	inches x 2.54 =	_____ cm
Engine Size: cyl./displ.	_____	_____	cc x .001 =	_____, _____ L
	_____	_____	CID x .0164 =	_____, _____ L

VEHICLE DAMAGE SKETCH		
<p><b>TIRE - WHEEL DAMAGE</b></p> <p>a. Retention physically restricted _____</p> <p>b. Tire deflated _____</p> <p>RF _____ RF _____</p> <p>LF _____ LF _____</p> <p>RR _____ RR _____</p> <p>LR _____ LR _____</p> <p>(1) Yes (2) No (8) NA (9) Unk.</p>	<p style="text-align: center;"><b>ORIGINAL SPECIFICATIONS</b></p> <p>Wheelbase _____ cm</p> <p>Overall Length _____ cm</p> <p>Maximum Width _____ cm</p> <p>Curb Weight _____ kg</p> <p>Average Track _____ cm</p> <p>Front Overhang _____ cm</p> <p>Rear Overhang _____ cm</p> <p>Undeformed End Width _____ cm</p> <p>Engine Size: cyl./displ. _____ L</p>	<p><b>WHEEL STEER ANGLES</b> (For locked front wheels or displaced rear axles only)</p> <p>RF ± _____ °</p> <p>LF ± _____ °</p> <p>RR ± _____ °</p> <p>LR ± _____ °</p> <p>Within ± 5 degrees</p> <hr/> <p style="text-align: center;"><b>DRIVE WHEELS</b></p> <p><input type="checkbox"/> FWD <input type="checkbox"/> RWD <input type="checkbox"/> 4WD</p> <hr/> <p>Approximate Cargo Weight _____ kg</p>
<p><b>TYPE OF TRANSMISSION</b></p> <p><input type="checkbox"/> Manual <input type="checkbox"/> Automatic</p>		
<p><b>MEASUREMENTS IN CENTIMETERS</b></p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;">   </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;">  </div>		
<p><b>NOTES:</b> Sketch new perimeter and cross hatch direct damage and single hatch induced damage on all views. Annotate observations which might be useful in reconstructing the accident (e.g., grass in tire bead, direction of striations, scuff on sidewalls, etc.). If pulling trailer, sketch type of trailer and damage received on the back of this page.</p> <p>Annotate any damage caused by extrication such as component removal by torching, prying, or hydraulic shears.</p>		



**COLLISION DEFORMATION CLASSIFICATION**

HIGHEST DELTA "V"

Accident Event Sequence Number	Object Contacted	(1) (2) Direction of Force	(3) Deformation Location	(4) Longitudinal or Lateral Location	(5) Vertical or Lateral Location	(6) Type of Damage Distribution	(7) Deformation Extent
4. _____	5. _____	6. _____	7. _____	8. _____	9. _____	10. _____	11. _____

Second Highest Delta "V"

12. _____	13. _____	14. _____	15. _____	16. _____	17. _____	18. _____	19. _____
-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

**CRUSH PROFILE IN CENTIMETERS**

The crush profile for the damage described in the CDC(s) above should be documented in the appropriate space below. (ALL MEASUREMENTS ARE IN CENTIMETERS.)

HIGHEST DELTA "V"

20. _____ L	21. _____ C <sub>1</sub>	_____ C <sub>2</sub>	_____ C <sub>3</sub>	_____ C <sub>4</sub>	_____ C <sub>5</sub>	_____ C <sub>6</sub>	22. _____ ±D
							+
							-

Second Highest Delta "V"

23. _____ L	24. _____ C <sub>1</sub>	_____ C <sub>2</sub>	_____ C <sub>3</sub>	_____ C <sub>4</sub>	_____ C <sub>5</sub>	_____ C <sub>6</sub>	25. _____ ±D
							+
							-

26. Are CDCs Documented but Not Coded on The Automated File?  
(0) No  
(1) Yes

27. Researcher's Assessment of Vehicle Disposition  
(0) Not towed due to vehicle damage  
(1) Towed due to vehicle damage  
(9) Unknown

28. Original Wheelbase \_\_\_\_\_  
Code to the nearest centimeter  
(999) Unknown

\_\_\_\_\_ inches X 2.54 = \_\_\_\_\_ centimeters

# NASS/CDS Data Elements

National Accident Sampling System-Crashworthiness Data System: Exterior Vehicle Form

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<p>29. Is This A Multi-Stage Manufactured Vehicle And/Or A Certified Altered Vehicle? _____</p> <p>(0) No post manufacturer modifications (1) Yes - post manufacturer modifications (specify): _____ _____</p> <p>(Include photograph of CERTIFICATION PLACARD in case report)</p> <p>(9) Unknown if vehicle is modified</p> <p>30. Fire Occurrence _____</p> <p>(0) No fire</p> <p>Yes, fire occurred</p> <p>(1) Minor (2) Major (9) Unknown</p> <p>31. Origin of Fire _____</p> <p>(0) No fire (1) Vehicle exterior (front, side, back, top) (2) Exhaust system (3) Fuel tank (and other fuel retention system parts) (4) Engine compartment (5) Cargo/trunk compartment (6) Instrument panel (7) Passenger compartment area (8) Other location (specify): _____ (9) Unknown</p> <p>32. Type of Fuel Tank-1 _____</p> <p>33. Type of Fuel Tank-2 _____</p> <p>(0) No fuel tank (electrical vehicle) (1) Metallic (2) Non-metallic (9) Unknown</p>	<p>34. Fuel Tank-1 Location _____</p> <p>35. Fuel Tank-2 Location _____</p> <p>(0) No fuel tank (1) Aft of center of the rear wheels (rear axle) centered (2) Aft of center of the rear wheels (rear axle) left side (3) Aft of center of the rear wheels (rear axle) right side (4) Forward of center of the rear wheels (rear axle) centered (5) Forward of center of the rear wheels (rear axle) left side (6) Forward of center of the rear wheels (rear axle) right side (7) Over center of the rear wheels (rear axle) (8) Other (specify): _____ (9) Unknown</p> <p>36. Fuel Tank-1 Filler Cap Location _____</p> <p>37. Fuel Tank-2 Filler Cap Location _____</p> <p>(0) No fuel tank (1) On back plane (2) Aft of center of the rear wheels (rear axle) on left side plane (3) Aft of center of the rear wheels (rear axle) on right side plane (4) Forward of center of the rear wheels (rear axle) on left side plane (5) Forward of center of the rear wheels (rear axle) on right side plane (6) Over the center of the rear wheels (rear axle) on left side plane (7) Over the center of the rear wheels (rear axle) on right side plane (8) Other (specify): _____ (9) Unknown</p> <p>38. Fuel Tank-1 Damage _____</p> <p>39. Fuel Tank-2 Damage _____</p> <p>(0) No fuel tank (1) No damage to fuel tank (2) Deformed, no seam failure (3) Deformed, with a seam failure (4) Punctured (5) Lacerated (ripped) (6) Abraded (scraped) (7) Filler neck separation from the fuel tank (8) Other damage (specify): _____ (9) Unknown</p>
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<p>40. Location of Fuel System-1 Leakage _____</p> <p>41. Location of Fuel System-2 Leakage _____                  (0) No fuel tank                  (1) No fuel leakage</p> <p><i>Primary Area Of Leakage</i>                  (2) Tank                  (3) Filler neck                  (4) Cap                  (5) Lines/pump/filter                  (6) Vent/emission recovery                  (8) Other (specify): _____                  (9) Unknown</p> <p>42. Fuel Type-1 _____</p> <p>43. Fuel Type-2 _____</p> <p><i>Single Fuel Type</i>                  (00) No fuel tank                  (01) Gasoline                  (02) Diesel                  (03) CNG (Compressed Natural Gas)                  (04) LPG (Liquid Petroleum Gas) also known as Propane                  (05) LNG (Liquid Natural Gas)                  (06) Methanol (M100 or M85)                  (07) Ethanol (E100 or E85)                  (08) Other (Hydrogen or others) (specify): _____</p> <p><i>Electric Powered or Electric/Solar Powered Vehicles</i>                  (10) Lead Acid Battery                  (11) Nickel-Iron Battery                  (12) Nickel-Cadmium Battery                  (13) Sodium Metal Chloride Battery                  (14) Sodium Sulfur Battery                  (18) Other (Specify): _____                  (98) Other Hybrid (specify): _____                  (99) Unknown fuel type</p>	<p>44. Is This Vehicle Equipped With More Than Two Fuel Tanks? _____                  (0) No (one or two tanks only)</p> <p><i>Yes - More Than Two Tanks</i>                  (1) Yes -- <u>no damage</u> to any tank or filler cap and <u>no fuel system leakage</u>                  (2) Yes -- <u>no damage</u> to any tank or filler cap but <u>there is fuel system leakage</u> (specify leakage location): _____                  (3) Yes -- <u>damage</u> to an additional tank or filler cap and <u>there is fuel system leakage</u> (specify the following):                  Type of tank _____                  Tank location _____                  Filler cap location _____                  Tank damage _____                  Location of leakage _____                  Type of fuel _____                  (9) Unknown if more than two tanks</p> <p style="text-align: center;"><b>COMMENTS</b></p> <p>_____</p>
<p>*** STOP: IF THE CDS APPLICABLE VEHICLE WAS NOT TOWED AND WAS NOT AN AOPS ***                  (I.E., GV09 = 0 OR 9 AND GV36 = 0), DO NOT COMPLETE THE INTERIOR VEHICLE FORM.</p>	

# NASS/CDS Data Elements



U.S. Department of Transportation  
National Highway Traffic Safety  
Administration

## INTERIOR VEHICLE FORM

NATIONAL ACCIDENT SAMPLING SYSTEM  
CRASHWORTHINESS DATA SYSTEM

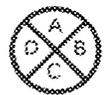
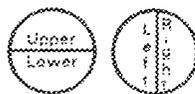
<p>1. Primary Sampling Unit Number _____</p> <p>2. Case Number - Stratum _____</p> <p>3. Vehicle Number _____</p>	<p style="text-align: center;"><b>GLAZING</b></p> <p>Glazing Damage from Impact Forces</p> <p>15. WS ____ 16. LF ____ 17. RF ____ 18. LR ____ 19. RR ____</p> <p>20. BL ____ 21. Roof ____ 22. Other ____</p> <p>(0) No glazing damage from impact forces (2) Glazing in place and cracked from impact forces (3) Glazing in place and holed from impact forces (4) Glazing out-of-place (cracked or not) and not holed from impact forces (5) Glazing out-of-place and holed from impact forces (6) Glazing disintegrated from impact forces (7) Glazing removed prior to accident (8) No glazing (9) Unknown if damaged</p> <p>Glazing Damage from Occupant Contact</p> <p>23. WS ____ 24. LF ____ 25. RF ____ 26. LR ____ 27. RR ____</p> <p>28. BL ____ 29. Roof ____ 30. Other ____</p> <p>(0) No occupant contact to glazing or no glazing (1) Glazing contacted by occupant but no glazing damage (2) Glazing in place and cracked by occupant contact (3) Glazing in place and holed by occupant contact (4) Glazing out-of-place (cracked or not) by occupant contact and not holed by occupant contact (5) Glazing out-of-place by occupant contact and holed by occupant contact (6) Glazing disintegrated by occupant contact (9) Unknown if contacted by occupant</p> <p>If No Glazing Damage <i>And</i> No Occupant Contact or No Glazing, Then Code IV31 Through IV46 As 0</p> <p>Type of Window/Windshield Glazing</p> <p>31. WS ____ 32. LF ____ 33. RF ____ 34. LR ____ 35. RR ____</p> <p>36. BL ____ 37. Roof ____ 38. Other ____</p> <p>(0) No glazing contact and no damage, or no glazing (1) AS-1 -- Laminated (2) AS-2 -- Tempered (3) AS-3 -- Tempered-tinted (4) AS-14 -- Glass/Plastic (8) Other (specify): _____ (9) Unknown</p> <p>Window Precrash Glazing Status</p> <p>39. WS ____ 40. LF ____ 41. RF ____ 42. LR ____ 43. RR ____</p> <p>44. BL ____ 45. Roof ____ 46. Other ____</p> <p>(0) No glazing contact and no damage, or no glazing (1) Fixed (2) Closed (3) Partially opened (4) Fully opened (9) Unknown</p>
<p style="text-align: center;"><b>INTEGRITY</b></p> <p>4. Passenger Compartment Integrity _____</p> <p>(00) No integrity loss</p> <p>Yes, Integrity Was Lost Through:</p> <p>(01) Windshield (02) Door (side) (03) Door/hatch (back door) (04) Roof (05) Roof glass (06) Side window (07) Rear window (backlight) (08) Roof and roof glass (09) Windshield and door (side) (10) Windshield and roof (11) Side and rear window (side window and backlight) (12) Windshield and side window (13) Door and side window (18) Other combination of above (specify): _____ (99) Unknown</p> <p>Door, Tailgate or Hatch Opening</p> <p>5. LF ____ 6. RF ____ 7. LR ____ 8. RR ____ 9. TG/H ____</p> <p>(0) No door/gate/hatch (1) Door/gate/hatch remained closed and operational (2) Door/gate/hatch came open during collision (3) Door/gate/hatch jammed shut (8) Other (specify): _____ (9) Unknown</p> <p>Damage/Failure Associated with Door, Tailgate or Hatch Opening in Collision. If IV05-IV09 ≠ 2. Then code 0</p> <p>10. LF ____ 11. RF ____ 12. LR ____ 13. RR ____ 14. TG/H ____</p> <p>(0) No door/gate/hatch or door not opened</p> <p>Door, Tailgate or Hatch Came Open During Collision</p> <p>(1) Door operational (no damage) (2) Latch/striker failure due to damage (3) Hinge failure due to damage (4) Door structure failure due to damage (5) Door support (i.e., pillar, sill, roof side rail, etc.) failure due to damage (6) Latch/striker and hinge failure due to damage (8) Other failure (specify): _____ (9) Unknown</p>	

HS Form 435C (Rev. 1/84)



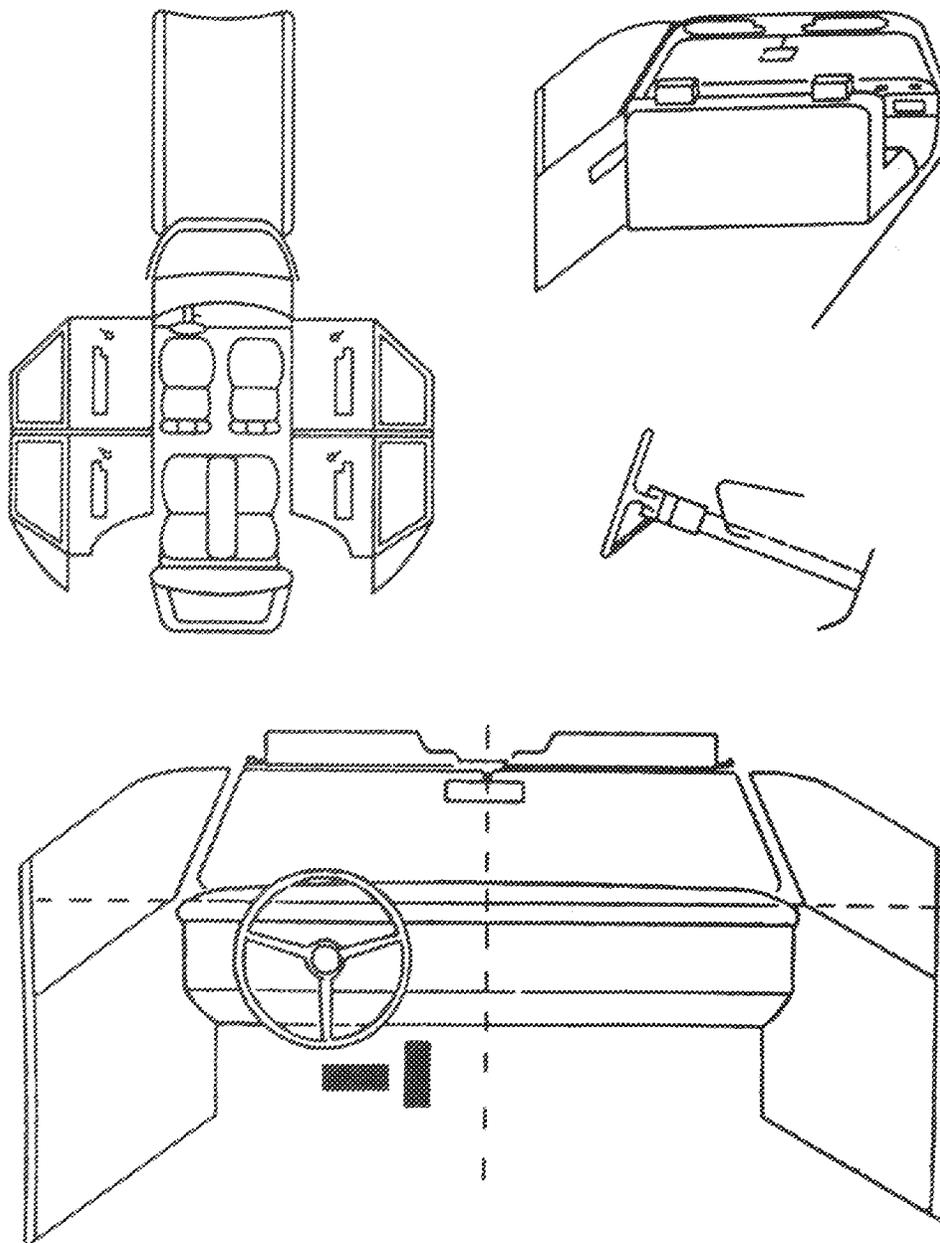
OCCUPANT AREA INTRUSION				
Note: If no intrusions, leave variables IV47-IV86 blank.				INTRUDING COMPONENT
	Location of Intrusion	Intruding Component	Magnitude of Intrusion	Dominant Crush Direction
1st	47. _____	48. _____	49. _____	50. _____
2nd	51. _____	52. _____	53. _____	54. _____
3rd	55. _____	56. _____	57. _____	58. _____
4th	59. _____	60. _____	61. _____	62. _____
5th	63. _____	64. _____	65. _____	66. _____
6th	67. _____	68. _____	69. _____	70. _____
7th	71. _____	72. _____	73. _____	74. _____
8th	75. _____	76. _____	77. _____	78. _____
9th	79. _____	80. _____	81. _____	82. _____
10th	83. _____	84. _____	85. _____	86. _____
<b>LOCATION OF INTRUSION</b> Front Seat (11) Left (12) Middle (13) Right  Second Seat (21) Left (22) Middle (23) Right  Third Seat (31) Left (32) Middle (33) Right  Fourth Seat (41) Left (42) Middle (43) Right  (97) Catastrophic (98) Other enclosed area (specify) _____ (99) Unknown _____				<b>Interior Components</b> (01) Steering assembly (02) Instrument panel left (03) Instrument panel center (04) Instrument panel right (05) Toe pan (06) A (A1/A2)-pillar (07) B-pillar (08) C-pillar (09) D-pillar (10) Door panel (side) (12) Roof (or convertible top) (13) Roof side rail (14) Windshield (15) Windshield header (16) Window frame (17) Floor pan (includes sill) (18) Backlight header (19) Front seat back (20) Second seat back (21) Third seat back (22) Fourth seat back (23) Fifth seat back (24) Seat cushion (25) Back door/panel (e.g., tailgate) (26) Other interior component (specify): _____  (27) Side panel - forward of the A (A2)-pillar (28) Side panel - rear of the A (A2)-pillar  <b>Exterior Components</b> (30) Hood (31) Outside surface of this vehicle (specify): _____  (32) Other exterior object in the environment (specify): _____ (33) Unknown exterior object (97) Catastrophic (98) Intrusion of unlisted component(s) (specify): _____ (99) Unknown
				<b>MAGNITUDE OF INTRUSION</b> (1) ≥ 3 centimeters but < 8 centimeters (2) ≥ 8 centimeters but < 15 centimeters (3) ≥ 15 centimeters but < 30 centimeters (4) ≥ 30 centimeters but < 46 centimeters (5) ≥ 46 centimeters but < 61 centimeters (6) ≥ 61 centimeters (7) Catastrophic (9) Unknown
				<b>DOMINANT CRUSH DIRECTION</b> (1) Vertical (2) Longitudinal (3) Lateral (7) Catastrophic (9) Unknown

STEERING RIM/SPOKE DEFORMATION				
(All Measurements Are in Centimeters)				
COMPARISON VALUE	--	DAMAGE VALUE	=	DEFORMATION
	--		=	
	--		=	
	--		=	
	--		=	
	--		=	

STEERING COLUMN	
<p>87. Steering Column Type _____</p> <p>(1) Fixed column</p> <p>(2) Tilt column</p> <p>(3) Telescoping column</p> <p>(4) Tilt and telescoping column</p> <p>(8) Other column type (specify): _____</p> <p>(9) Unknown</p>	<p>93. Location of Steering Rim/Spoke Deformation _____</p> <p>(00) No steering rim deformation</p> <p><i>Quarter Sections</i></p> <p>(01) Section A</p> <p>(02) Section B</p> <p>(03) Section C</p> <p>(04) Section D</p>  <p><i>Half Sections</i></p> <p>(05) Upper half of rim/spoke</p> <p>(06) Lower half of rim/spoke</p> <p>(07) Left half of rim/spoke</p> <p>(08) Right half of rim/spoke</p>  <p>(09) Complete steering wheel collapse</p> <p>(10) Undetermined location</p> <p>(99) Unknown</p>
<p>88. Blank _____ <u>X</u> <u>X</u></p> <p>(This variable is left blank so that numbering consistency can be maintained with the 1988-94 CDS.)</p>	<p style="background-color: #cccccc; text-align: center;"><b>INSTRUMENT PANEL</b></p>
<p>89. Blank _____ <u>X</u> <u>X</u> <u>X</u></p> <p>(This variable is left blank so that numbering consistency can be maintained with the 1988-94 CDS.)</p>	<p>94. Odometer Reading _____,000</p> <p>_____ kilometers -- Code to the nearest 1,000 kilometers</p> <p>(000) No odometer</p> <p>(001) Less than 1,500 kilometers</p> <p>(500) 499,500 kilometers or more</p> <p>(999) Unknown</p> <p>_____ miles x 1,609.3 = _____ kilometers</p> <p>Source: _____</p>
<p>90. Blank _____ <u>X</u> <u>X</u> <u>X</u></p> <p>(This variable is left blank so that numbering consistency can be maintained with the 1988-94 CDS.)</p>	<p>95. Instrument Panel Damage from Occupant Contact? _____</p> <p>(0) No</p> <p>(1) Yes</p> <p>(9) Unknown</p>
<p>91. Blank _____ <u>X</u> <u>X</u> <u>X</u></p> <p>(This variable is left blank so that numbering consistency can be maintained with the 1988-94 CDS.)</p>	<p>96. Knee Bolsters Deformed from Occupant Contact? _____</p> <p>(0) No</p> <p>(1) Yes</p> <p>(8) Not present</p> <p>(9) Unknown</p>
<p>92. Steering Rim/Spoke Deformation _____</p> <p>_____ Code actual measured deformation to the nearest centimeter</p> <p>(00) No steering rim deformation</p> <p>(01-14) Actual measured value in centimeters</p> <p>(15) 15 centimeters or more</p> <p>(98) Observed deformation cannot be measured</p> <p>(99) Unknown</p>	<p>97. Did Glove Compartment Door Open During Collision(s)? _____</p> <p>(0) No</p> <p>(1) Yes</p> <p>(8) Not present</p> <p>(9) Unknown</p>

**VEHICLE INTERIOR SKETCHES**

Note area of ejection/entrapment



Sketch windshield contact(s) and the damaged area(s) on the instrument panel outline (e.g., radio, glove compartment, damage to instrument panel structure).  
 Cross hatch contact points, draw spider webs or use other annotation as may be appropriate.  
 Annotate the contacted area with a letter (begin with A) and list on the Points of Occupant Contact page.

POINTS OF OCCUPANT CONTACT					
Contact	Interior Component Contacted	Occupant No. If Known	Body Region If Known	Supporting Physical Evidence	Confidence Level of Contact Point
A					
B					
C					
D					
E					
F					
G					
H					
I					
J					
K					
L					
M					
N					

CODES FOR INTERIOR COMPONENTS			
<b>FRONT</b>	(01) Windshield	(23) Left B-pillar	(45) Other occupants (specify):
	(02) Mirror	(24) Other left pillar (specify):	(47) Interior loose objects
	(03) Sunvisor	(25) Left side window glass or frame	(48) Child safety seat (specify):
	(04) Steering wheel rim	(26) Left side window glass including one or more of the following: frame, window sill, A (A1/A2)-pillar, B-pillar, or roof side rail.	(49) Other interior object (specify):
	(05) Steering wheel hub/spoke	(27) Other left side object (specify):	
	(06) Steering wheel (combination of codes 04 and 05)	(28) Left side window sill	<b>ROOF</b>
	(07) Steering column, transmission selector lever, other attachment		(50) Front header
	(08) Add on equipment (e.g., CB, tape deck, air conditioner)	<b>RIGHT SIDE</b>	(51) Rear header
	(09) Left instrument panel end below	(30) Right side interior surface, excluding hardware or armrests	(52) Roof left side rail
	(10) Center instrument panel end below	(31) Right side hardware or armrest	(53) Roof right side rail
	(11) Right instrument panel end below	(32) Right A (A1/A2)-pillar	(54) Roof or convertible top
	(12) Glove compartment door	(33) Right B-pillar	<b>FLOOR</b>
	(13) Knee bolster	(34) Other right pillar (specify):	(56) Floor (including toe pan)
	(14) Windshield including one or more of the following: front header, A (A1/A2)-pillar, instrument panel, mirror, or steering assembly (driver side only)	(35) Right side window glass or frame	(57) Floor or console mounted transmission lever, including console
	(15) Windshield including one or more of the following: front header, A (A1/A2)-pillar, instrument panel, or mirror (passenger side only)	(36) Right side window glass including one or more of the following: frame, window sill, A (A1/A2)-pillar, B pillar, or roof side rail.	(58) Parking brake handle
	(16) Driver side air bag compartment cover	(37) Other right side object (specify):	(59) Foot controls including parking brake
	(17) Passenger side air bag compartment cover	(38) Right side window sill	<b>REAR</b>
	(18) Windshield reinforced by exterior object (specify):	<b>INTERIOR</b>	(60) Backlight (rear window)
	(19) Other front object (specify):	(40) Seat, back support	(61) Backlight storage rack, door, etc.
<b>LEFT SIDE</b>	(20) Left side interior surface, excluding hardware or armrests	(41) Belt restraint webbing/buckle	(62) Other rear object (specify):
	(21) Left side hardware or armrest	(42) Belt restraint B-pillar attachment point	
	(22) Left A (A1/A2)-pillar	(43) Other restraint system component (specify):	
		(44) Head restraint system	
		(45) Air bag (use codes "16" and "17" for injuries sustained from air bag compartment covers)	

CONFIDENCE LEVEL OF CONTACT POINT
(1) Certain
(2) Probable
(3) Possible
(8) Unknown

AUTOMATIC RESTRAINTS			
<p>NOTES: Encode the data for each applicable front seat position. The attributes for the variables may be found below. Restraint systems should be assessed during the vehicle inspection then coded on the Occupant Assessment Form.</p>			
<b>AIR BAGS</b>			
		Left	Right
F I R S T	Availability/Function		
	Deployment		
	Failure		
<p><b>Air Bag System Availability/Function</b>                      (0) Not equipped/not available                      (1) Air bag</p> <p><i>Non-functional</i>                      (2) Air bag disconnected (specify): _____                      (3) Air bag not reinstalled                      (9) Unknown</p>	<p><b>Air Bag System Deployment</b>                      (0) Not equipped/not available                      (1) Air bag deployed during accident (as a result of impact)                      (2) Air bag deployed inadvertently just prior to accident                      (3) Air bag deployed, accident sequence undetermined                      (4) Nondeployed                      (5) Unknown if deployed                      (6) Air bag deployed as a result of a noncollision event during accident sequence (e.g., fire, explosion, electrical)                      (9) Unknown</p>	<p><b>Are There Indications of Air Bag System Failure?</b>                      (0) Not equipped/not available                      (1) No                      (2) Yes (specify): _____                      (9) Unknown</p>	
<b>AUTOMATIC BELTS</b>			
		Left	Right
F I R S T	Availability/Function		
	Use		
	Type		
	Proper Use		
	Failure Modes		
<p><b>Automatic (Passive) Belt System Availability/Function</b>                      (0) Not equipped/not available                      (1) 2 point automatic belts                      (2) 3 point automatic belts                      (3) Automatic belts - type unknown</p> <p><i>Non-functional</i>                      (4) Automatic belts destroyed or rendered inoperative                      (9) Unknown</p> <p><b>Automatic (Passive) Belt System Use</b>                      (0) Not equipped/not available/destroyed or rendered inoperative                      (1) Automatic belt in use                      (2) Automatic belt not in use (manually disconnected, motorized trunk inoperative)                      (3) Automatic belt use unknown                      (9) Unknown</p> <p><b>Automatic (Passive) Belt System Type</b>                      (0) Not equipped/not available                      (1) Non-motorized system                      (2) Motorized system                      (9) Unknown</p>	<p><b>Proper Use of Automatic (Passive) Belt System</b>                      (0) Not equipped/not available/not used                      (1) Automatic belt used properly                      (2) Automatic belt used properly with child safety seat</p> <p><i>Automatic Belt Used Improperly</i>                      (3) Automatic shoulder belt worn under arm                      (4) Automatic shoulder belt worn behind back                      (5) Automatic belt worn around more than one person                      (6) Lap portion of automatic belt worn on abdomen                      (7) Automatic lap and shoulder belt or automatic shoulder belt used improperly with child safety seat (specify): _____                      (8) Other improper use of automatic belt system (specify): _____                      (9) Unknown</p>	<p><b>Automatic (Passive) Belt Failure Modes During Accident</b>                      (0) Not equipped/not available/not in use                      (1) No automatic belt failure(s)                      (2) Torn webbing (stretched webbing not included)                      (3) Broken buckle or latchplate                      (4) Upper anchorage separated                      (5) Other anchorage separated (specify): _____                      (6) Broken retractor                      (7) Combination of above (specify): _____                      (8) Other automatic belt failure (specify): _____                      (9) Unknown</p>	

**MANUAL RESTRAINTS**

NOTES: Encode the applicable data for each seat position in the vehicle. The attribute for the variable may be found below. Restraint systems should be assessed during the vehicle inspection then coded on the Occupant Assessment Form.

If a Child safety seat is present, encode the data on the back of this page.

If the vehicle has automatic restraints available, encode the appropriate data on the back of the previous page.

		Left	Center	Right
FRONT	Availability			
	Evidence of usage			
	Used in this crash?			
	Proper Use			
	Failure Modes			
MID/OVER	Availability			
	Evidence of usage			
	Used in this crash?			
	Proper Use			
	Failure Modes			
CHILD	Availability			
	Evidence of usage			
	Used in this crash?			
	Proper Use			
	Failure Modes			

**Manual (Active) Belt System Availability**

- (0) None available
- (1) Belt removed/destroyed
- (2) Shoulder belt
- (3) Lap belt
- (4) Lap and shoulder belt
- (5) Belt available - type unknown

**Integral Belt Partially Destroyed**

- (6) Shoulder belt (lap belt destroyed/removed)
- (7) Lap belt (shoulder belt destroyed/removed)

(8) Other belt (specify):

(9) Unknown

**Proper Use of Manual (Active) Belts**

- (0) None used or not available
- (1) Belt used properly
- (2) Belt used properly with child safety seat

**Belt Used Improperly**

- (3) Shoulder belt worn under arm
- (4) Shoulder belt worn behind back or seat
- (5) Belt worn around more than one person
- (6) Lap belt worn on abdomen
- (7) Lap belt or lap and shoulder belt used improperly with child safety seat (specify):

(8) Other improper use of manual belt system (specify):

(9) Unknown

**Manual (Active) Belt System Use**

- (00) None used, not available, or belt removed/destroyed
- (01) Inoperable (specify):
- (02) Shoulder belt
- (03) Lap belt
- (04) Lap and shoulder belt
- (05) Belt used - type unknown
- (08) Other belt used (specify):
- (12) Shoulder belt used with child safety seat
- (13) Lap belt used with child safety seat
- (14) Lap and shoulder belt used with child safety seat
- (15) Belt used with child safety seat - type unknown
- (18) Other belts used with child safety seat (specify):
- (99) Unknown if belt used

**Manual (Active) Belt Failure Modes During Accident**

- (0) No manual belt used or not available
- (1) No manual belt failure(s)
- (2) Torn webbing (stretched webbing not included)
- (3) Broken buckle or latchplate
- (4) Upper anchorage separated
- (5) Other anchorage separated (specify):
- (6) Broken retractor
- (7) Combination of above (specify):
- (8) Other manual belt failure (specify):
- (9) Unknown

CHILD SAFETY SEAT FIELD ASSESSMENT								
When a child safety seat is present enter the occupant's number in the first row and complete the column below the occupant's number using the codes listed below. Complete a column for each child safety seat present.								
Occupant Number								
1. Type of Child Safety Seat								
2. Child Safety Seat Orientation								
3. Child Safety Seat Harness Usage								
4. Child Safety Seat Shield Usage								
5. Child Safety Seat Tether Usage								
6. Child Safety Seat Make/Model:	Specify Below for Each Child Safety Seat							
<table border="0"> <tr> <td style="vertical-align: top;"> <p>1. Type of Child Safety Seat</p> <p>(0) No child safety seat (1) Infant seat (2) Toddler seat (3) Convertible seat (4) Booster seat (7) Other type child safety seat (specify): ..... (8) Unknown child safety seat type (9) Unknown if child safety seat used</p> <p>2. Child Safety Seat Orientation</p> <p>(00) No child safety seat</p> <p>Designed for Rear Facing for This Age/Weight</p> <p>(01) Rear facing (02) Forward facing (08) Other orientation (specify): ..... (09) Unknown orientation</p> <p>Designed for Forward Facing for This Age/Weight</p> <p>(11) Rear facing (12) Forward facing (18) Other orientation (specify): ..... (19) Unknown orientation</p> <p>Unknown Design or Orientation For This Age/Weight, or Unknown Age/Weight</p> <p>(21) Rear facing (22) Forward facing (28) Other orientation (specify): ..... (29) Unknown orientation</p> <p>(99) Unknown if child safety seat used</p> </td> <td style="vertical-align: top;"> <p>3. Child Safety Seat Harness Usage</p> <p>4. Child Safety Seat Shield Usage</p> <p>5. Child Safety Seat Tether Usage</p> <p>Note: Options Below Are Used for Variables 3-5.</p> <p>(00) No child safety seat</p> <p>Not Designed with Harness/Shield/Tether</p> <p>(01) After market harness/shield/tether added, not used (02) After market harness/shield/tether used (03) Child safety seat used, but no after market harness/shield/tether added (09) Unknown if harness/shield/tether added or used</p> <p>Designed With Harness/Shield/Tether</p> <p>(11) Harness/shield/tether not used (12) Harness/shield/tether used (19) Unknown if harness/shield/tether used</p> <p>Unknown If Designed With Harness/Shield/Tether</p> <p>(21) Harness/shield/tether not used (22) Harness/shield/tether used (29) Unknown if harness/shield/tether used</p> <p>(99) Unknown if child safety seat used</p> <p>6. Child Safety Seat Make/Model (Specify make/model and occupant number)</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> </td> </tr> </table>							<p>1. Type of Child Safety Seat</p> <p>(0) No child safety seat (1) Infant seat (2) Toddler seat (3) Convertible seat (4) Booster seat (7) Other type child safety seat (specify): ..... (8) Unknown child safety seat type (9) Unknown if child safety seat used</p> <p>2. Child Safety Seat Orientation</p> <p>(00) No child safety seat</p> <p>Designed for Rear Facing for This Age/Weight</p> <p>(01) Rear facing (02) Forward facing (08) Other orientation (specify): ..... (09) Unknown orientation</p> <p>Designed for Forward Facing for This Age/Weight</p> <p>(11) Rear facing (12) Forward facing (18) Other orientation (specify): ..... (19) Unknown orientation</p> <p>Unknown Design or Orientation For This Age/Weight, or Unknown Age/Weight</p> <p>(21) Rear facing (22) Forward facing (28) Other orientation (specify): ..... (29) Unknown orientation</p> <p>(99) Unknown if child safety seat used</p>	<p>3. Child Safety Seat Harness Usage</p> <p>4. Child Safety Seat Shield Usage</p> <p>5. Child Safety Seat Tether Usage</p> <p>Note: Options Below Are Used for Variables 3-5.</p> <p>(00) No child safety seat</p> <p>Not Designed with Harness/Shield/Tether</p> <p>(01) After market harness/shield/tether added, not used (02) After market harness/shield/tether used (03) Child safety seat used, but no after market harness/shield/tether added (09) Unknown if harness/shield/tether added or used</p> <p>Designed With Harness/Shield/Tether</p> <p>(11) Harness/shield/tether not used (12) Harness/shield/tether used (19) Unknown if harness/shield/tether used</p> <p>Unknown If Designed With Harness/Shield/Tether</p> <p>(21) Harness/shield/tether not used (22) Harness/shield/tether used (29) Unknown if harness/shield/tether used</p> <p>(99) Unknown if child safety seat used</p> <p>6. Child Safety Seat Make/Model (Specify make/model and occupant number)</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
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HEAD RESTRAINTS/SEAT EVALUATION				
NOTES: Encode the applicable data for each seat position in the vehicle. The attribute for these variables may be found at the bottom of the page. Head restraint type/damage and seat type/performance should be assessed during the vehicle inspection then coded on the Occupant Assessment Form.				
		Left	Center	Right
F R S T	Head Restraint Type/Damage			
	Seat Type			
	Seat Performance			
	Seat Orientation			
S E C O N D	Head Restraint Type/Damage			
	Seat Type			
	Seat Performance			
	Seat Orientation			
T H I R D	Head Restraint Type/Damage			
	Seat Type			
	Seat Performance			
	Seat Orientation			
O T H E R	Head Restraint Type/Damage			
	Seat Type			
	Seat Performance			
	Seat Orientation			
<b>Head Restraint Type/Damage by Occupant at This Occupant Position</b> (0) No head restraints (1) Integral -- no damage (2) Integral -- damaged during accident (3) Adjustable -- no damage (4) Adjustable -- damaged during accident (5) Add-on -- no damage (6) Add-on -- damaged during accident (8) Other Specify: _____ (9) Unknown		<b>Seat Performance (this Occupant Position)</b> (0) Occupant not seated or no seat (1) No seat performance failure(s) (2) Seat adjusters failed (3) Seat back folding locks or "seat back" failed specify: _____ (4) Seat tracks/anchors failed (5) Deformed by impact of occupant (6) Deformed by passenger compartment intrusion (specify): _____ (7) Combination of above (specify): _____ (8) Other (specify): _____ (9) Unknown		
<b>Seat Type (this Occupant Position)</b> (00) Occupant not seated or no seat (01) Bucket (02) Bucket with folding back (03) Bench (04) Bench with separate back cushions (05) Bench with folding back(s) (06) Split bench with separate back cushions (07) Split bench with folding back(s) (08) Pedestal (i.e., column supported) (09) Other seat type (specify): _____ (10) Box mounted seat (i.e., van type) (99) Unknown		<b>Seat Orientation (this Occupant Position)</b> (0) Occupant not seated or no seat (1) Forward facing seat (2) Rear facing seat (3) Side facing seat (inward) (4) Side facing seat (outward) (8) Other (specify): _____ (9) Unknown		
<b>DESCRIBE ANY INDICATION OF ABNORMAL OCCUPANT POSTURE (I.E., UNUSUAL OCCUPANT CONTACT PATTERN):</b> _____ _____ _____				

**EJECTION/ENTRAPMENT DATA**

Complete the following if the researcher has any indication that an occupant was either ejected from or entrapped in the vehicle. Code the appropriate data on the Occupant Assessment Form.

EJECTION No [ ] Yes [ ]

Describe indications of ejection and body parts involved in partial ejection(s):

.....

.....

.....

Occupant Number						
Ejection						
(Note on Vehicle Interior Sketch) Ejection Area						
Ejection Medium						
Medium Status						

**Ejection**  
 (1) Complete ejection  
 (2) Partial ejection  
 (3) Ejection, Unknown degree  
 (9) Unknown

**Ejection Area**  
 (1) Windshield  
 (2) Left front  
 (3) Right front  
 (4) Left rear  
 (5) Right rear  
 (6) Rear

(7) Roof  
 (8) Other area (e.g., back of pickup, etc.) (specify):  
 \_\_\_\_\_  
 (9) Unknown

**Ejection Medium**  
 (1) Door/hatch/tailgate  
 (2) Nonfixed roof structure  
 (3) Fixed glazing  
 (4) Nonfixed glazing (specify):  
 \_\_\_\_\_

(5) Integral structure  
 (8) Other medium (specify):  
 \_\_\_\_\_  
 (9) Unknown

**Medium Status (Immediately Prior to Impact)**  
 (1) Open  
 (2) Closed  
 (3) Integral structure  
 (9) Unknown

ENTRAPMENT No [ ] Yes [ ]

Describe entrapment mechanism: .....

.....

.....

Component(s): .....

.....

(Note in vehicle interior diagram)



U.S. Department of Transportation  
National Highway Traffic Safety  
Administration

**OCCUPANT ASSESSMENT FORM**

Form Approved  
O.M.B. No. 2127-0021

NATIONAL ACCIDENT SAMPLING SYSTEM  
CRASHWORTHINESS DATA SYSTEM

<p>1. Primary Sampling Unit Number .....</p> <p>2. Case Number - Stratum .....</p> <p>3. Vehicle Number .....</p> <p>4. Occupant Number .....</p>	<p style="text-align: center;"><b>OCCUPANT'S SEATING</b></p> <p>10. Occupant's Seat Position .....</p> <p><i>Front Seat</i></p> <p>(11) Left side (12) Middle (13) Right side (14) Other (specify): .....</p> <p>(15) On or in the lap of another occupant</p> <p><i>Second Seat</i></p> <p>(21) Left side (22) Middle (23) Right side (24) Other (specify): .....</p> <p>(25) On or in the lap of another occupant</p> <p><i>Third Seat</i></p> <p>(31) Left side (32) Middle (33) Right side (34) Other (specify): .....</p> <p>(35) On or in the lap of another occupant</p> <p><i>Fourth Seat</i></p> <p>(41) Left side (42) Middle (43) Right side (44) Other (specify): .....</p> <p>(45) On or in the lap of another occupant</p> <p>(97) In or on unenclosed area (98) Other seat (specify): .....</p> <p>(99) Unknown</p>
<b>OCCUPANT'S CHARACTERISTICS</b>	
<p>5. Occupant's Age .....</p> <p>Code actual age at time of accident.</p> <p>(00) Less than one year old (specify by month): .....</p> <p>(97) 97 years and older (99) Unknown</p> <p>6. Occupant's Sex .....</p> <p>(1) Male (2) Female (9) Unknown</p> <p>7. Occupant's Height .....</p> <p>Code actual height to the nearest centimeter.</p> <p>(999) Unknown</p> <p>..... inches X 2.54 = ..... centimeters</p> <p>8. Occupant's Weight .....</p> <p>Code actual weight to the nearest kilogram.</p> <p>(999) Unknown</p> <p>..... pounds X .4536 = ..... kilograms</p> <p>9. Occupant's Role .....</p> <p>(1) Driver (2) Passenger (9) Unknown</p>	<p>11. Occupant's Posture .....</p> <p>(0) Normal posture</p> <p><i>Abnormal posture</i></p> <p>(1) Kneeling or standing on seat (2) Lying on or across seat (3) Kneeling, standing or sitting in front of seat (4) Sitting sideways or turned to talk with another occupant or to look out a rear window (5) Sitting on a console (6) Lying back in a reclined seat position (7) Bracing with feet or hands on a surface in front of seat (8) Other abnormal posture (specify): .....</p> <p>(9) Unknown</p>

<b>EJECTION/ENTRAPMENT</b>	
<p>12. Ejection -----</p> <p>(0) No ejection</p> <p>(1) Complete ejection</p> <p>(2) Partial ejection</p> <p>(3) Ejection, unknown degree</p> <p>(9) Unknown</p>	<p>15. Medium Status (Immediately Prior To Impact) _____</p> <p>(0) No ejection</p> <p>(1) Open</p> <p>(2) Closed</p> <p>(3) Integral structure</p> <p>(9) Unknown</p>
<p>13. Ejection Area -----</p> <p>(0) No ejection</p> <p>(1) Windshield</p> <p>(2) Left front</p> <p>(3) Right front</p> <p>(4) Left rear</p> <p>(5) Right rear</p> <p>(6) Rear</p> <p>(7) Roof</p> <p>(8) Other area (e.g., back of pickup, etc.) (specify): _____</p> <p>(9) Unknown</p>	<p>16. Entrapment -----</p> <p>(NOTE: Entrapped means that part of the person was in the vehicle and mechanically restrained; jammed doors and immobilizing injuries by themselves are not sufficient to constitute entrapment.)</p> <p>(0) Not entrapped</p> <p>(1) Entrapped</p> <p>(9) Unknown</p>
<p>14. Ejection Medium -----</p> <p>(0) No ejection</p> <p>(1) Door/hatch/tailgate</p> <p>(2) Nonfixed roof structure</p> <p>(3) Fixed glazing</p> <p>(4) Nonfixed glazing (specify): _____</p> <p>(5) Integral structure</p> <p>(8) Other medium (specify): _____</p> <p>(9) Unknown</p>	

<b>RESTRAINT SYSTEM EVALUATION</b>	
<p>17. Manual (Active) Belt System Availability -----</p> <p>(0) None available                      (1) Belt removed/destroyed                      (2) Shoulder belt                      (3) Lap belt                      (4) Lap and shoulder belt                      (5) Belt available--type unknown</p> <p><i>Integral Belt Partially Destroyed</i>                      (6) Shoulder belt (lap belt destroyed/removed)                      (7) Lap belt (shoulder belt destroyed/removed)</p> <p>(8) Other belt (specify): _____                      (9) Unknown</p>	<p>21. Air Bag System Availability/Function -----</p> <p>(0) Not equipped/not available                      (1) Air bag</p> <p><i>Non-functional</i>                      (2) Air bag disconnected (specify): _____                      (3) Air bag not reinstalled                      (9) Unknown</p>
<p>18. Manual (Active) Belt System Use -----</p> <p>(00) None used, not available, or belt removed/destroyed                      (01) Inoperative (specify): _____</p> <p>(02) Shoulder belt                      (03) Lap belt                      (04) Lap and shoulder belt                      (05) Belt used--type unknown                      (06) Other belt used (specify): _____</p> <p>(12) Shoulder belt used with child safety seat                      (13) Lap belt used with child safety seat                      (14) Lap and shoulder belt used with child safety seat                      (15) Belt used with child safety seat--type unknown                      (16) Other belt used with child safety seat (specify): _____                      (99) Unknown if belt used</p>	<p>22. Air Bag System Deployment -----</p> <p>(0) Not equipped/not available                      (1) Air bag deployed during accident (as a result of impact)                      (2) Air bag deployed inadvertently just prior to accident                      (3) Air bag deployed, accident sequence undetermined                      (4) Nondeployed                      (5) Unknown if deployed                      (6) Air bag deployed as a result of a noncollision event during accident sequence (e.g., fire, explosion, electrical)                      (8) Unknown</p>
<p>19. Proper Use of Manual (Active) Belts -----</p> <p>(0) None used or not available                      (1) Belt used properly                      (2) Belt used properly with child safety seat</p> <p><i>Belt Used Improperly</i>                      (3) Shoulder belt worn under arm                      (4) Shoulder belt worn behind back or seat                      (5) Belt worn around more than one person                      (6) Lap belt worn on abdomen                      (7) Lap belt or lap and shoulder belt used improperly with child safety seat (specify): _____</p> <p>(8) Other improper use of manual belt system (specify): _____                      (9) Unknown</p>	<p>23. Are There Indications of Air Bag System Failure? -----</p> <p>(0) Not equipped/not available                      (1) No                      (2) Yes (specify): _____                      (9) Unknown</p> <p>Note: See Variables 44 through 48 (Page 5) for information on Automatic Belts</p>
<p>20. Manual (Active) Belt Failure Modes During Accident -----</p> <p>(0) No manual belt used                      (1) No manual belt failure(s)                      (2) Torn webbing (stretched webbing not included)                      (3) Broken buckle or latchplate                      (4) Upper anchorage separated                      (5) Other anchorage separated (specify): _____</p> <p>(6) Broken retractor                      (7) Combination of above (specify): _____                      (8) Other manual belt failure (specify): _____                      (9) Unknown</p>	<p>24. Police Reported Restraint Use -----</p> <p>(0) None used                      (1) Police did not indicate restraint use                      (2) Shoulder belt                      (3) Lap belt                      (4) Lap and shoulder belt                      (5) Belt used, type not specified                      (6) Child safety seat                      (7) Other or automatic restraint (specify): _____</p> <p>(8) Restrained, type unknown                      (9) Police indicated "unknown"</p>

**HEAD RESTRAINT AND SEAT EVALUATION**

25. Head Restraint Type/Damage by Occupant at This Occupant Position \_\_\_\_\_

- (0) No head restraints
- (1) Integral—no damage
- (2) Integral—damaged during accident
- (3) Adjustable—no damage
- (4) Adjustable—damaged during accident
- (5) Add-on—no damage
- (6) Add-on—damaged during accident
- (8) Other (specify): \_\_\_\_\_
- (9) Unknown

26. Seat Type (this Occupant Position) \_\_\_\_\_

- (00) Occupant not seated or no seat
- (01) Bucket
- (02) Bucket with folding back
- (03) Bench
- (04) Bench with separate back cushions
- (05) Bench with folding back(s)
- (06) Split bench with separate back cushions
- (07) Split bench with folding back(s)
- (08) Pedestal (i.e., column supported)
- (09) Other seat type (specify): \_\_\_\_\_
- (10) Box mounted seat (i.e., van type)
- (99) Unknown

27. Seat Performance (this Occupant Position) \_\_\_\_\_

- (0) Occupant not seated or no seat
- (1) No seat performance failure(s)
- (2) Seat adjusters failed
- (3) Seat back folding locks or "seat back" failed (specify): \_\_\_\_\_
- (4) Seat track/anchors failed
- (5) Deformed by impact of occupant
- (6) Deformed by passenger compartment intrusion (specify): \_\_\_\_\_
- (7) Combination of above (specify): \_\_\_\_\_
- (8) Other (specify): \_\_\_\_\_
- (9) Unknown

CHILD SAFETY SEAT	
<p>28. Child Safety Seat Make/Model _____                      (000) No child safety seat                      Applicable codes are found in your NASS CDS                      Data Collection, Coding and Editing                      (950) Built-in child safety seat                      (997) Other make/model (specify):                      _____                      (998) Unknown make/model                      (999) Unknown if child safety seat used</p>	<p>31. Child Safety Seat Harness Usage _____</p>
<p>29. Type of Child Safety Seat _____                      (0) No child safety seat                      (1) Infant seat                      (2) Toddler seat                      (3) Convertible seat                      (4) Booster seat                      (7) Other type child safety seat (specify):                      _____                      (6) Unknown child safety seat type                      (9) Unknown if child safety seat used</p>	<p>32. Child Safety Seat Shield Usage _____</p> <p>33. Child Safety Seat Tether Usage _____</p> <p>Note: Options below applicable to                      Variables CA31-DA33.                      (00) No child safety seat</p> <p><i>Not Designed With Harness/Shield/Tether</i>                      (01) After market harness/shield/tether                      added, not used                      (02) After market harness/shield/tether used                      (03) Child safety seat used, but no after market                      harness/shield/tether added                      (09) Unknown if harness/shield/tether                      added or used</p> <p><i>Designed With Harness/Shield/Tether</i>                      (11) Harness/shield/tether not used                      (12) Harness/shield/tether used                      (19) Unknown if harness/shield/tether used</p>
<p>30. Child Safety Seat Orientation _____                      (00) No child safety seat</p> <p><i>Designed for Rear Facing for This Age/Weight</i>                      (01) Rear facing                      (02) Forward facing                      (08) Other orientation (specify):                      _____                      (09) Unknown orientation</p> <p><i>Designed For Forward Facing for This Age/Weight</i>                      (11) Rear facing                      (12) Forward facing                      (18) Other orientation (specify):                      _____                      (19) Unknown orientation</p> <p><i>Unknown Design or Orientation For This                      Age/Weight, or Unknown Age/Weight</i>                      (21) Rear facing                      (22) Forward facing                      (28) Other orientation (specify):                      _____                      (29) Unknown orientation</p> <p>(99) Unknown if child safety seat used</p>	<p><i>Unknown If Designed With Harness/Shield/Tether</i>                      (21) Harness/shield/tether not used                      (22) Harness/shield/tether used                      (29) Unknown if harness/shield/tether used</p> <p>(99) Unknown if child safety seat used</p>

INJURY CONSEQUENCES	
<p>34. Injury Severity (Police Rating) -----</p> <p>(0) D - No injury                      (1) C - Possible injury                      (2) B - Nonincapacitating injury                      (3) A - Incapacitating injury                      (4) K - Killed                      (5) U - Injury, severity unknown                      (6) Died prior to accident                      (9) Unknown</p>	<p>38. Working Days Lost -----</p> <p>Code the number of days (up through 60) that the occupant lost from work due to the accident</p> <p>(00) No working days lost                      (61) 61 days or more                      (62) Fatally injured                      (97) Not working prior to accident                      (99) Unknown</p>
<p><b>STOP - GO TO VARIABLE 44 ON PAGE 7</b></p> <p><b>VARIABLES 39 THROUGH 43 ARE COMPLETED BY THE ZONE CENTER</b></p>	
<p>35. Treatment - Mortality -----</p> <p>(0) No treatment                      (1) Fatal                      (2) Fatal - ruled disease (specify):                      _____</p> <p><i>Nonfatal</i></p> <p>(3) Hospitalization                      (4) Transported and released                      (5) Treatment at scene - nontransported                      (6) Treatment later                      (8) Treatment - other (specify):                      _____</p> <p>(9) Unknown</p>	<p>39. Time to Death -----</p> <p>Code number of hours from time of accident to time of death up through 24 hours. If time of death is greater than 24 hours, code number of days. (Note: 1 day = 24 hours, 2 days = 48, ... n days = 24 * n up through 30 days = 720)</p> <p>(00) Not fatal                      (96) Fatal - ruled disease                      (99) Unknown</p>
<p>36. Type Of Medical Facility (for Initial Treatment) -----</p> <p>(0) Not treated at a medical facility                      (1) Trauma center                      (2) Hospital                      (3) Medical clinic                      (4) Physician's office                      (5) Treatment later at medical facility                      (8) Other (specify):                      _____</p> <p>(9) Unknown</p>	<p>40. 1st Medically Reported Cause of Death -----</p> <p>41. 2nd Medically Reported Cause of Death -----</p> <p>42. 3rd Medically Reported Cause of Death -----</p> <p>Code the Occupant Injury from line number(s) for the medically reported injury(s) which reportedly contributed to this occupant's death</p> <p>(00) Not fatal or no additional causes                      (96) Mode of death given but specific injuries are not linked to cause of death. (specify):                      _____</p> <p>(97) Other result (includes fatal ruled disease) (specify):                      _____</p> <p>(99) Unknown</p>
<p>37. Hospital Stay -----</p> <p>(00) Not Hospitalized</p> <p>Code the number of days (up through 60) that the occupant stayed in hospital.</p> <p>(61) 61 days or more                      (99) Unknown</p>	<p>43. Number of Recorded Injuries for This Occupant -----</p> <p>Code the actual number of injuries recorded for this occupant.</p> <p>(00) No recorded injuries                      (97) Injured, details unknown                      (99) Unknown if injured</p>

NASS/CDS Data Elements

AUTOMATIC BELT SYSTEM	
<p>44. Automatic (Passive) Belt System Availability/Function .....                      (0) Not equipped/not available                      (1) 2 point automatic belts                      (2) 3 point automatic belts                      (3) Automatic belts - type unknown</p> <p><i>Non-functional</i>                      (4) Automatic belts destroyed or rendered inoperative                      (9) Unknown</p>	<p>48. Automatic (Passive) Belt Failure Modes During Accident .....                      (0) Not equipped/not available/not in use                      (1) No automatic belt failure(s)                      (2) Torn webbing (stretched webbing not included)                      (3) Broken buckle or latchplate                      (4) Upper anchorage separated                      (5) Other anchorage separated (specify):                      _____                      (6) Broken retractor                      (7) Combination of above (specify):                      (8) Other automatic belt failure (specify):                      _____                      (9) Unknown</p>
<p>45. Automatic (Passive) Belt System Use .....                      (0) Not equipped/not available/destroyed or rendered inoperative                      (1) Automatic belt in use                      (2) Automatic belt not in use (manually disconnected, motorized track inoperative) (specify):                      _____                      (3) Automatic belt use unknown                      (9) Unknown</p>	<p>49. Seat Orientation (this Occupant Position) .....                      (0) Occupant not seated or no seat                      (1) Forward facing seat                      (2) Rear facing seat                      (3) Side facing seat (inward)                      (4) Side facing seat (outward)                      (8) Other (specify):                      _____                      (9) Unknown</p>
<p>46. Automatic (Passive) Belt System Type .....                      (0) Not equipped/not available                      (1) Non-motorized system                      (2) Motorized system                      (9) Unknown</p>	<p>Check the Primary Source Used in Determining Belt Use.</p> <p><input type="checkbox"/> Not equipped/not available/destroyed or rendered inoperative  <input type="checkbox"/> Vehicle inspection  <input type="checkbox"/> Official injury data  <input type="checkbox"/> Driver/occupant interview  <input type="checkbox"/> Other (specify):                      _____  <input type="checkbox"/> Unknown if belt used                      _____                      _____                      _____</p>
<p>47. Proper Use of Automatic (Passive) Belt System .....                      (0) Not equipped/not available/not used                      (1) Automatic belt used properly                      (2) Automatic belt used properly with child safety seat</p> <p><i>Automatic Belt Used Improperly</i>                      (3) Automatic shoulder belt worn under arm                      (4) Automatic shoulder belt worn behind back                      (5) Automatic belt worn around more than one person                      (6) Lap portion of automatic belt worn on abdomen                      (7) Automatic lap and shoulder belt or automatic shoulder belt used improperly with child safety seat (specify):                      _____                      (8) Other improper use of automatic belt system (specify):                      _____                      (9) Unknown</p>	<p>ARE ALL APPLICABLE MEDICAL RECORDS INCLUDED WITH INITIAL SUBMISSION? NO <input type="checkbox"/> YES <input type="checkbox"/></p> <p>UPDATE CANDIDATE? NO <input type="checkbox"/> YES <input type="checkbox"/></p>

<p><b>STOP - VARIABLES 50 THROUGH 53 ARE COMPLETED BY THE ZONE CENTER</b></p>	
<p><b>TRAUMA DATA</b></p>	
<p>50. Glasgow Coma Scale (GCS) Score _____                  (at Medical Facility)                  (00) Not injured                  (01) Injured - not treated at medical facility                  (02) No GCS Score at medical facility                  (03-15) Code the actual value of the initial GCS Score recorded at medical facility.                  (97) Injured, details unknown                  (99) Unknown if injured</p>	<p>53. Primary Source of Belt Use Determination _____                  (0) Not equipped/not available/destroyed or rendered inoperative                  (1) Vehicle inspection                  (2) Official injury data                  (3) Driver/occupant interview                  (8) Other (specify): _____                  (9) Unknown if belt used</p>
<p>51. Was the Occupant Given Blood? _____                  (1) No - blood not given                  (2) Yes - blood given                  (specify units): _____                  (9) Unknown if blood given</p>	
<p>52. Arterial Blood Gases (ABG) - HCO<sub>3</sub> _____                  (00) Not injured                  (01) Injured, ABGs not measured or reported                  (02-50) Code the actual value of the HCO<sub>3</sub>                  (96) ABGs reported, HCO<sub>3</sub> unknown                  (97) Injured, details unknown                  (99) Unknown if injured</p>	

# NASS/CDS Data Elements



U.S. Department of Transportation  
National Highway Traffic Safety  
Administration

## OCCUPANT INJURY FORM

Form Approved  
G.M.S. No. 2127-0021  
NATIONAL ACCIDENT SAMPLING SYSTEM  
CRASHWORTHINESS DATA SYSTEM

1. Primary Sampling Unit Number _____	3. Vehicle Number _____										
2. Case Number - Stratum _____	4. Occupant Number _____										
<b>INJURY DATA</b>											
Record below the actual injuries sustained by this occupant that were identified from the official and unofficial data sources. Remember not to double count an injury just because it was identified from two different sources. If greater than ten injuries have been documented, encode the balance on the Occupant Injury Supplement.											
Source of Injury Data	Body Region	Type of Anatomic Structure	Specific Anatomic Structure	Level of Injury	A.I.S. Severity	Aspect	Injury Source	Injury Source Confidence Level	Direct/Indirect Injury	Occupant Area Intrusion Number	
1st	5. ____	6. ____	7. ____	8. ____	9. ____	10. ____	11. ____	12. ____	13. ____	14. ____	15. ____
2nd	16. ____	17. ____	18. ____	19. ____	20. ____	21. ____	22. ____	23. ____	24. ____	25. ____	26. ____
3rd	27. ____	28. ____	29. ____	30. ____	31. ____	32. ____	33. ____	34. ____	35. ____	36. ____	37. ____
4th	38. ____	39. ____	40. ____	41. ____	42. ____	43. ____	44. ____	45. ____	46. ____	47. ____	48. ____
5th	49. ____	50. ____	51. ____	52. ____	53. ____	54. ____	55. ____	56. ____	57. ____	58. ____	59. ____
6th	60. ____	61. ____	62. ____	63. ____	64. ____	65. ____	66. ____	67. ____	68. ____	69. ____	70. ____
7th	71. ____	72. ____	73. ____	74. ____	75. ____	76. ____	77. ____	78. ____	79. ____	80. ____	81. ____
8th	82. ____	83. ____	84. ____	85. ____	86. ____	87. ____	88. ____	89. ____	90. ____	91. ____	92. ____
9th	93. ____	94. ____	95. ____	96. ____	97. ____	98. ____	99. ____	100. ____	101. ____	102. ____	103. ____
10th	104. ____	105. ____	106. ____	107. ____	108. ____	109. ____	110. ____	111. ____	112. ____	113. ____	114. ____

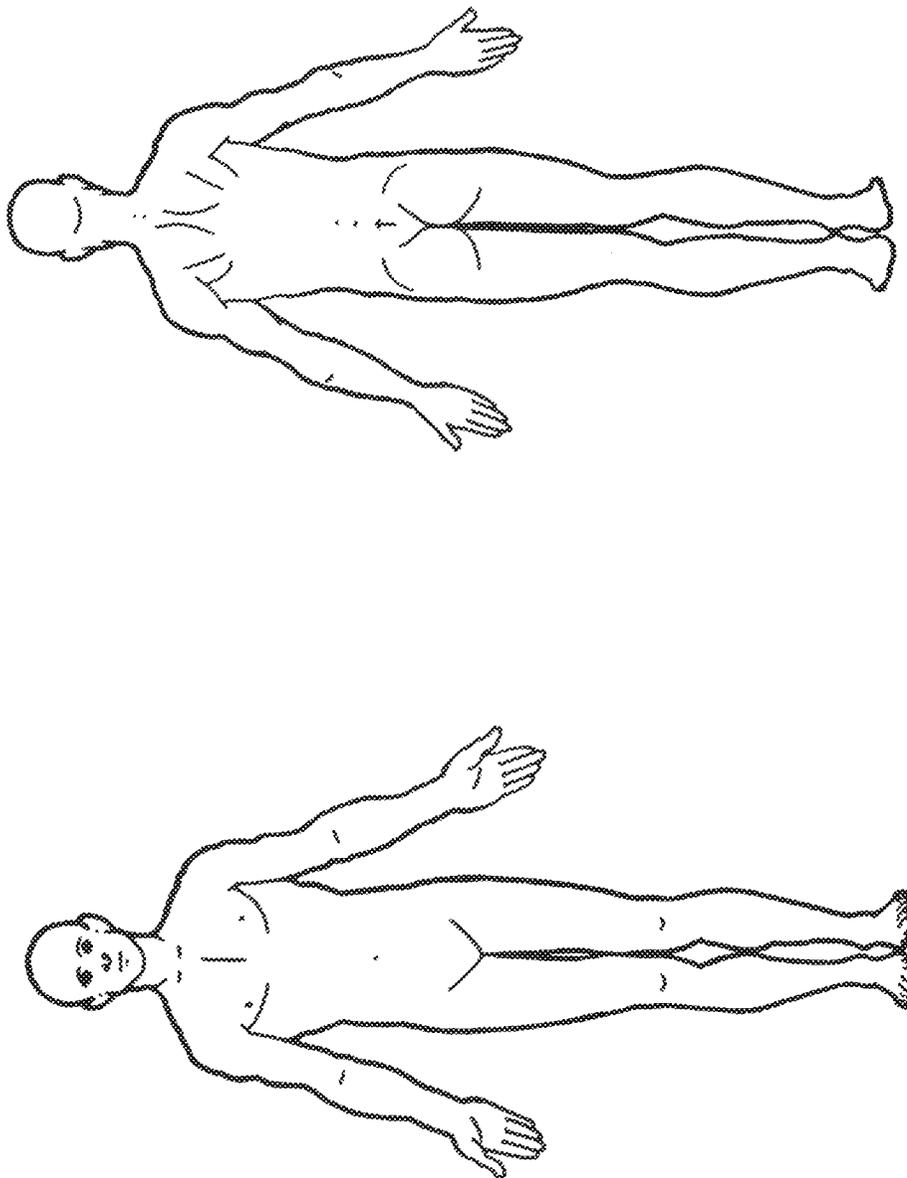
HS Form 433B (1/94)

This report is authorized by P.L. 89-563, Title 1, Section 106, 108, and 112. While you are not required to respond, your cooperation is needed to make the results of this data collection effort comprehensive, accurate, and timely.

OCCUPANT INJURY DATA											
Source of Injury Date	A.I.S. - 90						Injury Source	Injury Source Confidence Level	Direct/Indirect Injury	Occupant Area Intrusion Number	
	Body Region	Type of Anatomic Structure	Specific Anatomic Structure	Level of Injury	A.I.S. Severity	Aspect					
11th	---	---	---	---	---	---	---	---	---	---	
12th	---	---	---	---	---	---	---	---	---	---	
13th	---	---	---	---	---	---	---	---	---	---	
14th	---	---	---	---	---	---	---	---	---	---	
15th	---	---	---	---	---	---	---	---	---	---	
16th	---	---	---	---	---	---	---	---	---	---	
17th	---	---	---	---	---	---	---	---	---	---	
18th	---	---	---	---	---	---	---	---	---	---	
19th	---	---	---	---	---	---	---	---	---	---	
20th	---	---	---	---	---	---	---	---	---	---	
21st	---	---	---	---	---	---	---	---	---	---	
22nd	---	---	---	---	---	---	---	---	---	---	
23rd	---	---	---	---	---	---	---	---	---	---	
24th	---	---	---	---	---	---	---	---	---	---	
25th	---	---	---	---	---	---	---	---	---	---	

**OFFICIAL INJURY DATA — SOFT TISSUE INJURIES**

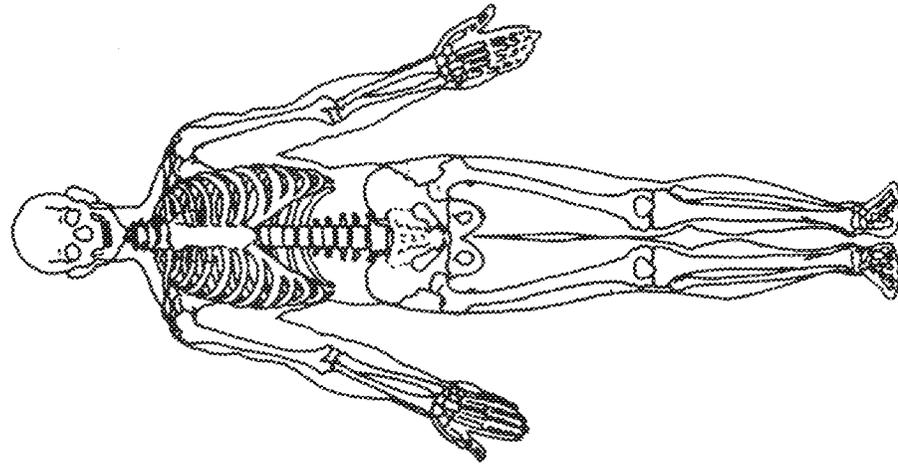
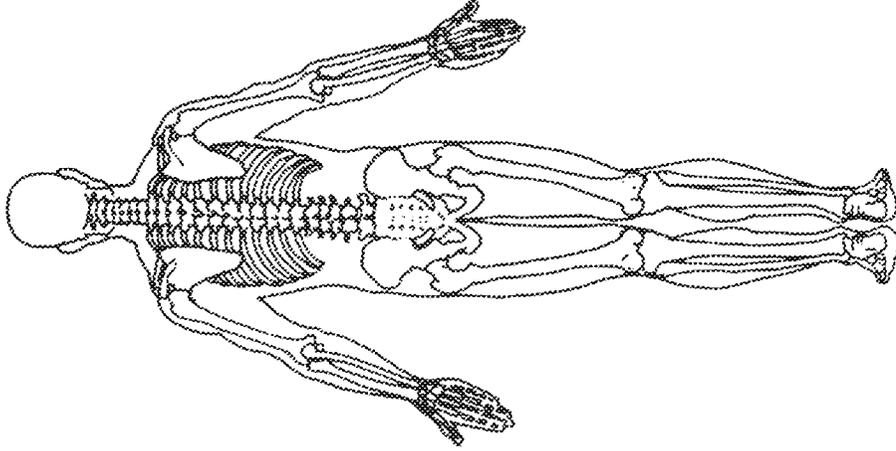
Indicate the Location, Specific Anatomic Structure, Detail (size, depth, fracture type, head injury clinical signs and neurological deficits), and Source of all injuries indicated by official sources (or from PAR or other unofficial sources if medical records and interview data are unavailable.)



<b>SOURCE OF INJURY DATA</b> <b>OFFICIAL</b> (1) Autopsy records with or without hospital/medical records (2) Hospital/medical records other than emergency room (e.g., discharge summary) (3) Emergency room records only (including associated X-rays or other lab reports) (4) Private physician, walk-in or emergency clinic  <b>UNOFFICIAL</b> (5) Lay coroner report (6) E.M.S. personnel (7) Interviewee (8) Other source (specify): _____ (9) Police		(25) Left side window glass or frame (26) Left side window glass including one or more of the following: frame, window sill, A (A1/A2)-pillar, B-pillar, or roof side rail. (27) Other left side object (specify): _____ (28) Left side window sill  <b>RIGHT SIDE</b> (30) Right side interior surface, excluding hardware or armrests (31) Right side hardware or armrest (32) Right A (A1/A2)-pillar (33) Right B-pillar (34) Other right pillar (specify): _____ (35) Right side window glass or frame (36) Right side window glass including one or more of the following: frame, window sill, A (A1/A2)-pillar, B-pillar, or roof side rail. (37) Other right side object (specify): _____ (38) Right side window sill  <b>INTERIOR</b> (40) Seat, back support (41) Belt restraint webbing/buckle (42) Belt restraint B-pillar or door frame attachment point (43) Other restraint system component (specify): _____ (44) Head restraint system (45) Air bag (use codes "18" and "17" for injuries sustained from air bag compartment covers) (46) Other occupants (specify): _____ (47) Interior loose objects (48) Child safety seat (specify): _____ (49) Other interior object (specify): _____  <b>ROOF</b> (50) Front header (51) Rear header (52) Roof left side rail (53) Roof right side rail (54) Roof or convertible top  <b>FLOOR</b> (56) Floor (including toe pan) (57) Floor or console mounted transmission lever, including console (58) Parking brake handle (59) Foot controls including parking brake  <b>REAR</b> (60) Backlight (rear window)		(61) Backlight storage rack, door, etc. (62) Other rear object (specify): _____  <b>EXTERIOR of OCCUPANT'S VEHICLE</b> (66) Hood (69) Outside hardware (e.g., outside mirror, antenna) (67) Other exterior surface or trim (specify): _____ (68) Unknown exterior objects  <b>EXTERIOR OF OTHER MOTOR VEHICLE</b> (70) Front bumper (71) Hood edge (72) Other front of vehicle (specify): _____ (73) Hood (74) Hood ornament (75) Windshield, roof rail, A-pillar (76) Side surface (77) Side mirror (78) Other side protrusions (specify): _____ (79) Rear surface (80) Undercarriage (81) Tires and wheels (82) Other exterior of other motor vehicle (specify): _____ (83) Unknown exterior of other motor vehicle  <b>OTHER VEHICLE OR OBJECT IN THE ENVIRONMENT</b> (84) Ground (85) Other vehicle or object (specify): _____ (86) Unknown vehicle or object  <b>NONCONTACT INJURY</b> (90) Fire in vehicle (81) Flying glass (92) Other noncontact injury source (specify): _____ (93) Air bag exhaust gases (87) Injured, unknown source	
<b>INJURY SOURCE</b> <b>FRONT</b> (01) Windshield (02) Mirror (03) Sunvisor (04) Steering wheel rim (05) Steering wheel hub/spoke (06) Steering wheel combination of codes O4 and O5 (07) Steering column, transmission selector lever, other attachment (08) Add on equipment (e.g., CB, tape deck, air conditioner) (09) Left instrument panel and below (10) Center instrument panel and below (11) Right instrument panel and below (12) Glove compartment door (13) Knee bolster (14) Windshield including one or more of the following: front header, A (A1/A2)-pillar, instrument panel, mirror, or steering assembly (driver side only) (15) Windshield including one or more of the following: front header, A (A1/A2)-pillar, instrument panel, or mirror (passenger side only) (16) Driver side air bag compartment cover (17) Passenger side air bag compartment cover (18) Windshield reinforced by exterior object (specify): _____ (19) Other front object (specify): _____  <b>LEFT SIDE</b> (20) Left side interior surface, excluding hardware or armrests (21) Left side hardware or armrest (22) Left A (A1/A2)-pillar (23) Left B-pillar (24) Other left pillar (specify): _____		<b>INJURY SOURCE CONFIDENCE LEVEL</b> (1) Certain (2) Probable (3) Possible (9) Unknown  <b>DIRECT/INDIRECT INJURY</b> (1) Direct contact injury (2) Indirect contact injury (3) Noncontact injury (7) Injured, unknown source			
<b>OCCUPANT INJURY CLASSIFICATION</b>					
<b>Body Region</b> (1) Head (2) Face (3) Neck (4) Thorax (5) Abdomen (6) Spine (7) Upper Extremity (8) Lower Extremity (9) Unspecified	<b>Specific Anatomic Structure</b> Whole Area (01) Skin - Abrasion (04) Skin - Contusion (06) Skin - Laceration (08) Skin - Avulsion (10) Amputation (20) Burn (30) Crush (40) Degloving (50) Injury - NPS (99) Trauma, other than mechanical	<b>Spine</b> (02) Cervical (04) Thoracic (06) Lumbar  <b>Vessels, Nerves, Organs, Bones, Joints</b> are assigned consecutive two digit numbers beginning with 02  <b>Level of Injury</b> Specific injuries are assigned consecutive two-digit numbers beginning with 02.  To the extent possible, within the organizational framework of the AIS, 00 is assigned to an injury NPS as to severity or where only one injury is given in the dictionary for that anatomic structure. 99 is assigned to any injury NPS as to lesion or severity.	<b>Abbreviated Injury Scale</b> (1) Minor injury (2) Moderate injury (3) Serious injury (4) Severe injury (5) Critical injury (6) Maximum (unrestorable) (7) Injured, unknown severity  <b>Aspect</b> (1) Right (2) Left (3) Bilateral (4) Central (5) Anterior (6) Posterior (7) Superior (8) Inferior (9) Unknown (0) Whole region		
<b>Type of Anatomic Structure</b> (1) Whole Area (2) Vessels (3) Nerves (4) Organs (includes muscles/ligaments) (5) Skeletal (includes joints) (6) Head - LOC (8) Skin	Head - LOC (02) Length of LOC (04, 06, 08) Level of Consciousness (10) Concussion				

**OFFICIAL INJURY DATA - SKELETAL INJURIES**

Indicate the Location, Specific Anatomic Structure, Detail (size, depth, fracture type, fracture type, head injury clinical signs and neurological deficits), and Source of all injuries indicated by official sources for from PAR or other unofficial sources if medical records and interviewee data are unavailable.)



Restrained?

..... No  
..... Yes

Blood Alcohol Level (mg/dl)

BAL = \_\_\_\_\_

Glasgow Coma Scale Score

GCSS = \_\_\_\_\_

Units of Blood Given

Units = \_\_\_\_\_

Arterial Blood Gases

pH = \_\_\_\_\_

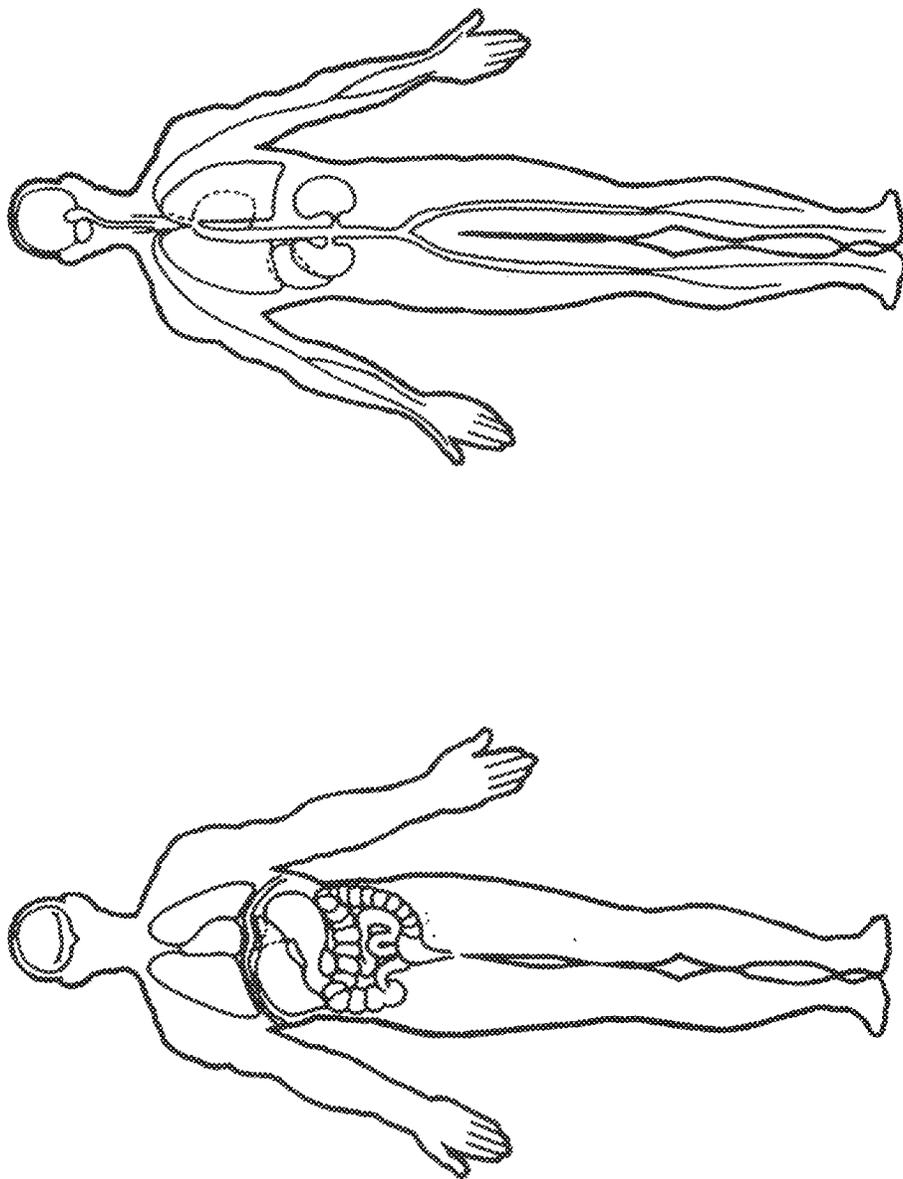
PO<sub>2</sub> = \_\_\_\_\_

PCO<sub>2</sub> = \_\_\_\_\_

HCO<sub>3</sub> = \_\_\_\_\_

**OFFICIAL INJURY DATA — INTERNAL INJURIES**

Indicate the Location, Specific Anatomic Structure, Detail (size, depth, fracture type, head injury clinical signs and neurological deficits), and Source of all injuries indicated by official sources (or from PAR or other unofficial sources if medical records and interview data are unavailable.)



## Appendix E. CRASHPC and OLDMISSPC Summary

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CRASHPC is an acronym for Calspan Reconstruction of Accident Speeds on the Highway. As its name implies, the CRASHPC program is a general-purpose personal computer program that can be used to estimate vehicle speeds in real-world crashes, based on physical evidence obtained by a crash investigator. The objective of the CRASHPC program is to provide a standardized and objective means of interpreting the physical evidence from the scene of an automobile collision.

Two separate and independent methods can be used to estimate the change in vehicle speeds experienced by the vehicles. The first method makes use of trajectory data and is based on work-energy relationships and the principle of conservation of linear momentum. The other method makes use of detailed measurements of the structural deformation of each vehicle to arrive at an estimate of the energy required to produce the observed vehicle damage. These two methods can be used to check each other, since they should yield similar results if the user possesses sufficient information to use both methods fully.

The CRASHPC program is a simplified mathematical analysis of automobile crash events. As is the case with any such analytical procedure, certain assumptions have been made to reduce the complexity and the operating cost of the program. In some particular cases, CRASHPC is not, nor was it intended to be, a high-fidelity collision simulation program. In most crashes, only a minimum of data are available, and even these data are only available second hand.

Beyond its use by Federal Government sponsored researchers, CRASHPC has become a popular tool among reconstructionists involved in litigation, and much of the criticism of the CRASHPC program regards its accuracy in such applications. CRASHPC was intended as a statistical tool to identify and isolate problems in motor vehicle safety, not as a simulation program, and it should be used accordingly. Often, accuracy problems are the result of applying the CRASHPC program in situations which violate, to some degree, its fundamental assumptions:

- It is a two-dimensional program.
- It simplifies the characteristics of vehicles.
- It assumes that at some instant during the impact both vehicles have a common velocity.
- It assumes that the vehicles spin out to rest with constant rolling resistances, no active steering, and over a single friction surface (a secondary friction surface may be specified in the trajectory simulation).

The above assumptions mean that the program cannot be used for: rollovers; sideswipes; severe override/underide crashes; nonhorizontal collision forces; or collisions with large trucks or trains in motion, yielding objects, or pedestrians, bicyclists, or motorcyclists.

The missing vehicle algorithm (OLDMISSPC) methodology is based on CRASHPC.

## Appendix F. Harm Definition

"Harm" is a concept developed by Malliaris [1] for quantifying, or normalizing, the relative consequences of the total estimated number of crash deaths and injured people. Harm is commonly used for prioritization in crashworthiness program planning.

Harm attributes to each surviving injured person and each death a quantity based on the costs (excluding property damage and travel delay costs) associated with each death or injured person. The cost quantities are obtained from National average cost estimates for injured people. National Harm estimates are developed by multiplying the frequency estimates of the incidence of injured people at each severity level by the unit cost estimates of the average losses for that severity of injury. These figures are then summed to arrive at annual National Harm estimates.

Injury costs are estimated in accordance with the Abbreviated Injury Scale (AIS) of six grades of increasing threat-to-life ranging from AIS 1 (Minor) to AIS 6 (Maximum). Table F1 provides the latest "Economic Harm" figures associated with the maximum AIS for a given crash victim using the latest NHTSA estimates of economic costs and injury incidence. Table F2 provides Comprehensive Harm figures that include quantities representing values for pain and suffering costs that are excluded in the "economic" cost schedule.

## Harm Definition

**Table F1. 1990 Economic Harm**

Survivor's Maximum AIS		Unit Costs [2]	Incidence [3]	Harm [4] (Billion Dollars)
Minor	1	\$3,094	4,617,228	\$14
Moderate	2	\$23,674	566,850	\$13
Serious	3	\$78,926	180,110	\$14
Severe	4	\$150,991	21,756	\$3
Critical	5	\$581,811	11,386	\$7
Fatalities		\$693,836	*44,531	\$31
<b>1990 National Estimate of Total Economic Harm</b>				<b>\$82</b>

\*This number was obtained from the 1990 Fatal Analysis Reporting System.

**Table F2. 1990 Comprehensive Harm**

Survivor's Maximum AIS		Unit Costs [2]	Incidence [3]	Harm [4] (Billion Dollars)
Minor	1	\$6,180	4,617,228	\$28
Moderate	2	\$107,638	566,850	\$61
Serious	3	\$400,310	180,110	\$72
Severe	4	\$1,017,331	21,756	\$22
Critical	5	\$2,122,648	11,386	\$24
Fatalities		\$2,620,516	*44,531	\$117
<b>1990 National Estimate of Total Comprehensive Harm</b>				<b>\$324</b>

\*This number was obtained from the 1990 Fatal Analysis Reporting System.

## References

- [1] Malliaris, A., A Search for Priorities in Crash Protection, SAE, 820242, 1982.
- [2] NHTSA, *The Economic Cost of Motor Vehicle Crashes, 1990*, DOT HS 807-876, 9/92, Table II-15.
- [3] NHTSA, *The Economic Cost of Motor Vehicle Crashes, 1990*, DOT HS 807-876, 9/92, Table I-3 (1990 incidence figures).
- [4] NHTSA, *The Economic Cost of Motor Vehicle Crashes, 1990*, DOT HS 807-876, 9/92, Table I-1.

## Appendix G. Statistical Methods

Two aspects of the NASS/CDS statistics presented in this report are discussed in this appendix. These aspects are:

- The univariate imputations of missing data
- The sampling errors for the weighted average counts over the 1992-1994 period.

The method for producing estimates from the 1992-1994 CDS data is to use national ratio-adjusted weights. These sampling weights are appended to the CDS data on the electronic data file. By summing the sampling weights that have a certain characteristic, an estimate of the national total for that characteristic can be produced.

### Imputations of Missing Data

A univariate imputation procedure was used to impute the missing (unknown or uncoded) data for crash mode (Tables 2, 6, and 23-26 of this report). The use of the univariate imputation procedure is illustrated here, using the data for crash modes of towed cars (Table 2). The procedure distributes the missing values of crash mode according to the proportion of all the known values of the crash mode. The crash mode values were defined using the values of the rollover, crash type, and deformation location (GAD1) variables in the CDS data. The assigned values are presented below.

Crash Mode	Definition
1	ROLLOVER = 1, 2, 3
2	ROLLOVER = 4
3	ROLLOVER = 5
4	ROLLOVER = 0 and CRASH TYPE = 1-19 and GAD1 = F
5	ROLLOVER = 0 and CRASH TYPE = 1-19 and GAD1 = L, R
6	ROLLOVER = 0 and CRASH TYPE = 1-19 and GAD1 = B, T, U
7	ROLLOVER = 0 and CRASH TYPE = 1-19 and GAD1 = 9
8	ROLLOVER = 0 and CRASH TYPE = 1-19 and GAD1 = OTHER VALUES
9	ROLLOVER = 0 and CRASH TYPE = 20-98 and GAD1 = F
10	ROLLOVER = 0 and CRASH TYPE = 20-98 and GAD1 = L, R
11	ROLLOVER = 0 and CRASH TYPE = 20-98 and GAD1 = B
12	ROLLOVER = 0 and CRASH TYPE = 20-98 and GAD1 = T, U
13	ROLLOVER = 0 and CRASH TYPE = 20-98 and GAD1 = 9
14	ROLLOVER = 0 and CRASH TYPE = 20-98 and GAD1 = OTHER VALUES
15	OTHER CASES NOT DEFINED ABOVE

## Statistical Methods

The weighted frequency distribution of the data for years 1992-1994 before imputation was:

Crash Mode	Frequency	Percent
1	199,422	3.3
2	92,637	1.5
3	8,209	0.1
4	528,741	8.8
5	161,681	2.7
6	39,214	0.7
8	425,688	7.1
9	1,814,072	30.3
10	995,606	16.6
11	477,720	8.0
12	6,156	0.1
13	274	0.0
14	1,202,791	20.1
15	30,028	0.5
<b>Total</b>	<b>5,982,239</b>	<b>100.0</b>

The crash mode values 7, 8, 13, 14, and 15 were imputed in three steps. In step 1, the crash type value 15 was distributed according to the following proportion distribution of all other crash modes (1-14):

Crash Mode	Frequency	Percent
1	199,422	3.4
2	92,637	1.6
3	8,209	0.1
4	528,741	8.9
5	161,881	2.7
6	39,214	0.7
8	425,688	7.2
9	1,814,072	30.5
10	995,606	16.7
11	477,720	8.0
12	6,156	0.1
13	274	0.0
14	1,202,791	20.2
<b>Total</b>	<b>5,952,212</b>	<b>100.0</b>

In step 2, the crash mode values 7 and 8 were distributed according to the following proportion distribution of crash modes 4-6:

Crash Mode	Frequency	Percent
4	529,989	72.4
5	162,921	22.3
6	39,214	5.4
<b>Total</b>	<b>732,124</b>	<b>100.0</b>

In step 3, the crash mode values 13 and 14 were distributed according to the following proportion distribution of crash modes 9-12:

Crash Mode	Frequency	Percent
9	1,824,012	55.0
10	1,002,153	30.2
11	481,552	14.5
12	6,156	0.2
<b>Total</b>	<b>3,313,873</b>	<b>100.0</b>

After imputing the missing crash modes to known crash modes, the distribution for all cars was as follows:

Crash Mode	Frequency	Percent
1	200,005	3.3
2	92,717	1.5
3	8,209	0.1
4	808,805	13.5
5	292,809	4.9
6	58,104	1.0
9	2,461,851	41.2
10	1,430,123	23.9
11	623,075	10.4
12	6,541	0.1
<b>Total</b>	<b>5,982,239</b>	<b>100.0</b>

### Standard Errors of the CDS Estimates

The national estimates produced from the CDS data may differ from the true values, because they are based on a probability sample of towed cars and not a census of all crashes. The size of these differences may vary depending on which sample was selected. The standard error of an estimate is a measure of the precision or reliability with which an estimate from this particular CDS sample approximates the result of a census.

It is impractical to compute and provide a standard error for each estimate in this report. Instead, generalized standard errors for estimates of totals are presented in the following two tables for vehicle characteristics (Table G1) and for occupant characteristics (Table G2). The generalized standard error tables were produced separately for the vehicle and occupant tables, using three steps:

1. The standard errors for selected estimates in the report were calculated using a Taylor series approximation.
2. An equation that best fit the standard errors was found using regression techniques.
3. Approximate standard errors were generated from this equation, and the generalized standard error tables were produced.

Shown in each table are the values for the estimates and an estimate of one standard error for that value derived from the 1992-1994 CDS data. By adding and subtracting one standard error to the associated estimate, approximate 68 percent confidence intervals for an estimate can be created. The estimated annual average number of small, crash-involved, towed cars is given in Table 1 of the report as 655,298 cars. To calculate one standard error for this estimate, use Table G1 in this appendix. Since 655,298 does not appear in Table G1, use linear interpolation from the standard error values for the estimates 600,000 and 700,000. One approximate standard error would be  $42,414 + 3,555 = 45,969$ . The confidence interval for this estimate would be  $655,298 \pm 45,969$  or 609,329 to 701,267.

The formula used to compute the standard errors is presented below each table. More information on standard error estimates can be obtained from the National Center for Statistics and Analysis.

Table G1  
Crash-Involved Vehicle Characteristics Estimates and Standard Errors

Estimate	Standard Error*	Estimate	Standard Error*
500	500	100,000	9,267
1,000	1,000	200,000	16,262
5,000	1,190	300,000	22,943
10,000	1,812	400,000	29,490
20,000	2,850	500,000	35,969
30,000	3,773	600,000	42,414
40,000	4,634	700,000	48,842
50,000	5,457	800,000	55,265
60,000	6,253	900,000	61,691
70,000	7,028	1,000,000	68,124
80,000	7,767	1,100,000	74,569
90,000	8,532	1,200,000	81,027

$$* SE = e^{a + b(\ln(x))^2}$$

where:

a = 4.600439

b = 0.034205

x = estimate

SE = standard error.

Statistical Methods

Table G2  
Crash-Involved Occupant Characteristics Estimates and Standard Errors

Estimate	Standard Error*	Estimate	Standard Error*
500	500	100,000	7.951
1,000	368	200,000	14,426
5,000	904	300,000	20,773
10,000	1,411	400,000	27,100
20,000	2,281	500,000	33,446
30,000	3,069	600,000	39,825
40,000	3,817	700,000	46,246
50,000	4,538	800,000	52,712
60,000	5,242	900,000	59,226
70,000	5,932	1,000,000	65,788
80,000	6,613	1,100,000	72,399
90,000	7,285	1,200,000	79,057

\*  $SE = e^{a + b(\ln(x))^2}$

where:

a = 4.178656

b = 0.036232

x = estimate

SE = standard error.

## Appendix H. Errata

In the previous report, *National Accident Sampling System/Crashworthiness Data System 1991-1993* (DOT HS 808 296, August 1995), Tables 3 and 7 contained incorrect data. The corrected tables are shown below.

Area of Damage	Crash Frequency by Crash Severity*						Total
	1-10 mph	11-20 mph	21-30 mph	31-40 mph	>40 mph	Unknown	
Front	143,898 34.1%	228,395 54.2%	42,194 10.0%	6,049 1.4%	997 0.2%	419,867 49.9%	841,401 39.2%
Side	71,587 44.5%	74,072 46.1%	14,232 8.8%	826 0.5%	130 0.1%	276,731 63.2%	437,578 20.4%
Rear	17,277 14.1%	55,393 45.1%	47,644 38.8%	2,167 1.8%	304 0.2%	52,564 30.0%	175,950 8.2%
Other	NA --	NA --	NA --	NA --	NA --	81,458 100.0%	81,458 3.8%
Unknown	20,202 30.0%	43,630 64.9%	3,075 4.6%	302 0.4%	44 0.1%	545,986 89.0%	613,239 28.5%
<b>Total</b>	<b>249,342 32.5%</b>	<b>397,852 51.8%</b>	<b>109,023 14.2%</b>	<b>9,271 1.2%</b>	<b>1,459 0.2%</b>	<b>1,382,077 64.3%</b>	<b>2,149,025 100.0%</b>

\*For each area of damage and known crash severity, the first data row shows the number of vehicles, and the second row shows the percentage of the total number of vehicles for which crash severities were known. For the "Unknown" column, the second data row shows the percentage of the total for each area of damage. For the "Total" column, the second data row shows the percentage of the grand total.

**Table 7**  
**Distribution of Towed Light Trucks by Crash Severity (delta-v)**  
**and Area of Damage: Weighted Average per Year, 1991-1993**

Area of Damage	Crash Frequency by Crash Severity*						Total
	1-10 mph	11-20 mph	21-30 mph	31-40 mph	>40 mph	Unknown	
Front	22,143	79,323	14,646	934	531	134,153	251,729
	18.8%	67.5%	12.5%	0.8%	0.5%	53.3%	38.1%
Side	13,012	9,744	1,044	171	0	67,606	91,577
	54.3%	40.6%	4.4%	0.7%	0.0%	73.8%	13.8%
Rear	812	7,355	600	21	0	10,170	18,958
	9.2%	83.7%	6.8%	0.2%	--	53.6%	2.9%
Other	138	82	0	0	0	43,838	44,057
	62.8%	37.2%	--	--	--	99.5%	6.7%
Unknown	5,925	42,811	768	0	0	205,801	255,105
	12.0%	86.5%	1.6%	--	--	80.6%	38.6%
<b>Total</b>	<b>40,729</b>	<b>134,675</b>	<b>15,703</b>	<b>1,041</b>	<b>480</b>	<b>468,798</b>	<b>661,426</b>
	<b>21.1%</b>	<b>69.9%</b>	<b>8.2%</b>	<b>0.5%</b>	<b>0.2%</b>	<b>70.9%</b>	<b>100.0%</b>

\*For each area of damage and known crash severity, the first data row shows the number of vehicles, and the second row shows the percentage of the total number of vehicles for which crash severities were known. For the "Unknown" column, the second data row shows the percentage of the total for each area of damage. For the "Total" column, the second data row shows the percentage of the grand total.