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

# *National Automotive Sampling System Crashworthiness Data System 1994 -1996*

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## Executive Summary


During the period 1994 through 1996, an estimated 11.4 million vehicles each year were involved in police-reported traffic crashes. Approximately 93 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 47,000 passenger 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 decision making, 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, Passenger 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 67 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 percent of the time, with passengers in the second and further seats about 13 percent of the time. For occupants of light trucks, front-seat passengers were present 20 percent of the time, with passengers in the second and further seats about 17 percent of the time.

One of the health-care consequences of motor vehicle crashes is the burden on emergency and health services. About 243,000 occupants of passenger vehicles were hospitalized each year as a result of police-reported traffic crashes. Another 1,321,000 occupants were transported to a medical facility and released, and 369,000 occupants were treated at the scene of the crash.

Contact with the steering assembly accounted for about 10 percent of the minor injuries (AIS 1-2) but about 15 percent of the serious-maximum (AIS 3+) injuries. A similar pattern was observed for contact with the interior side surface, comprising 7 percent of the minor injuries and 15 percent of serious and greater injuries.

Approximately 288,000 injuries to occupants resulted from contacting an air bag. Around 97 percent were minor injuries, and about 1 percent were serious injuries.

About 4 percent of the towed cars in crashes rolled over, compared with 16 percent of the towed light trucks.

Eight percent of car occupants in rollover crashes were ejected; the remaining crash types exhibited ejection rates in the range of 0.1 to 1.5 percent.

The belt use rate for all occupants of passenger vehicles was about 75 percent.

The alcohol involvement rate for drivers of both passenger cars and light trucks in traffic crashes is highest for the age group 25-34 years.

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 Fatality 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 1994 through 1996, 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.

## 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 1994 through 1996. 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 1994-1996 period are provided in Appendix F.

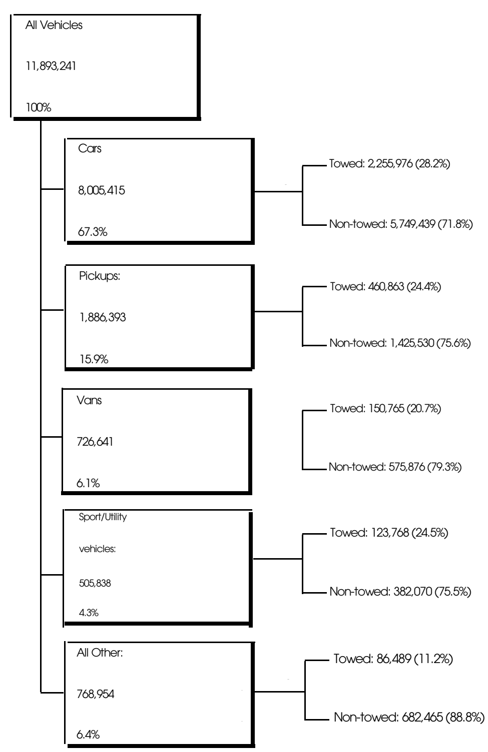
# 2. Perspective

A perspective on crash-involved vehicles is provided in Figure 1, which shows the annual incidence averaged over the years 1994-1996.

The number of vehicles of all body types involved in police-reported crashes each year in the United States is about 11,400,000; about 93.0 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.

**Figure 1**

**Crash-Involved Vehicles in the United States, Average per Year, 1994-1996**




Note: For those vehicles where tow status is unknown it is assumed that the vehicles were not towed. While all vehicles are addressed by NASS/GES, only towed passenger vehicles are addressed by NASS/CDS.
Source: NASS/CDS and NASS/GES, 1994-1996.

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 1994-1996, the average number of registered passenger vehicles per year, as reported by R.L. Polk & Co., was 185,765,664, of which 123,283,749 (66.4 percent) were passenger cars and 62,481,915 (33.6 percent) were light trucks.

# 3. Vehicle Crash Data

## Car Size

About 2,544,000 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, 1994-1996**

| WEIGHT CLASS | TOTAL SAMPLE | ANNUAL AVERAGE | |
|---|---|---|---|
| | | PERCENT | COUNT |
| SMALL (<2,500 LBS) | 4,762 | 33.3% | 846,069 |
| MID-SIZE (2,500-3,000 LBS) | 4,536 | 35.0% | 890,969 |
| LARGE (>3,000 LBS) | 4,631 | 30.3% | 772,190 |
| UNKNOWN SIZE | 256 | 1.4% | 35,066 |
| TOTAL | 14,185 | 100.0% | 2,544,293 |

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 58 percent of all towed car crashes. Side damage and all other nonrollover crash types account for 29 percent and 9 percent, respectively. Rollover car crashes account for the remaining 4 percent.

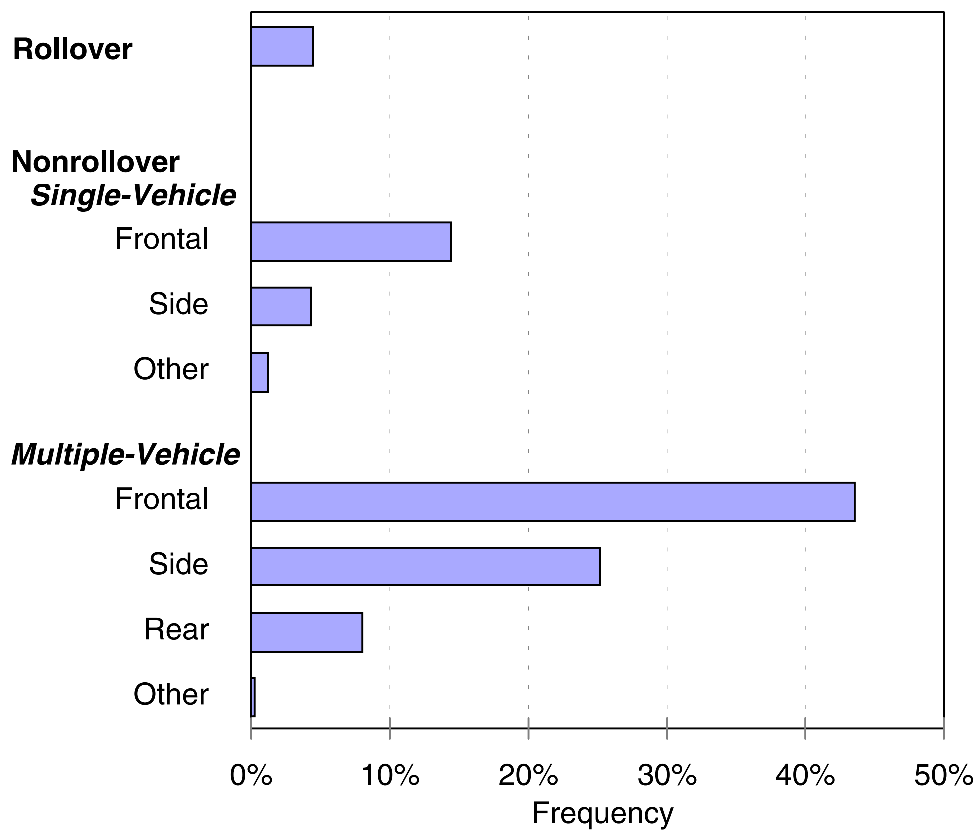
These crash frequencies do not reflect the distribution of harmful outcomes to the car occupants. Certain crash types are associated with higher proportions of injury. For example, although rollover occurs in about 4 percent of towed car crashes, it is responsible for about 13 percent of the harm-weighted injuries to car occupants in towed crashes. On the other hand, car crashes with rear damage account for about 9 percent of the cases but are responsible for about 5 percent of the harm-weighted injuries to occupants (see Table 25).

**TABLE 2**
**DISTRIBUTION OF TOWED CAR CRASH MODES AND AREAS OF DAMAGE, 1994-1996**

| CRASH MODE AND AREA OF DAMAGE | TOTAL SAMPLE | ANNUAL AVERAGE | |
|---|---|---|---|
| | | PERCENT | COUNT |
| ROLLOVER | | | |
| 1-3 QUARTER TURNS | 568 | 2.8% | 71,340 |
| 4+ QUARTER TURNS | 443 | 1.4% | 36,254 |
| END OVER END | 38 | 0.1% | 1,827 |
| *TOTAL ROLLOVER* | *1,049* | *4.3%* | *109,421* |
| NONROLLOVER | | | |
| SINGLE-VEHICLE | | | |
| FRONTAL DAMAGE | 1,989 | 14.2% | 362,350 |
| SIDE DAMAGE | 565 | 4.1% | 104,425 |
| REAR, TOP, OR UNDER DAMAGE | 73 | 1.0% | 25,007 |
| TOTAL SINGLE-VEHICLE | 2,627 | 19.3% | 491,782 |
| MULTIPLE-VEHICLE | | | |
| FRONTAL DAMAGE | 6,196 | 43.4% | 1,104,169 |
| SIDE DAMAGE | 3,380 | 25.0% | 636,588 |
| REAR DAMAGE | 919 | 7.9% | 200,319 |
| TOP OR UNDER DAMAGE | 14 | 0.1% | 2,014 |
| TOTAL MULTIPLE-VEHICLE | 10,509 | 76.4% | 1,943,090 |
| *TOTAL NONROLLOVER* | *13,136* | *95.7%* | *2,434,872* |
| TOTAL TOWED CAR CRASHES | 14,185 | 100.0% | 2,544,293 |

NOTE: DAMAGE AREA “UNKNOWN” HAS BEEN IMPUTED INTO THE KNOWN DAMAGE AREAS.

**Figure 2**
**Distribution of Towed Car Crash Modes and Areas of Damage, 1994-1996**




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, 1994-1996.

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, 1994-1996.

## 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.

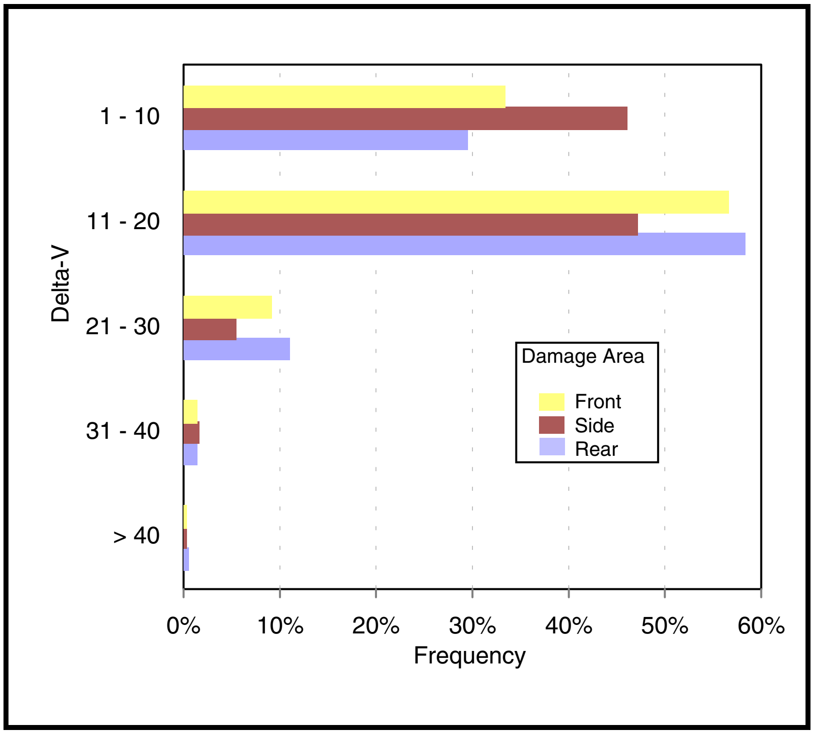
Great caution is recommended in the use and interpretation of crash severity data, for two reasons: (a) the large number of unknowns; and (b) the sharp reduction in the number of available cases as crash severity increases. For "Unknown" area of damage in Table 3, crash severity was calculated using 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, 1994-1996**

| AREA OF DAMAGE | CRASH FREQUENCY BY CRASH SEVERITY* | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1-10 MPH | 11-20 MPH | 21-30 MPH | 31-40 MPH | >40 MPH | UNKNOWN | TOTAL |
| FRONT | 217,353 | 368,872 | 57,659 | 6,991 | 1,477 | 382,295 | 1,034,646 |
| | 33.3% | 56.5% | 8.8% | 1.1% | 0.2% | 36.9% | 40.7% |
| SIDE | 144,746 | 148,240 | 16,480 | 5,753 | 242 | 218,918 | 534,377 |
| | 45.9% | 47.0% | 5.2% | 1.8% | 0.1% | 41.0% | 21.0% |
| REAR | 31,131 | 61,872 | 11,587 | 1,303 | 367 | 44,579 | 150,840 |
| | 29.3% | 58.2% | 10.9% | 1.2% | 0.3% | 29.6% | 5.9% |
| OTHER | 0 | 0 | 0 | 0 | 0 | 68,925 | 68,925 |
| | - | - | - | - | - | 100.0% | 2.7% |
| UNKNOWN | 4,753 | 3,542 | 117 | 0 | 0 | 747,092 | 755,505 |
| | 56.5% | 42.1% | 1.4% | 0.0% | 0.0% | 98.9% | 29.7% |
| TOTAL | 397,983 | 582,526 | 85,843 | 14,047 | 2,086 | 1,461,809 | 2,544,293 |
| | 36.8% | 53.8% | 7.9% | 1.3% | 0.2% | 57.5% | 100.0% |

*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 IN THAT ROW 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.

**Figure 3**
**Distribution of Towed Car Crashes by Crash Severity and Area of Damage, 1994-1996**




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 10 percent, 37 percent, 28 percent, 16 percent, and 8 percent for frontal impacts, compared with the corresponding crash proportions of 33 percent, 57 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 97 percent for side impacts and 98 percent for rear impacts.

## Seating Position of Car Occupants

Every year, approximately 3.8 million people are involved in crashes as occupants of towed cars. Table 4 shows the distribution of occupant seating positions for towed cars from 1994 through 1996.

The distribution pattern—about 67 percent drivers, 21 percent right front passengers, and 12 percent all other—is roughly the same as for all cars regardless of crash involvement.

**TABLE 4**
**OCCUPANT SEATING POSITIONS IN TOWED CARS, 1994-1996**

| CAR OCCUPANTS | TOTAL SAMPLE | ANNUAL AVERAGE | |
|---|---|---|---|
| | | PERCENT | COUNT |
| DRIVERS | 14,146 | 66.7% | 2,532,969 |
| RIGHT FRONT PASSENGERS | 5,064 | 20.5% | 780,160 |
| SECOND SEAT PASSENGERS | 3,221 | 11.8% | 448,201 |
| OTHER PASSENGERS | 287 | 1.0% | 36,774 |
| TOTAL | 22,718 | 100.0% | 3,798,104 |

## Functional Class and Size of Light Trucks

About 785,000 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, 1994-1996**

| | | ANNUAL AVERAGE | |
|---|---|---|---|
| VEHICLE CATEGORY AND SIZE | TOTAL SAMPLE | PERCENT | COUNT |
| COMPACT PICKUP | 1,345 | 29.4% | 231,107 |
| STANDARD PICKUP | 1,292 | 21.0% | 165,241 |
| UNKNOWN SIZE PICKUP | 44 | 0.8% | 6,163 |
| | | | |
| MINIVAN | 734 | 14.1% | 110,595 |
| STANDARD VAN | 429 | 9.5% | 74,723 |
| UNKNOWN SIZE VAN | 36 | 0.4% | 3,192 |
| | | | |
| COMPACT UTILITY VEHICLE | 1,038 | 20.3% | 159,594 |
| STANDARD UTILITY VEHICLE | 247 | 4.2% | 33,066 |
| UNKNOWN SIZE UTILITY VEHICLE | 12 | 0.2% | 1,709 |
| TOTAL | 5,177 | 100.0% | 785,390 |

## 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 3 to 4 times that for passenger cars. Table 6 shows the distribution of towed light trucks among the primary crash modes and areas of damage.

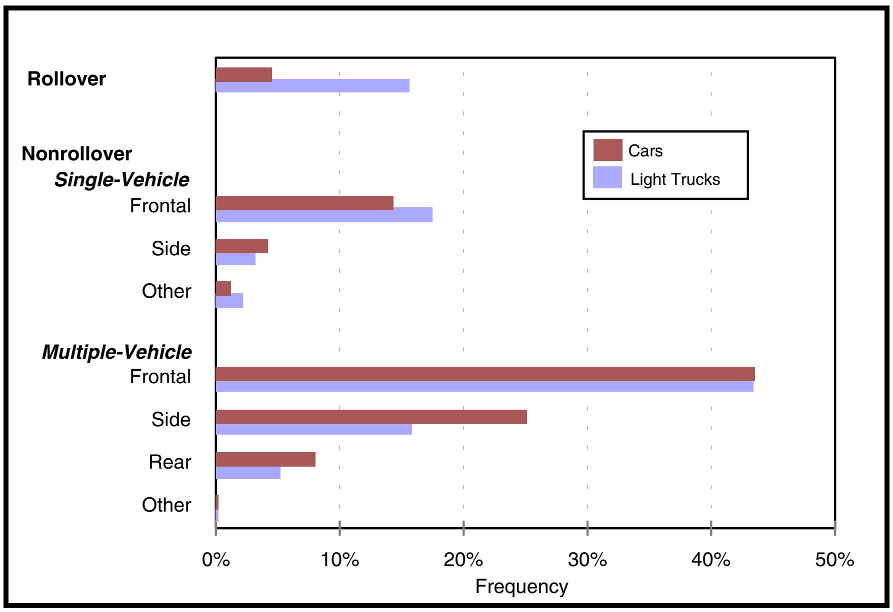
**TABLE 6**
**DISTRIBUTION OF TOWED LIGHT TRUCK CRASH MODES AND AREAS OF DAMAGE, 1994-1996**

| CRASH MODE AND AREA OF DAMAGE | TOTAL SAMPLE | ANNUAL AVERAGE | |
|---|---|---|---|
| | | PERCENT | COUNT |
| ROLLOVER | | | |
| 1-3 QUARTER TURNS | 613 | 10.0% | 78,439 |
| 4+ QUARTER TURNS | 444 | 5.4% | 42,570 |
| END OVER END | 16 | 0.1% | 450 |
| *TOTAL ROLLOVER* | *1,073* | *15.5%* | *121,459* |
| NONROLLOVER | | | |
| SINGLE-VEHICLE | | | |
| FRONTAL DAMAGE | 679 | 17.3% | 135,613 |
| SIDE DAMAGE | 140 | 3.0% | 23,210 |
| REAR, TOP, OR UNDER DAMAGE | 14 | 0.2% | 1,918 |
| TOTAL SINGLE-VEHICLE | 833 | 20.5% | 160,741 |
| MULTIPLE-VEHICLE | | | |
| FRONTAL DAMAGE | 2,380 | 43.2% | 339,519 |
| SIDE DAMAGE | 692 | 15.7% | 123,457 |
| REAR DAMAGE | 196 | 5.1% | 40,174 |
| TOP OR UNDER DAMAGE | 3 | 0.0% | 40 |
| TOTAL MULTIPLE-VEHICLE | 3,271 | 64.1% | 503,190 |
| *TOTAL NONROLLOVER* | *4,104* | *84.5%* | *663,931* |
| TOTAL CRASHES | 5,177 | 100.0% | 785,390 |

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 1994 through 1996.

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 (16 percent and 4 percent, respectively) and result in a greater proportion of harmful outcomes to the vehicle occupants (37 percent and 13 percent, respectively). The proportion of harm-weighted injuries (37 percent) associated with rollover crashes is the average for three vehicle classes -pickups, vans, and sport/utility vehicles (see Table 26). For these three classes the proportion of harmful outcomes varies significantly: rollover accounts for approximately 37 percent of all harm associated with pickups, 29 percent for vans, and 45 percent for sport/utility vehicles

**Figure 4**
**Distribution of Crash Modes and Areas of Damage:**
**Comparison of Cars vs. Light Trucks, 1994-1996**




NOTE: THE "OTHER" CATEGORY FOR SINGLE-VEHICLE CRASHES INCLUDES REAR, TOP, AND UNDER DAMAGE. FOR MULTIPLE-VEHICLE CRASHES, "OTHER" INCLUDES TOP AND UNDER DAMAGE.

## 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, for frontal impact, the injury proportions (not shown) in the five crash severity intervals used in Table 7 are 7 percent, 27 percent, 29 percent, 18 percent, and 20 percent for frontal impacts, and the corresponding crash proportions are 39 percent, 48 percent, 10 percent, 2 percent, and less than 1 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 80 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, 1994-1996**

| | CRASH FREQUENCY BY CRASH SEVERITY* | | | | | | |
|---|---|---|---|---|---|---|---|
| AREA OF DAMAGE | 1-10 MPH | 11-20 MPH | 21-30 MPH | 31-40 MPH | >40 MPH | UNKNOWN | TOTAL |
| FRONT | 67,304 | 81,479 | 17,753 | 3,073 | 1,185 | 140,678 | 311,472 |
| | 39.4% | 47.7% | 10.4% | 1.8% | 0.7% | 45.2% | 39.7% |
| SIDE | 39,068 | 20,333 | 3,609 | 129 | 16 | 53,728 | 116,883 |
| | 61.9% | 32.2% | 5.7% | 0.2% | 0.0% | 46.0% | 14.9% |
| REAR | 5,021 | 10,331 | 364 | 37 | 0 | 10,691 | 26,444 |
| | 31.9% | 65.6% | 2.3% | 0.2% | 0.0% | 40.4% | 3.4% |
| OTHER | 0 | 0 | 0 | 0 | 0 | 39,652 | 39,652 |
| | – | – – | – | | – | 100.0% | 5.0% |
| UNKNOWN | 150 | 406 | 11 | 0 | 0 | 290,372 | 290,940 |
| | 26.4% | 71.5% | 1.9% | 0.0% | 0.0% | 99.8% | 37.0% |
| TOTAL | 111,543 | 112,549 | 21,737 | 3,239 | 1,201 | 535,121 | 785,390 |
| | 44.6% | 45.0% | 8.7% | 1.3% | 0.5% | 68.1% | 100.0% |

## Seating Position of Light Truck Occupants

Approximately 1,225,000 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 1994 through 1996.

The distribution pattern—about 63 percent drivers, 20 percent right front passengers, and 17 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).

**TABLE 8**
**OCCUPANT SEATING POSITIONS IN TOWED LIGHT TRUCKS, 1994-1996**

| VEHICLE OCCUPANTS | TOTAL SAMPLE | ANNUAL AVERAGE | |
|---|---|---|---|
| | | PERCENT | COUNT |
| DRIVERS | 5,156 | 63.4% | 776,920 |
| RIGHT FRONT PASSENGERS | 1,726 | 19.9% | 244,121 |
| SECOND SEAT PASSENGERS | 805 | 7.5% | 92,409 |
| OTHER PASSENGERS | 604 | 9.1% | 111,064 |
| TOTAL | 8,291 | 100.0% | 1,224,514 |

# 4. Occupant Injury Data

## Crash-Involved Occupants by Injury Severity

Approximately 3,800,000 occupants are involved in towed car crashes every year. About 49 percent of them are uninjured, and 51 percent are injured at various severity levels. Similarly, about 1,225,000 occupants are involved in towed light truck crashes per year, with about 55 percent uninjured and 45 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 51 percent for AIS=5; about 24 percent for AIS=4; declining rapidly to almost 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.

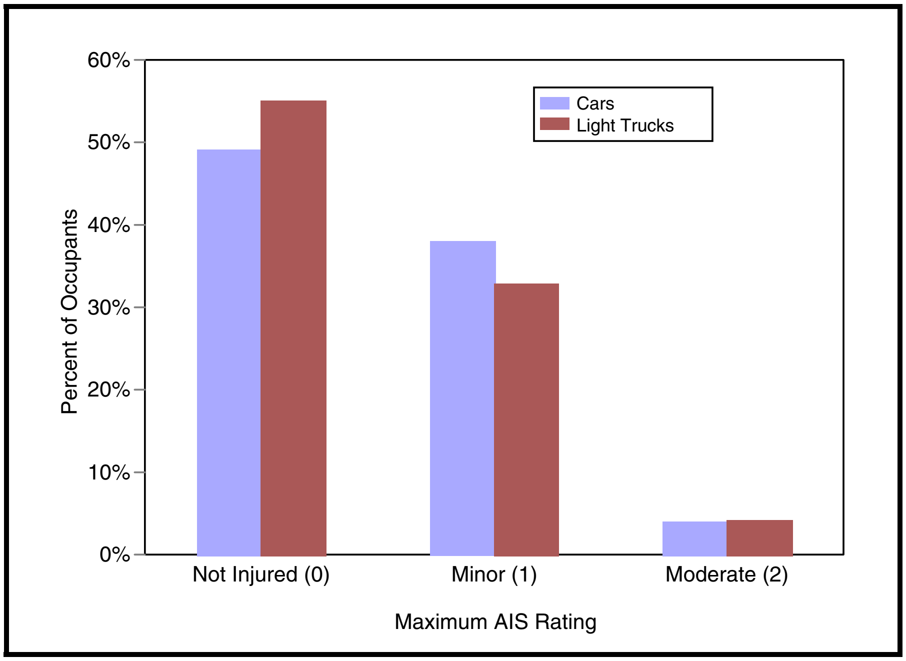
**TABLE 9**
**DISTRIBUTION OF CRASH-INVOLVED**
**CAR OCCUPANTS BY MAXIMUM INJURY SEVERITY:**
**AVERAGE PER YEAR, 1994-1996**

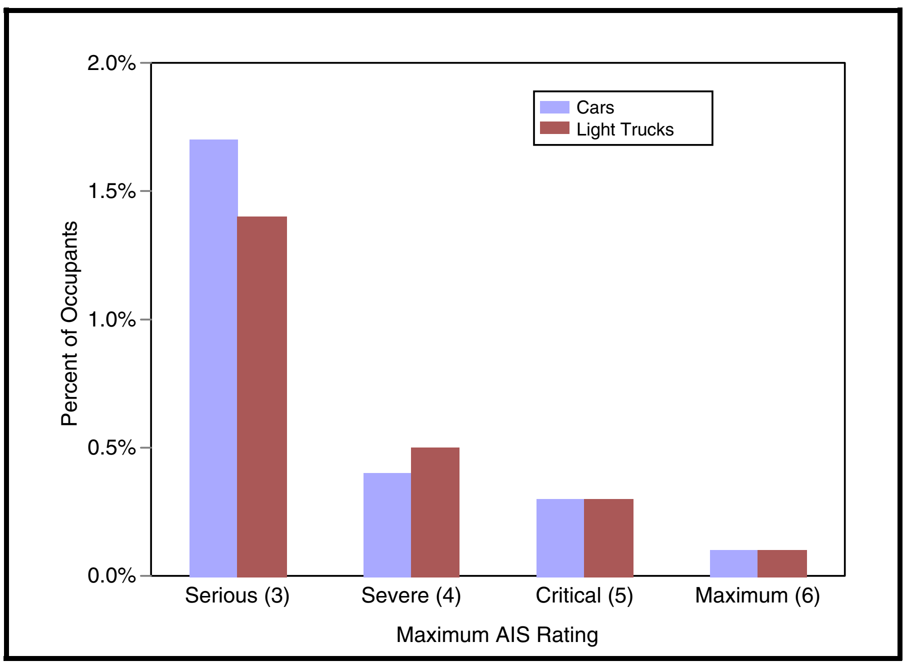
| MAXIMUM AIS RATING | COUNT | PERCENT |
|---|---|---|
| NOT INJURED (0) | 1,863,648 | 49.1% |
| MINOR (1) | 1,443,812 | 38.0% |
| MODERATE (2) | 151,919 | 4.0% |
| SERIOUS (3) | 64,479 | 1.7% |
| SEVERE (4) | 13,943 | 0.4% |
| CRITICAL (5) | 9,540 | 0.3% |
| MAXIMUM (6) | 3,364 | 0.1% |
| *TOTAL, KNOWN SEVERITY* | *3,550,706* | *93.5%* |
| INJURED, SEVERITY UNKNOWN (7) | 207,341 | 5.5% |
| TOTAL | 3,798,104 | 100.0% |

**TABLE 10**
**DISTRIBUTION OF CRASH-INVOLVED**
**LIGHT TRUCK OCCUPANTS BY MAXIMUM INJURY SEVERITY:**
**AVERAGE PER YEAR, 1994-1996**

| MAXIMUM AIS RATING | COUNT | PERCENT |
|---|---|---|
| NOT INJURED (0) | 675,165 | 55.1% |
| MINOR (1) | 403,107 | 32.9% |
| MODERATE (2) | 51,367 | 4.2% |
| SERIOUS (3) | 17,490 | 1.4% |
| SEVERE (4) | 6,225 | 0.5% |
| CRITICAL (5) | 3,156 | 0.3% |
| MAXIMUM (6) | 1,601 | 0.1% |
| *TOTAL, KNOWN SEVERITY* | *1,158,111* | *94.6%* |
| INJURED, SEVERITY UNKNOWN (7) | 57,770 | 4.7% |
| TOTAL | 1,224,514 | 100.0% |

**Figure 5**
**Distribution of Crash-Involved Occupant Injuries**
**by Maximum Injury Severity: Cars vs. Light Trucks, 1995-1996**



## Use of Belts

The annual distribution of injuries to crash-involved car occupants by maximum injury severity and belt 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 BELT USE AND MAXIMUM INJURY SEVERITY: AVERAGE PER YEAR, 1994-1996**

| BELT USE | FREQUENCY OF INJURY BY MAXIMUM AIS RATING* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NOT INJURED (0) | MINOR (1) | MODERATE (2) | SERIOUS (3) | SEVERE (4) | CRITICAL (5) | MAXIMUM (6) | INJURED, SEVERITY UNKNOWN (7) | TOTAL |
| NONE | 267,314 | 372,119 | 64,938 | 29,997 | 7,695 | 5,514 | 1,650 | 27,856 | 789,094 |
| | 17.6% | 27.1% | 45.4% | 50.6% | 58.4% | 62.9% | 65.0% | 25.1% | 24.3% |
| AUTOMATIC BELT | 327,889 | 244,606 | 27,057 | 12,451 | 2,769 | 1,169 | 385 | 20,416 | 636,988 |
| | 21.5% | 17.8% | 18.9% | 21.0% | 21.0% | 13.3% | 15.2% | 18.4% | 19.6% |
| MANUAL BELT | 862,436 | 747,911 | 50,379 | 16,788 | 2,584 | 2,029 | 472 | 62,266 | 1,748,457 |
| | 56.7% | 54.5% | 35.2% | 28.3% | 19.6% | 23.2% | 18.6% | 56.2% | 53.8% |
| BELT WITH CHILD SEAT | 64,747 | 8,933 | 752 | 18 | 138 | 51 | 31 | 315 | 74,985 |
| | 4.3% | 0.7% | 0.5% | 0.0% | 1.0% | 0.6% | 1.2% | 0.3% | 2.3% |
| *TOTAL, RESTRAINED* | *1,255,072* | *1,001,450* | *78,188* | *29,257* | *5,491* | *3,249* | *888* | *82,997* | *2,460,430* |
| | *82.4%* | *72.9%* | *54.6%* | *49.4%* | *41.6%* | *37.1%* | *35.0%* | *74.9%* | *75.7%* |
| TOTAL KNOWN | 1,522,386 | 1,373,569 | 143,126 | 59,254 | 13,186 | 8,763 | 2,538 | 110,853 | 3,249,524 |
| | 81.7% | 95.1% | 94.2% | 91.9% | 94.6% | 91.8% | 75.4% | 53.5% | 85.6% |
| UNKNOWN | 341,262 | 70,244 | 8,793 | 5,225 | 758 | 778 | 826 | 96,487 | 548,580 |
| | 18.3% | 4.9% | 5.8% | 8.1% | 5.4% | 8.2% | 24.6% | 46.5% | 14.4% |
| TOTAL | 1,863,648 | 1,443,813 | 151,919 | 64,479 | 13,944 | 9,541 | 3,364 | 207,340 | 3,798,104 |
| | 49.1% | 38.0% | 4.0% | 1.7% | 0.4% | 0.3% | 0.1% | 5.5% | 100.0% |

*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" IN THAT COLUMN. 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 IF INJURED".

Overall, belt use is approximately 76 percent for passenger car occupants and 71 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 66 percent in 1993, 67 percent in 1994, and 68 percent in 1995.

**TABLE 12**
**DISTRIBUTION OF CRASH-INVOLVED LIGHT TRUCK OCCUPANTS BY BELT USE AND MAXIMUM INJURY SEVERITY: AVERAGE PER YEAR, 1994-1996**

| BELT USE | FREQUENCY OF INJURY BY MAXIMUM AIS RATING* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NOT INJURED (0) | MINOR (1) | MODERATE (2) | SERIOUS (3) | SEVERE (4) | CRITICAL (5) | MAXIMUM (6) | INJURED, SEVERITY UNKNOWN (7) | TOTAL |
| NONE | 107,905 | 138,722 | 24,137 | 11,080 | 4,819 | 2,393 | 659 | 11,814 | 307,417 |
| | 19.7% | 35.9% | 49.7% | 66.6% | 82.1% | 80.3% | 62.2% | 33.5% | 29.2% |
| AUTOMATIC BELT | 2,318 | 1,577 | 406 | 17 | 0 | 0 | 0 | 0 | 4,318 |
| | 0.4% | 0.4% | 0.8% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.4% |
| MANUAL BELT | 426,032 | 244,583 | 23,916 | 5,499 | 1,050 | 586 | 400 | 23,333 | 725,857 |
| | 77.6% | 63.3% | 49.3% | 33.0% | 17.9% | 19.7% | 37.8% | 66.2% | 69.0% |
| BELT WITH | 12,432 | 1,565 | 69 | 45 | 0 | 0 | 0 | 112 | 14,222 |
| CHILD SEAT | 2.3% | 0.4% | 0.1% | 0.3% | 0.0% | 0.0% | 0.0% | 0.3% | 1.4% |
| *TOTAL,* | *440,782* | *247,725* | *24,391* | *5,561* | *1,050* | *586* | *400* | *23,445* | *744,397* |
| *RESTRAINED* | *80.3%* | *64.1%* | *50.3%* | *33.4%* | *17.9%* | *19.7%* | *37.8%* | *66.5%* | *70.8%* |
| TOTAL KNOWN | 548,687 | 386,447 | 48,528 | 16,641 | 5,869 | 2,979 | 1,059 | 35,259 | 1,051,814 |
| | 81.3% | 95.9% | 94.5% | 95.2% | 94.3% | 94.4% | 66.1% | 61.0% | 85.9% |
| UNKNOWN | 126,480 | 16,661 | 2,840 | 848 | 355 | 176 | 543 | 22,512 | 172,700 |
| | 18.7% | 4.1% | 5.5% | 4.8% | 5.7% | 5.6% | 33.9% | 39.0% | 14.1% |
| TOTAL | 675,167 | 403,108 | 51,368 | 17,489 | 6,224 | 3,155 | 1,602 | 57,771 | 1,224,514 |
| | 55.1% | 32.9% | 4.2% | 1.4% | 0.5% | 0.3% | 0.1% | 4.7% | 100.0% |

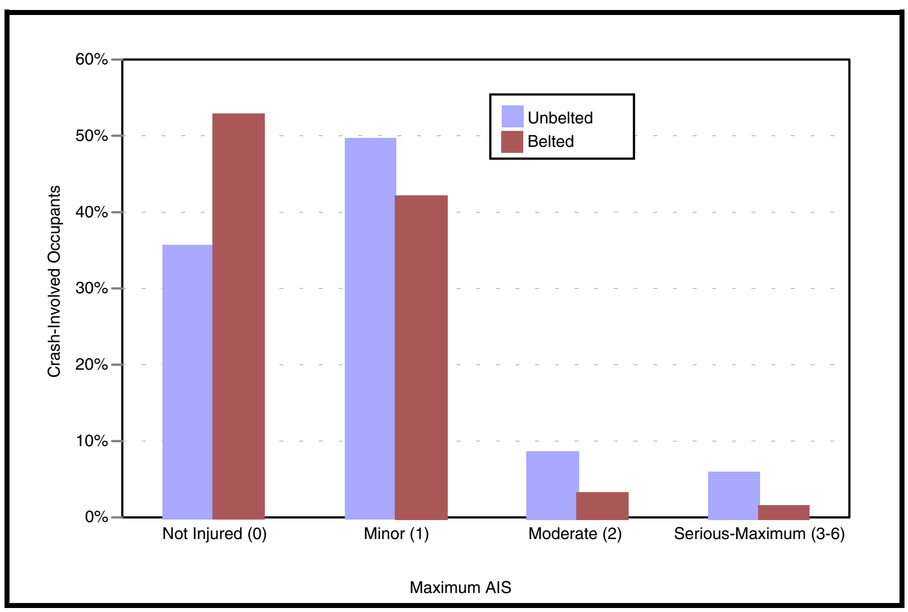
*FOR EACH KNOWN BELT USE CATEGORY, THE FIRST DATA ROW SHOWS THE NUMBER OF INJURIES AND THE SECOND ROW SHOWS THE PERCENTAGE OF THE "TOTAL KNOWN" IN THAT COLUMN. FOR THE "TOTAL KNOWN" AND "UNKNOWN" BELT USE CATEGORIES, THE FIRST ROW SHOWS THE NUMBER OF INJURIES AND THE SECOND ROW SHOWS THE PERCENTAGE OF 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 IF INJURED."

## Effect of Belt 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 belts is lower than that for unbelted 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 belted versus unbelted occupants at high injury severities. It is likely that belted occupants, who usually have a higher awareness of safety than the unbelted, are also the occupants who usually avoid crashes of high severities. Thus, the advantage of belted 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 belts.

**Figure 6**
**Injury Rates for Crash-Involved Car Occupants by Maximum Injury Severity as a Function of Belt-Use, 1994-1996**



## 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.

**TABLE 13**
**DISTRIBUTION OF CRASH-INVOLVED CAR OCCUPANTS BY TREATMENT AND MAXIMUM INJURY SEVERITY: AVERAGE PER YEAR, 1994-1996**

| TREATMENT | FREQUENCY OF INJURY BY MAXIMUM AIS RATING* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NOT INJURED (0) | MINOR (1) | MODERATE (2) | SERIOUS (3) | SEVERE (4) | CRITICAL (5) | MAXIMUM (6) | INJURED, SEVERITY UNKNOWN (7) | TOTAL |
| NONE | 1,755,391 | 341,630 | 4,690 | 0 | 0 | 0 | 0 | 38,918 | 2,147,728 |
| | 81.7% | 15.9% | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 1.8% | 56 5% |
| TREATED | 21,832 | 223,483 | 10,138 | 538 | 0 | 0 | 0 | 33,266 | 289,777 |
| AT SCENE | 7.5% | 77.1% | 3.5% | 0.2% | 0.0% | 0.0% | 0.0% | 11.5% | 7 6% |
| TRANSPORTED | 76,662 | 815,911 | 75,124 | 12,833 | 81 | 16 | 0 | 49,492 | 1,030,895 |
| AND RELEASED | 7.4% | 79.1% | 7.3% | 1.2% | 0.0% | 0.0% | 0.0% | 4.8% | 27 1% |
| HOSPITALIZED | 3,330 | 40,439 | 34,389 | 15,663 | 2,568 | 533 | 0 | 3,053 | 99,975 |
| 1-2 DAYS | 3.3% | 40.4% | 34.4% | 15.7% | 2.6% | 0.5% | 0.0% | 3.1% | 2 6% |
| | 326 | 8,599 | 21,098 | 17,990 | 4,269 | 1,145 | 0 | 774 | 54,202 |
| 3-7 DAYS | 0.6% | 15.9% | 38.9% | 33.2% | 7.9% | 2.1% | 0.0% | 1.4% | 1 4% |
| | 43 | 268 | 3,217 | 10,294 | 1,759 | 1,433 | 0 | 29 | 17,044 |
| 8-14 DAYS | 0.3% | 1.6% | 18.9% | 60.4% | 10.3% | 8.4% | 0.0% | 0.2% | 0 4% |
| | 0 | 327 | 1,684 | 3,726 | 1,237 | 999 | 0 | 33 | 8,007 |
| 15-30 DAYS | 0.0% | 4.1% | 21.0% | 46.5% | 15.4% | 12.5% | 0.0% | 0.4% | 0 2% |
| | 0 | 38 | 160 | 1,048 | 724 | 504 | 27 | 0 | 2,499 |
| >30 DAYS | 0.0% | 1.5% | 6.4% | 41.9% | 29.0% | 20.2% | 1.1% | 0.0% | 0.1% |
| FATAL | 0 | 1,077 | 1,272 | 2,362 | 3,306 | 4,909 | 3,338 | 2,912 | 19,177 |
| | 0.0% | 5.6% | 6.6% | 12.3% | 17.2% | 25.6% | 17.4% | 15.2% | 0.5% |
| UNKNOWN | 6,064 | 12,040 | 147 | 24 | 0 | 0 | 0 | 78,863 | 128,800 |
| | 4.7% | 9.3% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 61.2% | 3.4% |
| TOTAL | 1,863,648 | 1,443,812 | 151,919 | 64,479 | 13,943 | 9,540 | 3,364 | 207,341 | 3,798,104 |
| | 49.1% | 38.0% | 4.0% | 1.7% | 0.4% | 0.3% | 0.1% | 5.5% | 100.0% |

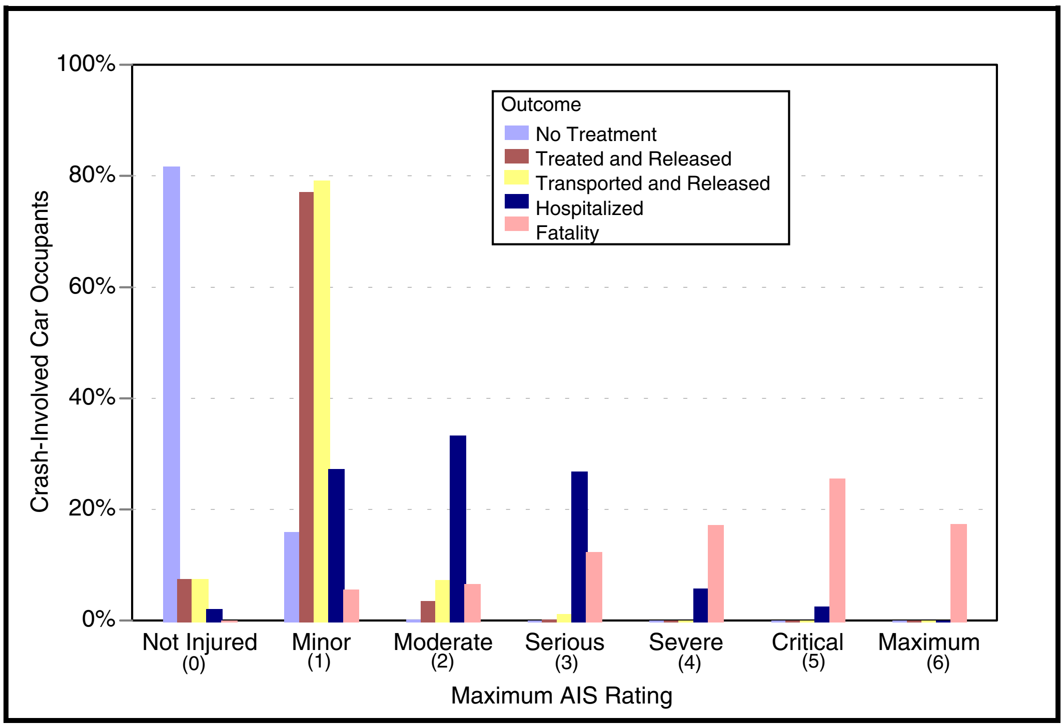
*FOR EACH TREATMENT CATEGORY, THE FIRST DATA ROW SHOWS THE NUMBER OF INJURIES AND THE SECOND ROW SHOWS THE PERCENTAGE OF THE ROW TOTAL. THE ROW TOTALS INCLUDE THE NUMBER OF "UNKNOWN IF INJURED."

## TABLE 14
## DISTRIBUTION OF CRASH-INVOLVED LIGHT TRUCK OCCUPANTS BY TREATMENT AND MAXIMUM INJURY SEVERITY: AVERAGE PER YEAR, 1994-1996

| TREATMENT | FREQUENCY OF INJURY BY MAXIMUM AIS RATING* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NOT INJURED (0) | MINOR (1) | MODERATE (2) | SERIOUS (3) | SEVERE (4) | CRITICAL (5) | MAXIMUM (6) | INJURED, SEVERITY UNKNOWN (7) | TOTAL |
| NONE | 646,139 | 87,387 | 60 | 0 | 0 | 0 | 0 | 17,652 | 752,000 |
| | 85.9% | 11.6% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.3% | 61 4% |
| TREATED AT SCENE | 15,165 | 57,849 | 1,509 | 41 | 0 | 0 | 0 | 4,883 | 79,522 |
| | 19.1% | 72.7% | 1.9% | 0.1% | 0.0% | 0.0% | 0.0% | 6.1% | 6 5% |
| TRANSPORTED AND RELEASED | 11,329 | 240,825 | 26,066 | 1,477 | 0 | 0 | 0 | 9,957 | 289,653 |
| | 3.9% | 83.1% | 9.0% | 0.5% | 0.0% | 0.0% | 0.0% | 3.4% | 23 7% |
| HOSPITALIZED 1-2 DAYS | 392 | 12,142 | 14,412 | 3,769 | 1,423 | 157 | 0 | 1,658 | 34,001 |
| | 1.2% | 35.7% | 42.4% | 11.1% | 4.2% | 0.5% | 0.0% | 4.9% | 2 8% |
| 3-7 DAYS | 42 | 3,154 | 5,267 | 6,080 | 1,422 | 141 | 0 | 32 | 16,138 |
| | 0.3% | 19.5% | 32.6% | 37.7% | 8.8% | 0.9% | 0.0% | 0.2% | 1 3% |
| 8-14 DAYS | 6 | 110 | 1,829 | 2,793 | 989 | 285 | 0 | 4 | 6,016 |
| | 0.1% | 1.8% | 30.4% | 46.4% | 16.4% | 4.7% | 0.0% | 0.1% | 0 5% |
| 15-30 DAYS | 0 | 25 | 1,748 | 1,970 | 288 | 301 | 0 | 24 | 4,355 |
| | 0.0% | 0.6% | 40.1% | 45.2% | 6.6% | 6.9% | 0.0% | 0.6% | 0 4% |
| >30 DAYS | 0 | 0 | 120 | 359 | 275 | 152 | 3 | 0 | 908 |
| | 0.0% | 0.0% | 13.2% | 39.5% | 30.3% | 16.7% | 0.3% | 0.0% | 0.1% |
| FATAL | 0 | 529 | 325 | 983 | 1,828 | 2,120 | 1,598 | 1,836 | 9,220 |
| | 0.0% | 5.7% | 3.5% | 10.7% | 19.8% | 23.0% | 17.3% | 19.9% | 0.8% |
| UNKNOWN | 2,093 | 1,086 | 30 | 18 | 0 | 0 | 0 | 21,726 | 32,700 |
| | 6.4% | 3.3% | 0.1% | 0.1% | 0.0% | 0.0% | 0.0% | 66.4% | 2.7% |
| TOTAL | 675,165 | 403,107 | 51,367 | 17,490 | 6,225 | 3,156 | 1,601 | 57,770 | 1,224,514 |
| | 55.1% | 32.9% | 4.2% | 1.4% | 0.5% | 0.3% | 0.1% | 4.7% | 100.0% |

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.

**Figure 7**
**Annual Incidence of Injured Crash-Involved Car Occupants, by Maximum Injury Severity and Treatment, 1994-1996**



## 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, (b) the severity of the crash, and possibly the severity of the outcome in terms of survivability. 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 35 through 44 age range and then the 21- through 24-year-old drivers. Table 16 shows that, for drivers of light trucks, those whose age is between 25 and 34 have the highest alcohol use rate, followed by drivers 15 through 20 years old and then by those 35 through 44 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 alsmost 3 times those for drivers with no alcohol present. Approximately 24 percent of the MAIS 6 injuries are the result of alcohol involvement, followed by 23 percent of the MAIS 5 injuries and 18 percent of the MAIS 4 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.

## TABLE 15
## DISTRIBUTION OF CRASH-INVOLVED CAR DRIVERS BY AGE GROUP AND ALCOHOL USE: AVERAGE PER YEAR, 1994-1996

| POLICE-REPORTED ALCOHOL USE | AGE GROUP (YEARS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 15-20 | 21-24 | 25-34 | 35-44 | 45-64 | 65 | UNKNOWN | TOTAL |
| NO ALCOHOL PRESENT | 447,146 | 280,812 | 480,055 | 363,468 | 354,019 | 205,835 | 11,205 | 2,142,538 |
| | 20.9% | 13.1% | 22.4% | 17.0% | 16.5% | 9.6% | 0.5% | 84.6% |
| ALCOHOL PRESENT | 27,404 | 27,984 | 64,193 | 36,986 | 19,355 | 4,851 | 4,130 | 184,903 |
| | 14.8% | 15.1% | 34.7% | 20.0% | 10.5% | 2.6% | 2.2% | 7.3% |
| NOT REPORTED | 42,743 | 15,643 | 26,115 | 20,563 | 21,752 | 16,171 | 15,355 | 158,342 |
| | 27.0% | 9.9% | 16.5% | 13.0% | 13.7% | 10.2% | 9.7% | 6.3% |
| NOT CODED | 5,997 | 12,095 | 7,870 | 3,878 | 3,617 | 799 | 12,929 | 47,186 |
| | 12.7% | 25.6% | 16.7% | 8.2% | 7.7% | 1.7% | 27.4% | 1.9% |
| TOTAL | 523,290 | 336,533 | 578,233 | 424,894 | 398,743 | 227,657 | 43,619 | 2,532,969 |
| | 20.7% | 13.3% | 22.8% | 16.8% | 15.7% | 9.0% | 1.7% | 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.
NOT REPORTED: VARIABLE IS NOT AVAILABLE ON THE POLICE CRASH REPORT.
NOT CODED: POLICE OFFICE DID NOT PROVIDE THE INFORMATION.

## TABLE 16
## DISTRIBUTION OF CRASH-INVOLVED LIGHT TRUCK DRIVERS BY AGE GROUP AND ALCOHOL USE: AVERAGE PER YEAR, 1994-1996

| POLICE-REPORTED ALCOHOL USE | AGE GROUP (YEARS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 15-20 | 21-24 | 25-34 | 35-44 | 45-64 | 65 | UNKNOWN | TOTAL |
| NO ALCOHOL PRESENT | 121,117 | 60,306 | 161,778 | 140,285 | 127,989 | 26,800 | 1,582 | 639,857 |
| | 18.9% | 9.4% | 25.3% | 21.9% | 20.0% | 4.2% | 0.2% | 82.1% |
| ALCOHOL PRESENT | 17,463 | 13,892 | 21,421 | 15,834 | 15,329 | 760 | 1,768 | 86,466 |
| | 20.2% | 16.1% | 24.8% | 18.3% | 17.7% | 0.9% | 2.0% | 11.1% |
| NOT REPORTED | 5,183 | 2,079 | 14,553 | 4,950 | 5,309 | 718 | 1,652 | 34,442 |
| | 15.0% | 6.0% | 42.3% | 14.4% | 15.4% | 2.1% | 4.8% | 4.4% |
| NOT CODED | 3,016 | 1,748 | 1,848 | 2,314 | 1,669 | 1,783 | 6,308 | 18,685 |
| | 16.1% | 9.4% | 9.9% | 12.4% | 8.9% | 9.5% | 33.8% | 2.4% |
| TOTAL | 146,778 | 78,024 | 199,599 | 163,382 | 150,295 | 30,062 | 11,310 | 779,450 |
| | 18.8% | 10.0% | 25.6% | 21.0% | 19.3% | 3.9% | 1.5% | 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.
NOT REPORTED: VARIABLE IS NOT AVAILABLE ON THE POLICE CRASH REPORT.
NOT CODED: POLICE OFFICE DID NOT PROVIDE THE INFORMATION.

**TABLE 17**
**DISTRIBUTION OF CRASH-INVOLVED CAR DRIVERS BY ALCOHOL USE AND MAXIMUM INJURY SEVERITY: AVERAGE PER YEAR, 1994-1996**

| POLICE-REPORTED ALCOHOL USE | FREQUENCY OF INJURY BY MAXIMUM AIS RATING* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NOT INJURED (0) | MINOR (1) | MODERATE (2) | SERIOUS (3) | SEVERE (4) | CRITICAL (5) | MAXIMUM (6) | INJURED, SEVERITY UNKNOWN (7) | TOTAL |
| NO ALCOHOL PRESENT | 1,017,247 | 862,458 | 90,720 | 35,973 | 5,252 | 3,603 | 805 | 121,243 | 2,142,538 |
| | 47.5% | 40.3% | 4.2% | 1.7% | 0.2% | 0.2% | 0.0% | 5.7% | 84.6% |
| ALCOHOL PRESENT | 69,748 | 78,238 | 13,002 | 5,983 | 1,765 | 1,556 | 487 | 11,807 | 184,903 |
| | 37.7% | 42.3% | 7.0% | 3.2% | 1.0% | 0.8% | 0.3% | 6.4% | 7.3% |
| NOT REPORTED | 64,537 | 65,731 | 6,397 | 1,917 | 692 | 561 | 528 | 6,326 | 158,342 |
| | 40.8% | 41.5% | 4.0% | 1.2% | 0.4% | 0.4% | 0.3% | 4.0% | 6.3% |
| NOT CODED | 22,310 | 10,273 | 1,637 | 2,082 | 1,903 | 1,082 | 180 | 1,550 | 47,186 |
| | 47.3% | 21.8% | 3.5% | 4.4% | 4.0% | 2.3% | 0.4% | 3.3% | 1.9% |
| TOTAL | 1,173,842 | 1,016,701 | 111,756 | 45,954 | 9,612 | 6,802 | 2,000 | 140,925 | 2,532,969 |
| | 46.3% | 40.1% | 4.4% | 1.8% | 0.4% | 0.3% | 0.1% | 5.6% | 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. THE ROW TOTALS INCLUDE THE NUMBER OF "UNKNOWN IF INJURED."
NOT REPORTED: VARIABLE IS NOT AVAILABLE ON THE POLICE CRASH REPORT.
NOT CODED: POLICE OFFICE DID NOT PROVIDE THE INFORMATION.

**TABLE 18**
**DISTRIBUTION OF CRASH-INVOLVED LIGHT TRUCK DRIVERS BY ALCOHOL USE AND MAXIMUM INJURY SEVERITY: AVERAGE PER YEAR, 1994-1996**

| POLICE-REPORTED ALCOHOL USE | FREQUENCY OF INJURY BY MAXIMUM AIS RATING* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | NOT INJURED (0) | MINOR (1) | MODERATE (2) | SERIOUS (3) | SEVERE (4) | CRITICAL (5) | MAXIMUM (6) | INJURED, SEVERITY UNKNOWN (7) | TOTAL |
| NO ALCOHOL PRESENT | 330,223 | 239,746 | 21,865 | 8,342 | 2,355 | 1,225 | 372 | 35,281 | 639,857 |
| | 51.6% | 37.5% | 3.4% | 1.3% | 0.4% | 0.2% | 0.1% | 5.5% | 82.1% |
| ALCOHOL PRESENT | 32,964 | 40,353 | 5,033 | 1,771 | 1,165 | 471 | 147 | 2,782 | 86,466 |
| | 38.1% | 46.7% | 5.8% | 2.0% | 1.3% | 0.5% | 0.2% | 3.2% | 11.1% |
| NOT REPORTED | 19,772 | 5,328 | 6,136 | 336 | 112 | 115 | 111 | 2,416 | 34,442 |
| | 57.4% | 15.5% | 17.8% | 1.0% | 0.3% | 0.3% | 0.3% | 7.0% | 4.4% |
| NOT CODED | 4,489 | 3,079 | 1,860 | 1,045 | 781 | 233 | 819 | 992 | 18,685 |
| | 24.0% | 16.5% | 10.0% | 5.6% | 4.2% | 1.2% | 4.4% | 5.3% | 2.4% |
| TOTAL | 387,447 | 288,506 | 34,894 | 11,495 | 4,413 | 2,044 | 1,450 | 41,470 | 779,450 |
| | 49.7% | 37.0% | 4.5% | 1.5% | 0.6% | 0.3% | 0.2% | 5.3% | 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. THE ROW TOTALS INCLUDE THE NUMBER OF "UNKNOWN IF INJURED."
NOT REPORTED: VARIABLE IS NOT AVAILABLE ON THE POLICE CRASH REPORT.
NOT CODED: POLICE OFFICE DID NOT PROVIDE THE INFORMATION.

## Body Regions Injured in Traffic Crashes

There are about 2,544,000 cars towed away from traffic crashes every year. The incidence of crash-involved occupants in these cars is about 3,800,000 per year. Of these, about 1,934,000 car occupants per year are injured, incurring about 4,844,000 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, 1994-1996**

| | FREQUENCY OF INJURY BY AIS RATING* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| BODY REGION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
| HEAD (BRAIN) | 39,344 | 62,493 | 22,228 | 11,435 | 8,751 | 747 | 0 | 144,998 |
| | 27.1% | 43.1% | 15.3% | 7.9% | 6.0% | 0.5% | 0.0% | |
| | 0.9% | 19.6% | 16.6% | 36.9% | 57.2% | 20.2% | 0.0% | |
| HEAD (SKULL) | 0 | 3,534 | 5,511 | 2,171 | 0 | 443 | 0 | 11,658 |
| | 0.0% | 30.3% | 47.3% | 18.6% | 0.0% | 3.8% | 0.0% | |
| | 0.0% | 1.1% | 4.1% | 7.0% | 0.0% | 12.0% | 0.0% | |
| HEAD (OTHER) | 0 | 442 | 21 | 47 | 38 | 0 | 8,117 | 8,666 |
| | 0.0% | 5.1% | 0.2% | 0.5% | 0.4% | 0.0% | 93.7% | |
| | 0.0% | 0.1% | 0.0% | 0.2% | 0.2% | 0.0% | 31.4% | |
| FACE | 74,232 | 17,465 | 4,810 | 107 | 0 | 0 | 42 | 96,654 |
| | 76.8% | 18.1% | 5.0% | 0.1% | 0.0% | 0.0% | 0.0% | |
| | 1.7% | 5.5% | 3.6% | 0.3% | 0.0% | 0.0% | 0.2% | |
| NECK | 371,631 | 236 | 35 | 22 | 0 | 10 | 2,240 | 374,174 |
| | 99.3% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.6% | |
| | 8.6% | 0.1% | 0.0% | 0.1% | 0.0% | 0.3% | 8.7% | |
| CHEST | 28,607 | 24,818 | 34,755 | 10,673 | 4,087 | 1,876 | 8,812 | 113,628 |
| | 25.2% | 21.8% | 30.6% | 9.4% | 3.6% | 1.7% | 7.8% | |
| | 0.7% | 7.8% | 26.0% | 34.4% | 26.7% | 50.7% | 34.1% | |
| SHOULDER AND BACK | 196,256 | 49,404 | 4,222 | 90 | 0 | 0 | 1,423 | 251,395 |
| | 78.1% | 19.7% | 1.7% | 0.0% | 0.0% | 0.0% | 0.6% | |
| | 4.5% | 15.5% | 3.2% | 0.3% | 0.0% | 0.0% | 5.5% | |

*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 19 (CONTINUED)**
**DISTRIBUTION OF ALL INJURIES TO CRASH-INVOLVED CAR OCCUPANTS**
**BY BODY REGION AND SEVERITY: AVERAGE PER YEAR, 1994-1996**

| BODY REGION | FREQUENCY OF INJURY BY AIS RATING* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
| ABDOMEN | 809 | 20,263 | 4,557 | 5,052 | 1,326 | 4 | 4,421 | 36,432 |
| | 2.2% | 55.6% | 12.5% | 13.9% | 3.6% | 0.0% | 12.1% | |
| | 0.0% | 6.4% | 3.4% | 16.3% | 8.7% | 0.1% | 17.1% | |
| SPINE | 0 | 0 | 467 | 1,372 | 732 | 192 | 0 | 2,763 |
| | 0.0% | 0.0% | 16.9% | 49.7% | 26.5% | 6.9% | 0.0% | |
| | 0.0% | 0.0% | 0.3% | 4.4% | 4.8% | 5.2% | 0.0% | |
| UPPER EXTREMITIES | 61,518 | 35,663 | 23,057 | 0 | 0 | 0 | 651 | 120,889 |
| | 50.9% | 29.5% | 19.1% | 0.0% | 0.0% | 0.0% | 0.5% | |
| | 1.4% | 11.2% | 17.3% | 0.0% | 0.0% | 0.0% | 2.5% | |
| PELVIS | 0 | 16,954 | 8,377 | 23 | 36 | 0 | 0 | 25,390 |
| | 0.0% | 66.8% | 33.0% | 0.1% | 0.1% | 0.0% | 0.0% | |
| | 0.0% | 5.3% | 6.3% | 0.1% | 0.2% | 0.0% | 0.0% | |
| LOWER EXTREMITIES | 42,337 | 83,608 | 25,231 | 6 | 0 | 0 | 132 | 151,313 |
| | 28.0% | 55.3% | 16.7% | 0.0% | 0.0% | 0.0% | 0.1% | |
| | 1.0% | 26.2% | 18.9% | 0.0% | 0.0% | 0.0% | 0.5% | |
| SKIN | 3,500,721 | 3,793 | 241 | 0 | 7 | 430 | 0 | 3,505,192 |
| | 99.9% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 81.1% | 1.2% | 0.2% | 0.0% | 0.0% | 11.6% | 0.0% | |
| ALL OTHER | 11 | 16 | 129 | 33 | 315 | 0 | 0 | 503 |
| | 2.2% | 3.2% | 25.6% | 6.6% | 62.6% | 0.0% | 0.0% | |
| | 0.0% | 0.0% | 0.1% | 0.1% | 2.1% | 0.0% | 0.0% | |
| TOTAL | 4,315,465 | 318,690 | 133,639 | 31,030 | 15,293 | 3,702 | 25,837 | 4,843,655 |

*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**
**DISTRIBUTION OF ALL INJURIES TO CRASH-INVOLVED LIGHT TRUCK OCCUPANTS BY BODY REGION AND SEVERITY: AVERAGE PER YEAR, 1994-1996**

| BODY REGION | FREQUENCY OF INJURY BY AIS RATING* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
| HEAD (BRAIN) | 16,450 | 26,768 | 8,485 | 5,145 | 3,068 | 235 | 0 | 60,150 |
| | 27.3% | 44.5% | 14.1% | 8.6% | 5.1% | 0.4% | 0.0% | |
| | 1.2% | 21.8% | 19.1% | 40.1% | 62.7% | 12.6% | 0.0% | |
| HEAD (SKULL) | 0 | 2,157 | 3,052 | 1,401 | 0 | 512 | 0 | 7,122 |
| | 0.0% | 30.3% | 42.9% | 19.7% | 0.0% | 7.2% | 0.0% | |
| | 0.0% | 1.8% | 6.9% | 10.9% | 0.0% | 27.4% | 0.0% | |
| HEAD (OTHER) | 0 | 12 | 0 | 85 | 0 | 0 | 6,811 | 6,908 |
| | 0.0% | 0.2% | 0.0% | 1.2% | 0.0% | 0.0% | 98.6% | |
| | 0.0% | 0.0% | 0.0% | 0.7% | 0.0% | 0.0% | 58.0% | |
| FACE | 22,810 | 10,325 | 1,843 | 0 | 0 | 0 | 17 | 34,995 |
| | 65.2% | 29.5% | 5.3% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 1.7% | 8.4% | 4.1% | 0.0% | 0.0% | 0.0% | 0.1% | |
| NECK | 89,616 | 116 | 13 | 0 | 0 | 6 | 0 | 89,750 |
| | 99.9% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 6.5% | 0.1% | 0.0% | 0.0% | 0.0% | 0.3% | 0.0% | |
| CHEST | 5,938 | 7,354 | 8,689 | 4,352 | 1,041 | 542 | 1,608 | 29,523 |
| | 20.1% | 24.9% | 29.4% | 14.7% | 3.5% | 1.8% | 5.4% | |
| | 0.4% | 6.0% | 19.6% | 33.9% | 21.3% | 29.0% | 13.7% | |
| SHOULDER AND BACK | 46,265 | 20,447 | 2,748 | 0 | 0 | 0 | 0 | 69,460 |
| | 66.6% | 29.4% | 4.0% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 3.4% | 16.6% | 6.2% | 0.0% | 0.0% | 0.0% | 0.0% | |

*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, 1994-1996**

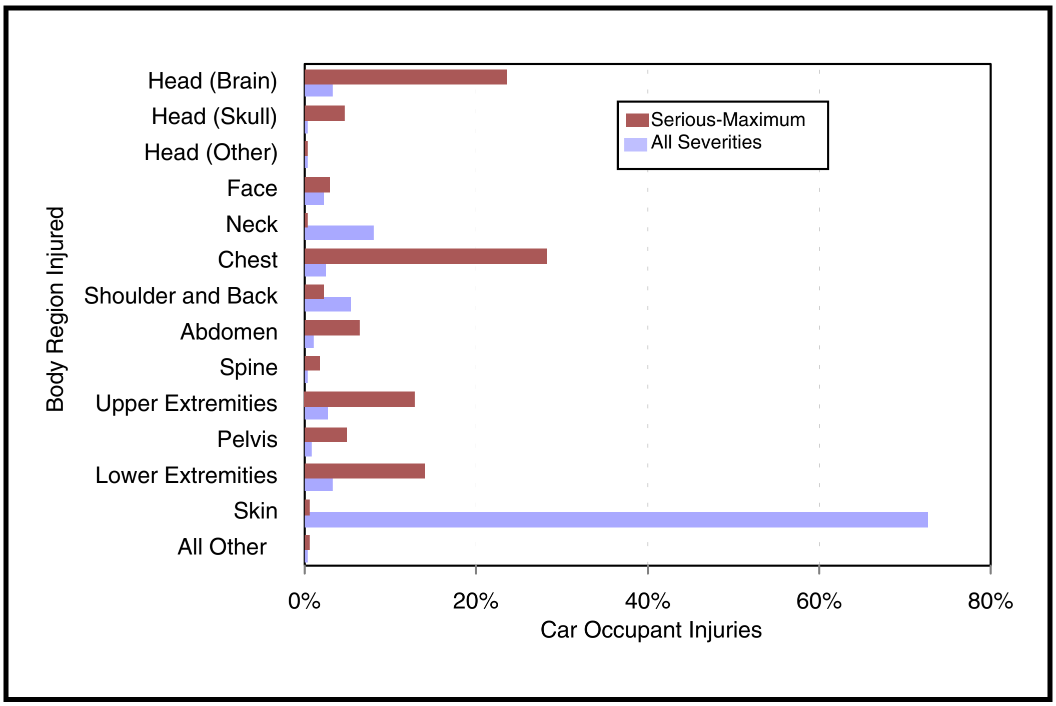
| | FREQUENCY OF INJURY BY AIS RATING* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| BODY REGION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
| ABDOMEN | 623 | 6,640 | 985 | 1,453 | 423 | 0 | 3,207 | 13,330 |
| | 4.7% | 49.8% | 7.4% | 10.9% | 3.2% | 0.0% | 24.1% | |
| | 0.0% | 5.4% | 2.2% | 11.3% | 8.6% | 0.0% | 27.3% | |
| SPINE | 0 | 0 | 150 | 406 | 200 | 34 | 0 | 789 |
| | 0.0% | 0.0% | 19.0% | 51.5% | 25.3% | 4.3% | 0.0% | |
| | 0.0% | 0.0% | 0.3% | 3.2% | 4.1% | 1.8% | 0.0% | |
| UPPER EXTREMITIES | 18,569 | 14,595 | 5,209 | 0 | 0 | 0 | 19 | 38,391 |
| | 48.4% | 38.0% | 13.6% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 1.4% | 11.9% | 11.7% | 0.0% | 0.0% | 0.0% | 0.2% | |
| PELVIS | 0 | 5,258 | 4,798 | 4 | 89 | 0 | 0 | 10,150 |
| | 0.0% | 51.8% | 47.3% | 0.0% | 0.9% | 0.0% | 0.0% | |
| | 0.0% | 4.3% | 10.8% | 0.0% | 1.8% | 0.0% | 0.0% | |
| LOWER EXTREMITIES | 10,598 | 26,232 | 8,193 | 0 | 0 | 0 | 75 | 45,097 |
| | 23.5% | 58.2% | 18.2% | 0.0% | 0.0% | 0.0% | 0.2% | |
| | 0.8% | 21.3% | 18.4% | 0.0% | 0.0% | 0.0% | 0.6% | |
| SKIN | 1,164,148 | 3,025 | 215 | 0 | 72 | 542 | 0 | 1,168,002 |
| | 99.7% | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 84.7% | 2.5% | 0.5% | 0.0% | 1.5% | 29.0% | 0.0% | |
| ALL OTHER | 0 | 17 | 33 | 0 | 1 | 0 | 0 | 51 |
| | 0.0% | 33.3% | 64.7% | 0.0% | 2.0% | 0.0% | 0.0% | |
| | 0.0% | 0.0% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | |
| TOTAL | 1,375,016 | 122,945 | 44,411 | 12,845 | 4,894 | 1,870 | 11,737 | 1,573,718 |

*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.

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, abdomen, and upper and lower extremities are injured frequently at high severities, but occur less significantly when all severities are considered.

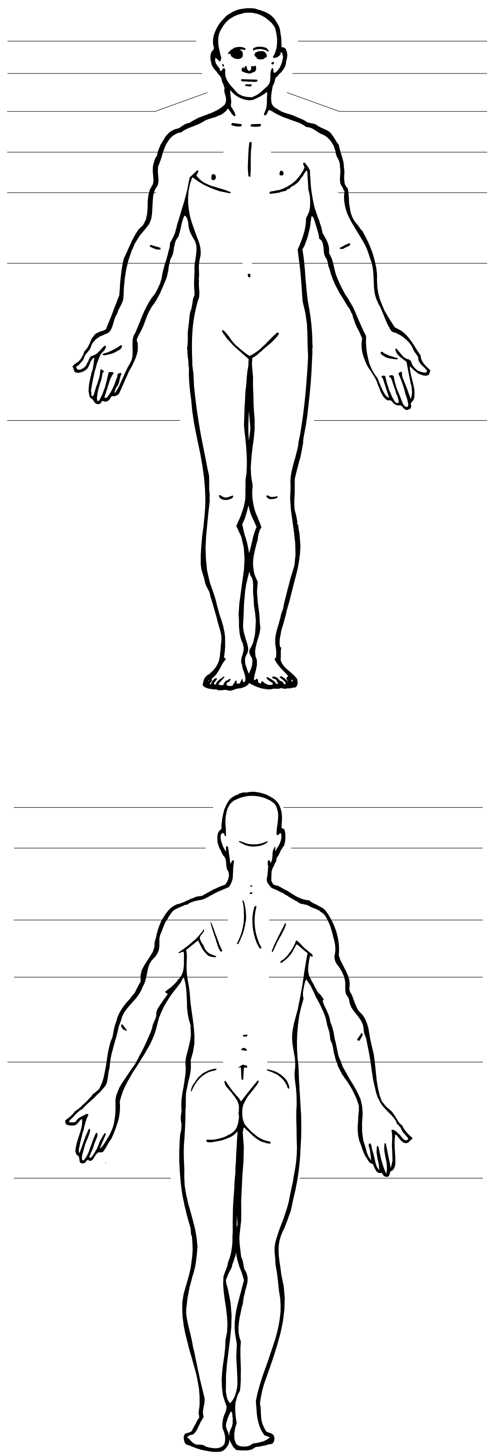
**Figure 8**
**Distribution of Injuries to Crash-Involved Car Occupants by Affected Body Region and Severity of Inury, 1994-1996**



## Belt 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.

**Figure 9**
**Distribution of Injuries by Body Region to Crash-Involved Car Occupants by Belt Usage: Average per Year, 1994-1996**



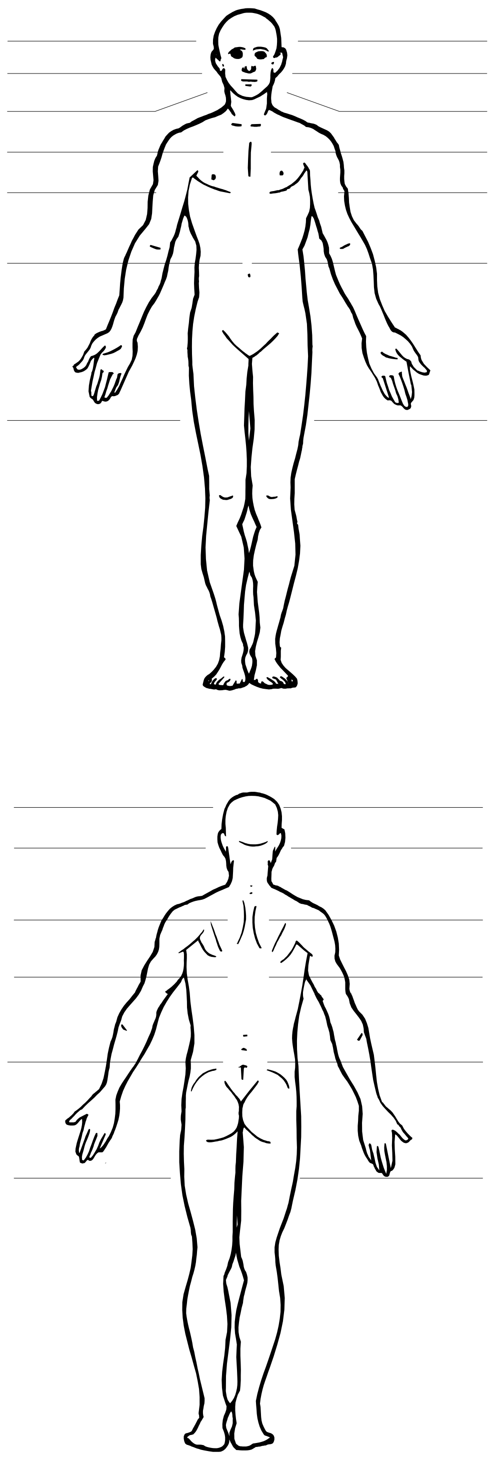
**Belted**
Brain: 48,896 (2.0%)
Other Head: 2,802 (0.1%)
Face: 29,064 (1.2%)
Chest: 57,691 (2.3%)
Upper
Extremities: 60,022 (2.4%)
Abdomen: 10,067 (0.4%)
Abdomen: 10,945 (1.4%)
Skin: 927,202 (37.7%)
Skull: 6,679 (0.1%)
Neck: 288,263 (11.7%)
Shoulder
and Back: 158,553 (6.4%)
Spine: 509 (0.0%)
Pelvis: 5,368 (2.2%)
Lower
Extremities: 63,210 (2.6%)

**Total Belted Occupants: 2,460,430**

**Unbelted**
Brain: 59,240 (7.5%)
Other Head: 4,281 (0.5%)
Face: 37,269 (4.7%)
Chest: 26,997 (3.4%)
Upper
Extremities: 36,144 (4.6%)
Skin: 437,628 (55.4%)
Skull: 4,548 (0.6%)
Neck: 63,788 (8.1%)
Shoulder
and Back: 52,224 (6.6%)
Spine: 1,196 (0.2%)
Pelvis: 11,454 (1.5%)
Lower
Extremities: 36,435 (4.6%)

**Total Unbelted Occupants: 789,094**

**Figure 10**
**Distribution of Injuries by Body Region to Crash-Involved Light Truck Occupants by Belt Usage: Average per Year, 1994-1996**



## 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, 1994-1996**

| INJURY CONTACT | FREQUENCY OF INJURY BY AIS RATING* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
| STEERING ASSEMBLY | 437,476 | 43,401 | 21,568 | 4,360 | 1,919 | 653 | 3,958 | 513,335 |
| | 85.2% | 8.5% | 4.2% | 0.8% | 0.4% | 0.1% | 0.8% | |
| | 10.1% | 13.6% | 16.1% | 14.1% | 12.5% | 17.6% | 15.3% | |
| INSTRUMENT PANEL | 643,057 | 49,049 | 18,888 | 1,124 | 655 | 415 | 744 | 713,931 |
| | 90.1% | 6.9% | 2.6% | 0.2% | 0.1% | 0.1% | 0.1% | |
| | 14.9% | 15.4% | 14.1% | 3.6% | 4.3% | 11.2% | 2.9% | |
| WINDSHIELD | 382,120 | 20,083 | 7,749 | 2,187 | 1,065 | 69 | 2,051 | 415,326 |
| | 92.0% | 4.8% | 1.9% | 0.5% | 0.3% | 0.0% | 0.5% | |
| | 8.9% | 6.3% | 5.8% | 7.0% | 7.0% | 1.9% | 7.9% | |
| INTERIOR SIDE SURFACE | 324,229 | 35,832 | 21,260 | 5,237 | 2,231 | 316 | 989 | 390,094 |
| | 83.1% | 9.2% | 5.4% | 1.3% | 0.6% | 0.1% | 0.3% | |
| | 7.5% | 11.2% | 15.9% | 16.9% | 14.6% | 8.5% | 3.8% | |
| PILLARS | 86,342 | 12,091 | 5,495 | 2,297 | 1,500 | 156 | 364 | 108,244 |
| | 79.8% | 11.2% | 5.1% | 2.1% | 1.4% | 0.1% | 0.3% | |
| | 2.0% | 3.8% | 4.1% | 7.4% | 9.8% | 4.2% | 1.4% | |
| RESTRAINT (BELT) SYSTEM | 500,003 | 15,462 | 8,237 | 1,655 | 344 | 14 | 3,011 | 528,727 |
| | 94.6% | 2.9% | 1.6% | 0.3% | 0.1% | 0.0% | 0.6% | |
| | 11.6% | 4.9% | 6.2% | 5.3% | 2.2% | 0.4% | 11.7% | |
| CHILD SEAT | 6,287 | 656 | 44 | 9 | 35 | 14 | 14 | 7,059 |
| | 89.1% | 9.3% | 0.6% | 0.1% | 0.5% | 0.2% | 0.2% | |
| | 0.1% | 0.2% | 0.0% | 0.0% | 0.2% | 0.4% | 0.1% | |
| AIR BAG | 256,490 | 2,305 | 1,122 | 319 | 393 | 38 | 146 | 260,813 |
| | 98.3% | 0.9% | 0.4% | 0.1% | 0.2% | 0.0% | 0.1% | |
| | 5.9% | 0.7% | 0.8% | 1.0% | 2.6% | 1.0% | 0.6% | |
| HEAD RESTRAINTS | 40,841 | 4,988 | 485 | 185 | 35 | 0 | 89 | 46,623 |
| | 87.6% | 10.7% | 1.0% | 0.4% | 0.1% | 0.0% | 0.2% | |
| | 0.9% | 1.6% | 0.4% | 0.6% | 0.2% | 0.0% | 0.3% | |
| SEAT BACK | 175,756 | 12,920 | 6,903 | 568 | 111 | 17 | 88 | 196,364 |
| | 89.5% | 6.6% | 3.5% | 0.3% | 0.1% | 0.0% | 0.0% | |
| | 4.1% | 4.1% | 5.2% | 1.8% | 0.7% | 0.5% | 0.3% | |
| ROOF | 86,276 | 14,250 | 6,426 | 2,997 | 1,905 | 202 | 1,026 | 113,082 |
| | 76.3% | 12.6% | 5.7% | 2.7% | 1.7% | 0.2% | 0.9% | |
| | 2.0% | 4.5% | 4.8% | 9.7% | 12.5% | 5.5% | 4.0% | |

*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, 1994-1996**

| | FREQUENCY OF INJURY BY AIS RATING* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| INJURY CONTACT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
| FLOOR | 69,179 | 32,556 | 3,214 | 0 | 0 | 0 | 0 | 104,950 |
| | 65.9% | 31.0% | 3.1% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 1.6% | 10.2% | 2.4% | 0.0% | 0.0% | 0.0% | 0.0% | |
| NON-CONTACT INJURIES | 573,404 | 4,387 | 601 | 142 | 479 | 32 | 803 | 579,847 |
| | 98.9% | 0.8% | 0.1% | 0.0% | 0.1% | 0.0% | 0.1% | |
| | 13.3% | 1.4% | 0.4% | 0.5% | 3.1% | 0.9% | 3.1% | |
| FIRE IN VEHICLE | 420 | 17 | 242 | 7 | 7 | 430 | 0 | 1,123 |
| | 37.4% | 1.5% | 21.5% | 0.6% | 0.6% | 38.3% | 0.0% | |
| | 0.0% | 0.0% | 0.2% | 0.0% | 0.0% | 11.6% | 0.0% | |
| GROUND | 33,537 | 5,848 | 2,880 | 1,366 | 458 | 148 | 284 | 44,523 |
| | 75.3% | 13.1% | 6.5% | 3.1% | 1.0% | 0.3% | 0.6% | |
| | 0.8% | 1.8% | 2.2% | 4.4% | 3.0% | 4.0% | 1.1% | |
| EXTERIOR (OCCUPANT'S VEHICLE) | 3,811 | 2,185 | 1,278 | 725 | 436 | 208 | 194 | 8,838 |
| | 43.1% | 24.7% | 14.5% | 8.2% | 4.9% | 2.4% | 2.2% | |
| | 0.1% | 0.7% | 1.0% | 2.3% | 2.9% | 5.6% | 0.8% | |
| EXTERIOR (OTHER VEHICLE OR EXTERIOR OBJECT) | 6,647 | 2,740 | 2,057 | 1,305 | 755 | 354 | 145 | 14,003 |
| | 47.5% | 19.6% | 14.7% | 9.3% | 5.4% | 2.5% | 1.0% | |
| | 0.2% | 0.9% | 1.5% | 4.2% | 4.9% | 9.6% | 0.6% | |
| SIDE AND REAR GLAZING | 65,777 | 6,048 | 864 | 217 | 164 | 15 | 95 | 73,179 |
| | 89.9% | 8.3% | 1.2% | 0.3% | 0.2% | 0.0% | 0.1% | |
| | 1.5% | 1.9% | 0.6% | 0.7% | 1.1% | 0.4% | 0.4% | |
| ALL OTHERS | 221,486 | 15,449 | 6,898 | 939 | 236 | 16 | 704 | 245,728 |
| | 90.1% | 6.3% | 2.8% | 0.4% | 0.1% | 0.0% | 0.3% | |
| | 5.1% | 4.8% | 5.2% | 3.0% | 1.5% | 0.4% | 2.7% | |
| UNKNOWN | 402,328 | 38,422 | 17,427 | 5,392 | 2,565 | 602 | 11,132 | 477,868 |
| | 84.2% | 8.0% | 3.6% | 1.1% | 0.5% | 0.1% | 2.3% | |
| | 9.3% | 12.1% | 13.0% | 17.4% | 16.8% | 16.3% | 43.1% | |
| TOTAL | 4,315,465 | 318,690 | 133,639 | 31,030 | 15,293 | 3,702 | 25,837 | 4,843,655 |

*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 22**
**DISTRIBUTION OF ALL INJURIES TO CRASH-INVOLVED LIGHT TRUCK OCCUPANTS BY INJURY CONTACT AND SEVERITY: AVERAGE PER YEAR, 1994-1996**

| | FREQUENCY OF INJURY BY AIS RATING* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| INJURY CONTACT | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
| STEERING ASSEMBLY | 140,269 | 14,345 | 5,124 | 2,124 | 612 | 172 | 4,263 | 166,908 |
| | 84.0% | 8.6% | 3.1% | 1.3% | 0.4% | 0.1% | 2.6% | |
| | 10.2% | 11.7% | 11.5% | 16.5% | 12.5% | 9.2% | 36.3% | |
| INSTRUMENT PANEL | 213,041 | 21,541 | 7,723 | 350 | 177 | 28 | 124 | 242,983 |
| | 87.7% | 8.9% | 3.2% | 0.1% | 0.1% | 0.0% | 0.1% | |
| | 15.5% | 17.5% | 17.4% | 2.7% | 3.6% | 1.5% | 1.1% | |
| WINDSHIELD | 115,717 | 5,810 | 905 | 410 | 235 | 219 | 3,975 | 127,271 |
| | 90.9% | 4.6% | 0.7% | 0.3% | 0.2% | 0.2% | 3.1% | |
| | 8.4% | 4.7% | 2.0% | 3.2% | 4.8% | 11.7% | 33.9% | |
| INTERIOR SIDE SURFACE | 99,319 | 9,230 | 6,784 | 1,180 | 307 | 113 | 120 | 117,055 |
| | 84.8% | 7.9% | 5.8% | 1.0% | 0.3% | 0.1% | 0.1% | |
| | 7.2% | 7.5% | 15.3% | 9.2% | 6.3% | 6.0% | 1.0% | |
| PILLARS | 39,192 | 8,398 | 1,797 | 953 | 323 | 0 | 200 | 50,863 |
| | 77.1% | 16.5% | 3.5% | 1.9% | 0.6% | 0.0% | 0.4% | |
| | 2.9% | 6.8% | 4.0% | 7.4% | 6.6% | 0.0% | 1.7% | |
| RESTRAINT (BELT) SYSTEM | 133,932 | 2,498 | 1,225 | 252 | 0 | 0 | 326 | 138,233 |
| | 96.9% | 1.8% | 0.9% | 0.2% | 0.0% | 0.0% | 0.2% | |
| | 9.7% | 2.0% | 2.8% | 2.0% | 0.0% | 0.0% | 2.8% | |
| CHILD SEAT | 3,383 | 290 | 82 | 0 | 0 | 0 | 5 | 3,760 |
| | 90.0% | 7.7% | 2.2% | 0.0% | 0.0% | 0.0% | 0.1% | |
| | 0.2% | 0.2% | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | |
| AIR BAG | 25,636 | 1,542 | 161 | 0 | 0 | 3 | 2 | 27,345 |
| | 93.8% | 5.6% | 0.6% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 1.9% | 1.3% | 0.4% | 0.0% | 0.0% | 0.2% | 0.0% | |
| HEAD RESTRAINTS | 13,059 | 1,395 | 4 | 0 | 0 | 0 | 21 | 14,479 |
| | 90.2% | 9.6% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | |
| | 0.9% | 1.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.2% | |
| SEAT BACK | 40,555 | 4,840 | 451 | 204 | 71 | 0 | 16 | 46,137 |
| | 87.9% | 10.5% | 1.0% | 0.4% | 0.2% | 0.0% | 0.0% | |
| | 2.9% | 3.9% | 1.0% | 1.6% | 1.5% | 0.0% | 0.1% | |
| ROOF | 53,157 | 9,292 | 3,134 | 986 | 647 | 173 | 374 | 67,763 |
| | 78.4% | 13.7% | 4.6% | 1.5% | 1.0% | 0.3% | 0.6% | |
| | 3.9% | 7.6% | 7.1% | 7.7% | 13.2% | 9.3% | 3.2% | |

*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 22 (CONTINUED)**
**DISTRIBUTION OF ALL INJURIES TO CRASH-INVOLVED LIGHT TRUCK OCCUPANTS BY INJURY CONTACT AND SEVERITY: AVERAGE PER YEAR, 1994-1996**

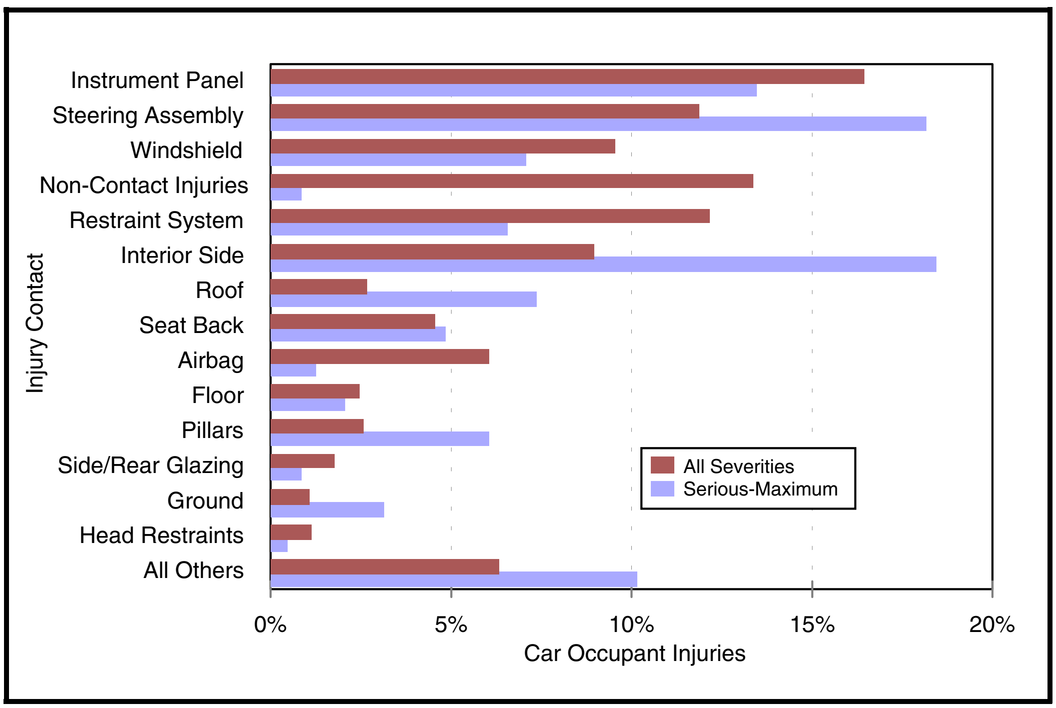
| INJURY CONTACT | FREQUENCY OF INJURY BY AIS RATING* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
| FLOOR | 17,642 | 9,014 | 613 | 0 | 0 | 0 | 0 | 27,268 |
| | 64.7% | 33.1% | 2.2% | 0.0% | 0.0% | 0.0% | 0.0% | |
| | 1.3% | 7.3% | 1.4% | 0.0% | 0.0% | 0.0% | 0.0% | |
| NON-CONTACT INJURIES | 163,317 | 755 | 315 | 18 | 182 | 26 | 14 | 164,627 |
| | 99.2% | 0.5% | 0.2% | 0.0% | 0.1% | 0.0% | 0.0% | |
| | 11.9% | 0.6% | 0.7% | 0.1% | 3.7% | 1.4% | 0.1% | |
| FIRE IN VEHICLE | 29 | 0 | 67 | 0 | 70 | 542 | 0 | 708 |
| | 4.1% | 0.0% | 9.5% | 0.0% | 9.9% | 76.6% | 0.0% | |
| | 0.0% | 0.0% | 0.2% | 0.0% | 1.4% | 29.0% | 0.0% | |
| GROUND | 44,973 | 12,231 | 5,416 | 2,051 | 963 | 59 | 616 | 66,309 |
| | 67.8% | 18.4% | 8.2% | 3.1% | 1.5% | 0.1% | 0.9% | |
| | 3.3% | 9.9% | 12.2% | 16.0% | 19.7% | 3.2% | 5.2% | |
| EXTERIOR (OCCUPANT'S VEHICLE) | 5,446 | 4,046 | 2,057 | 907 | 238 | 64 | 55 | 12,814 |
| | 42.5% | 31.6% | 16.1% | 7.1% | 1.9% | 0.5% | 0.4% | |
| | 0.4% | 3.3% | 4.6% | 7.1% | 4.9% | 3.4% | 0.5% | |
| EXTERIOR (OTHER VEHICLE OR EXTERIOR OBJECT) | 2,206 | 1,430 | 1,531 | 662 | 256 | 157 | 138 | 6,380 |
| | 34.6% | 22.4% | 24.0% | 10.4% | 4.0% | 2.5% | 2.2% | |
| | 0.2% | 1.2% | 3.4% | 5.2% | 5.2% | 8.4% | 1.2% | |
| SIDE AND REAR GLAZING | 27,617 | 1,538 | 744 | 22 | 12 | 0 | 23 | 29,956 |
| | 92.2% | 5.1% | 2.5% | 0.1% | 0.0% | 0.0% | 0.1% | |
| | 2.0% | 1.3% | 1.7% | 0.2% | 0.2% | 0.0% | 0.2% | |
| ALL OTHERS | 86,759 | 3,781 | 815 | 216 | 74 | 0 | 54 | 91,699 |
| | 94.6% | 4.1% | 0.9% | 0.2% | 0.1% | 0.0% | 0.1% | |
| | 6.3% | 3.1% | 1.8% | 1.7% | 1.5% | 0.0% | 0.5% | |
| UNKNOWN | 149,766 | 10,969 | 5,466 | 2,509 | 726 | 313 | 1,410 | 171,160 |
| | 87.5% | 6.4% | 3.2% | 1.5% | 0.4% | 0.2% | 0.8% | |
| | 10.9% | 8.9% | 12.3% | 19.5% | 14.8% | 16.7% | 12.0% | |
| TOTAL | 1,375,016 | 122,945 | 44,411 | 12,845 | 4,894 | 1,870 | 11,737 | 1,573,718 |

*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.

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 instrument panel, windshield, and restraint system as injury contacts have high frequencies in general but relatively low frequencies for serious to maximum injuries. The converse is observed for the steering assembly, interior side, roof, pillars, and ground.

**Figure 11**
**Distribution of Injuries to Crash-Involved Car Occupants by Injury Contact and Severity of Injury, 1994-1996**




Note: All Others category includes items shown in Table 22 (child seat and exterior of occupant's vehicle, other vehicle, or exterior object). Unknowns are excluded from Figure 11.

## 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.

**TABLE 23**
**OCCUPANT EJECTION AND ENTRAPMENT IN CRASH-INVOLVED TOWED CARS BY DEGREE OF EJECTION, CRASH MODE, AND AREA OF DAMAGE: AVERAGE OF NATIONALLY WEIGHTED COUNTS PER YEAR, 1994-1996**

| CRASH MODE AND AREA OF DAMAGE | COMPLETE EJECTION | PARTIAL EJECTION | ENTRAPMENT | TOTAL |
|---|---|---|---|---|
| ROLLOVER | 8,519 | 4,437 | 895 | 169,975 |
| | 5.0% | 2.6% | 0.5% | 4.5% |
| NONROLLOVER | | | | |
| SINGLE-VEHICLE | | | | |
| FRONT | 966 | 897 | 3,360 | 540,818 |
| | 0.2% | 0.2% | 0.6% | 14.2% |
| SIDE | 2,094 | 2,514 | 1,552 | 173,215 |
| | 1.2% | 1.5% | 0.9% | 4.6% |
| REAR, TOP, OR UNDER | 21 | 53 | 5 | 28,693 |
| | 0.1% | 0.2% | 0.0% | 0.8% |
| MULTIPLE-VEHICLE | | | | |
| FRONT | 542 | 1,537 | 4,377 | 1,599,086 |
| | 0.0% | 0.1% | 0.3% | 42.1% |
| SIDE | 1,897 | 2,392 | 2,294 | 967,262 |
| | 0.2% | 0.2% | 0.2% | 25.5% |
| REAR | 343 | 353 | 30 | 315,810 |
| | 0.1% | 0.1% | 0.0% | 8.3% |
| TOP OR UNDER | 0 | 0 | 0 | 3245 |
| | 0.0% | 0.0% | 0.0% | 0.1% |
| TOTAL | 14,380 | 12,182 | 12,514 | 3,798,104 |
| | 0.4% | 0.3% | 0.3% | 100.0% |

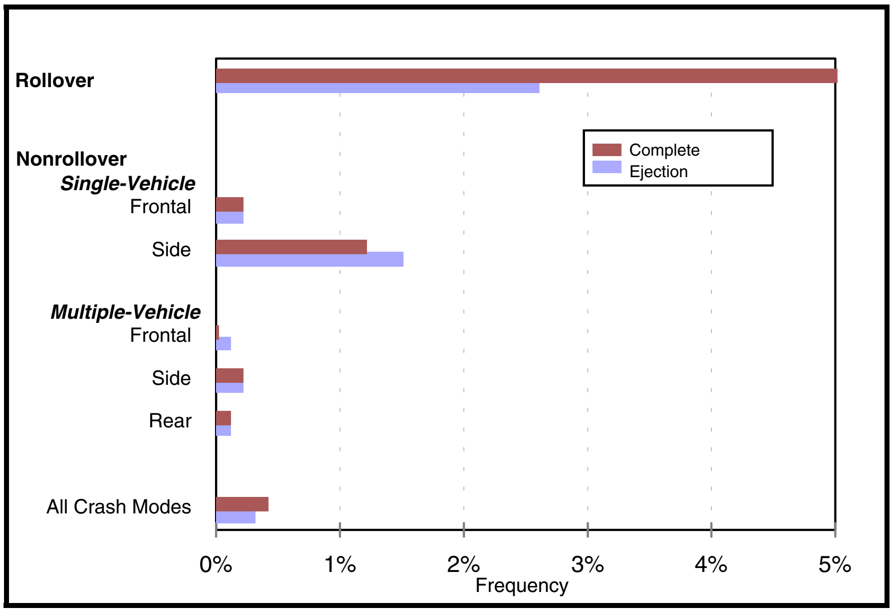
*FOR EACH CRASH MODE, THE FIRST DATA ROW SHOWS THE NUMBER OF OCCUPANTS EJECTED OR ENTRAPPED AND THE SECOND ROW SHOWS THE PERCENTAGE OF THE ROW TOTAL.
NOTE: DAMAGE AREA "UNKNOWN" HAS BEEN IMPUTED INTO THE KNOWN DAMAGE AREAS.

**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, 1994-1996**

| CRASH MODE AND AREA OF DAMAGE | COMPLETE EJECTION | PARTIAL EJECTION | ENTRAPMENT | TOTAL |
|---|---|---|---|---|
| ROLLOVER | 14,915 | 5,839 | 2,009 | 189,068 |
| | 7.9% | 3.1% | 1.1% | 15.4% |
| NONROLLOVER | | | | |
| SINGLE-VEHICLE | | | | |
| FRONT | 648 | 853 | 851 | 210,853 |
| | 0.3% | 0.4% | 0.4% | 17.2% |
| SIDE | 303 | 426 | 284 | 33,274 |
| | 0.9% | 1.3% | 0.9% | 2.7% |
| REAR, TOP, OR UNDER | 3 | 0 | 13 | 9,774 |
| | 0.0% | 0.0% | 0.1% | 0.8% |
| MULTIPLE-VEHICLE | | | | |
| FRONT | 1,239 | 403 | 1,492 | 548,477 |
| | 0.2% | 0.1% | 0.3% | 44.8% |
| SIDE | 3,483 | 231 | 378 | 182,021 |
| | 1.9% | 0.1% | 0.2% | 14.9% |
| REAR | 261 | 576 | 262 | 51,007 |
| | 0.5% | 1.1% | 0.5% | 4.2% |
| TOP OR UNDER | 0 | 0 | 11 | 41 |
| | 0.0% | 0.0% | 26.8% | 0.0% |
| TOTAL | 20,851 | 8,328 | 5,301 | 1,224,514 |
| | 1.7% | 0.7% | 0.4% | 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.

## Figure 12
## Towed Car Occupant Ejection Rates
## by Crash Mode and Degree of Ejection, 1994-1996



The ejection rates shown in Tables 23 and 24 are generally small, except in 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 E) 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, 1994-1996**

| CRASH MODE AND AREA OF DAMAGE | COMPLETE EJECTION | PARTIAL EJECTION | ENTRAPMENT | TOTAL |
|---|---|---|---|---|
| ROLLOVER | 1,530,211 | 692,621 | 240,247 | 5,447,957 |
| | 28.1% | 12.7% | 4.4% | 13.3% |
| NONROLLOVER | | | | |
| SINGLE-VEHICLE | | | | |
| FRONT | 231,088 | 205,417 | 528,442 | 6,385,927 |
| | 3.6% | 3.2% | 8.3% | 15.6% |
| SIDE | 310,520 | 277,245 | 388,920 | 2,681,532 |
| | 11.6% | 10.3% | 14.5% | 6.6% |
| REAR, TOP, OR UNDER | 96 | 20,599 | 102 | 268,703 |
| | 0.0% | 7.7% | 0.0% | 0.7% |
| MULTIPLE-VEHICLE | | | | |
| FRONT | 195,819 | 262,602 | 1,217,441 | 13,985,807 |
| | 1.4% | 1.9% | 8.7% | 34.2% |
| SIDE | 392,455 | 601,447 | 652,889 | 10,342,682 |
| | 3.8% | 5.8% | 6.3% | 25.3% |
| REAR | 21,819 | 23,131 | 10,682 | 1,787,654 |
| | 1.2% | 1.3% | 0.6% | 4.4% |
| TOP OR UNDER | 0 | 0 | 0 | 15798 |
| | 0.0% | 0.0% | 0.0% | 0.0% |
| TOTAL | 2,682,008 | 2,083,062 | 3,038,723 | 40,916,061 |
| | 6.6% | 5.1% | 7.4% | 100.0% |

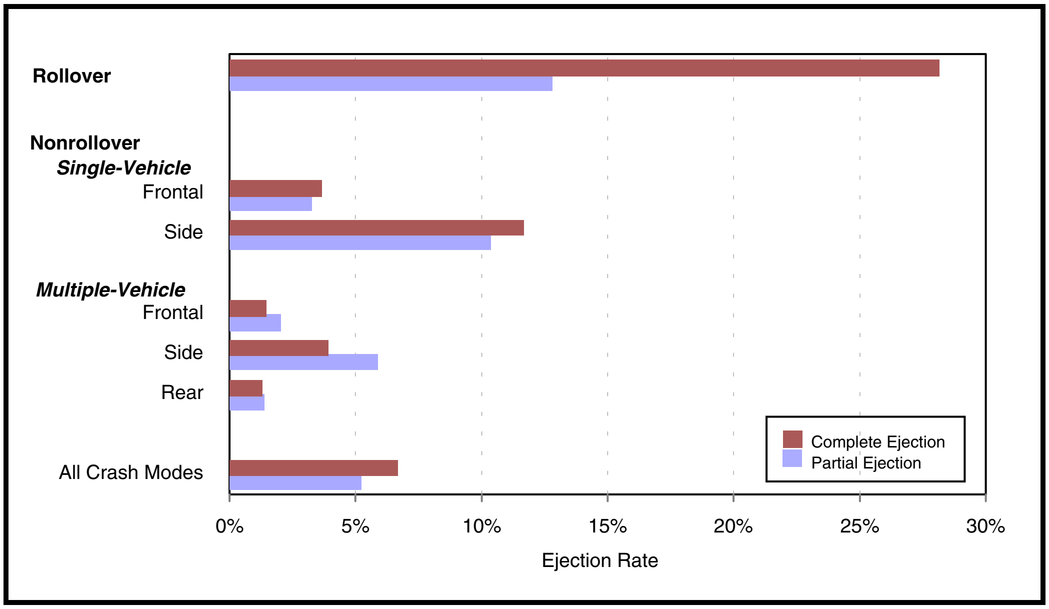
*FOR EACH CRASH MODE, THE FIRST DATA ROW SHOWS THE NUMBER OF OCCUPANTS EJECTED OR ENTRAPPED AND THE SECOND ROW SHOWS THE PERCENTAGE OF THE ROW TOTAL.

**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, 1994-1996**

| CRASH MODE AND AREA OF DAMAGE | COMPLETE EJECTION | PARTIAL EJECTION | ENTRAPMENT | TOTAL |
|---|---|---|---|---|
| ROLLOVER | 2,555,014 | 532,049 | 272,969 | 5,413,543 |
| | 47.2% | 9.8% | 5.0% | 37.0% |
| NONROLLOVER | | | | |
| SINGLE-VEHICLE | | | | |
| FRONT | 332,549 | 99,429 | 302,974 | 2,224,462 |
| | 14.9% | 4.5% | 13.6% | 15.2% |
| SIDE | 68,142 | 146,592 | 139,640 | 673,111 |
| | 10.1% | 21.8% | 20.7% | 4.6% |
| REAR, TOP, OR UNDER | 87 | 0 | 10,975 | 14,986 |
| | 0.6% | 0.0% | 73.2% | 0.1% |
| MULTIPLE-VEHICLE | | | | |
| FRONT | 56,032 | 159,534 | 316,014 | 3,730,416 |
| | 1.5% | 4.3% | 8.5% | 25.5% |
| SIDE | 529,300 | 84,621 | 67,037 | 2,184,444 |
| | 24.2% | 3.9% | 3.1% | 14.9% |
| REAR | 1,307 | 2,473 | 901 | 383,908 |
| | 0.3% | 0.6% | 0.2% | 2.6% |
| TOP OR UNDER | 0 | 0 | 8305 | 12493 |
| | 0.0% | 0.0% | 66.5% | 0.1% |
| TOTAL | 3,542,432 | 1,024,699 | 1,118,815 | 14,637,363 |
| | 24.2% | 7.0% | 7.6% | 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.

Figure 13
Ejection-Induced Occupant Injury Rates for Crash-Involved Towed Cars by Degree off Ejection and Crash Mode, 1994-1996



# 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 D). 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, sport 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.

**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 within 30 days of a CDS applicable motor vehicle crash is a result of injuries sustained in the 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 that include motor vehicles, pedestrians, pedalcyclists, animals, trains, trailers, ojects that fall from vehicles, small boulders, trash cans, or grocery carts.

**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.

**Belt Usage**
Manually operated belt systems include shoulder belts, lap belts, lap and should belt combinations, or child safety seats. Automatic belt 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 survivors 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 by means other than its own power from the crash scene due to damage resulting from the crash.

**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

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 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 product 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 Data Elements

The data are collected on six forms: the Accident Form, the General Vehicle Form, the Exterior Vehicle Form, the Interior Vehicle Form, the Occupant Assessment Form, and the Occupant Injury Form. There are 310 different data elements in the NASS/CDS that characterize the crash, vehicles, and the people involved. This appendix includes the forms used for each crash in the CDS.

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

# ACCIDENT FORM

NATIONAL ACCIDENT SAMPLING SYSTEM
CRASHWORTHINESS DATA SYSTEM

1. Primary Sampling Unit Number ___ - _

2. Case Number - Stratum ___ ___ ___ ___

## IDENTIFICATION

3. Number of General Vehicle Forms Submitted ___ ___

4. Date of Accident (Month,Day,Year) ___ ___/___ ___/ 9 5

5. Time of Accident ___ ___ ___ ___

Code reported military time of accident.

NOTE: Midnight = 2400
Unknown = 9999

## SPECIAL STUDIES - INDICATORS

Check (✓) each special study (SS15-SS18 below) that has been completed; code 1 for the checked special studies and 0 for the special studies not checked.

6. ___ SS15 Administrative Use ___

7. ___ SS16 Pedestrian Crash Data Study 0
*(Data for this special study available in a separate file.)*

8. ___ SS17 Impact Fires ___

9. ___ SS18 Unsafe Driver Actions ___

10. ___ SS19 ______________ ___

## NUMBER OF EVENTS

11. Number of Recorded Events in This Accident ___ ___

Code the number of events which occurred in this accident.

## ACCIDENT EVENTS

For each event that occurred in the accident, code the lowest numbered vehicle in the left columns and the other involved vehicle or object in the right columnns.

| Accident Event Sequence Number | Vehicle Number | Class Of Vehicle | General Area of Damage | Vehicle Number or Object Contacted | Class Of Vehicle | General Area of Damage |
|---|---|---|---|---|---|---|
| 12. 0 1 | 13. ___ ___ | 14. ___ ___ | 15. ___ | 16. ___ ___ | 17. ___ ___ | 18. ___ |
| 19. 0 2 | 20. ___ ___ | 21. ___ ___ | 22. ___ | 23. ___ ___ | 24. ___ ___ | 25. ___ |
| 26. 0 3 | 27. ___ ___ | 28. ___ ___ | 29. ___ | 30. ___ ___ | 31. ___ ___ | 32. ___ |
| 33. 0 4 | 34. ___ ___ | 35. ___ ___ | 36. ___ | 37. ___ ___ | 38. ___ ___ | 39. ___ |
| 40. 0 5 | 41. ___ ___ | 42. ___ ___ | 43. ___ | 44. ___ ___ | 45. ___ ___ | 46. ___ |

IF GREATER THAN FIVE EVENTS, CONTINUE CODING ON THE ACCIDENT EVENT SUPPLEMENT

## CODES FOR CLASS OF VEHICLE

| | | | |
|---|---|---|---|
| (00) | Not a motor vehicle | (31) | Large pickup truck (≤ 4,500 kgs GVWR) |
| (01) | Subcompact/mini (wheelbase < 254 cm) | (38) | Other pickup truck (≤ 4,500 kgs GVWR) |
| (02) | Compact (wheelbase ≥ 254 but < 265 cm) | (39) | Unknown pickup truck type (≤ 4,500 kgs GVWR |
| (03) | Intermediate (wheelbase ≥ 265 but < 278 cm) | (45) | Other light truck (≤ 4,500 kgs GVWR) |
| (04) | Full size (wheelbase ≥ 278 but < 291 cm) | (48) | Unknown light truck type (≤ 4,500 kgs GVWR) |
| (05) | Largest (wheelbase ≥ 291 cm) | (49) | Unknown light vehicle type |
| (09) | Unknown passenger car size | (50) | School bus (excludes van based)(> 4,500 kgs GVWR) |
| (14) | Compact utility vehicle | (58) | Other bus (> 4,500 kgs GVWR) |
| (15) | Large utility vehicle (≤ 4,500 kgs GVWR) | (59) | Unknown bus type |
| (16) | Utility station wagon (≤ 4,500 kgs GVWR) | (60) | Truck (> 4,500 kgs GVWR) |
| (19) | Unknown utility type | (67) | Tractor without trailer |
| (20) | Minivan (≤ 4,500 kgs GVWR) | (68) | Tractor-trailer(s) |
| (21) | Large van (≤ 4,500 kgs GVWR) | (78) | Unknown medium/heavy truck type |
| (24) | Van Based school bus (≤ 4,500 kgs GVWR) | (79) | Unknown light/medium/heavy truck type |
| (28) | Other van type (≤ 4,500 kgs GVWR) | (80) | Motored cycle |
| (29) | Unknown van type (≤ 4,500 kgs GVWR) | (90) | Other vehicle |
| (30) | Compact pickup truck (≤ 4,500 kgs GVWR) | (99) | Unknown |

## CODES FOR GENERAL AREA OF DAMAGE (GAD)

| | | | |
|---|---|---|---|
| CDS APPLICABLE AND OTHER VEHICLES | (0) Not a motor vehicle<br>(N) Noncollision<br>(F) Front | (R) Right side<br>(L) Left side<br>(B) Back | (T) Top<br>(U) Undercarriage<br>(9) Unknown |
| TDC APPLICABLE VEHICLES | (0) Not a motor vehicle<br>(N) Noncollision<br>(F) Front<br>(R) Right side | (L) Left side<br>(B) Back of unit with cargo area (rear of trailer or straight truck)<br>(D) Back (rear of tractor) | (C) Rear of cab<br>(V) Front of cargo area<br>(T) Top<br>(U) Undercarriage<br>(9) Unknown |

## CODES FOR VEHICLE NUMBER OR OBJECT CONTACTED

(01-30) — Vehicle Number

Noncollision

- (31) Overturn — rollover (excludes end-over-end)
- (32) Rollover — end-over-end
- (33) Fire or explosion
- (34) Jackknife
- (35) Other intraunit damage (specify): ______________________
- (36) Noncollision injury
- (38) Other noncollision (specify): ______________________
- (39) Noncollision — details unknown

Collision With Fixed Object

- (41) Tree (≤ 10 cm in diameter)
- (42) Tree (> 10 cm in diameter)
- (43) Shrubbery or bush
- (44) Embankment
- (45) Breakaway pole or post (any diameter)

Nonbreakaway Pole or Post

- (50) Pole or post (≤ 10 cm in diameter)
- (51) Pole or post (> 10 cm but ≤ 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

- (70) Passenger car, light truck, van, or other vehicle not in-transport
- (71) Medium/heavy truck or bus not in-transport
- (72) Pedestrian
- (73) Cyclist or cycle
- (74) Other nonmotorist or conveyance ______________________
- (75) Vehicle occupant
- (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

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

# GENERAL VEHICLE FORM

NATIONAL ACCIDENT SAMPLING SYSTEM
CRASHWORTHINESS DATA SYSTEM

1. Primary Sampling Unit Number ___ ___
2. Case Number - Stratum ___ ___ ___ ___
3. Vehicle Number ___ ___

## VEHICLE IDENTIFICATION

4. Vehicle Model Year ___ ___
   Code the last two digits of the model year
   (99) Unknown

5. Vehicle Make (specify): ___ ___
   ______________________
   Applicable codes are found in your NASS Data Collection, Coding and Editing Manual.
   (99) Unknown

6. Vehicle Model (specify): ___ ___ ___
   ______________________
   Applicable codes are found in your NASS Data Collection, Coding and Editing Manual.
   (999) Unknown

7. Body Type ___ ___
   Note: Applicable codes may be found on the back of this page.

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 (Ø and ~~Z~~)
   No VIN—Code all zeros    Unknown—Code all nines

9. Vehicle Special Use (This Trip) ___
   (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

## OFFICIAL RECORDS

10. Police Reported Vehicle Disposition ___
    (0) Not towed due to vehicle damage
    (1) Towed due to vehicle damage
    (9) Unknown

11. Police Reported Travel Speed ___ ___ ___
    Code to the nearest kmph (NOTE: 000 means less than 0.5 kmph)
    (160) 159.5 kmph and above
    (999) Unknown

    ___ ___ mph X 1.6093 = ___ ___ ___ kmph

12. Speed Limit ___ ___ ___
    (000) No statutory limit
    Code posted or statutory speed limit in kmph
    (999) Unknown

    ___ ___ mph X 1.6093 = ___ ___ ___ kmph

13. Police Reported Alcohol Presence For Driver ___
    (0) No alcohol present
    (1) Yes alcohol present
    (7) Not reported
    (8) No driver present
    (9) Unknown

14. 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

    Source: ______________________

15. Police Reported Other Drug Presence For Driver ___
    (0) No other drug(s) present
    (1) Yes other drug(s) present
    (7) Not reported
    (8) No driver present
    (9) Unknown

16. Other Drug Specimen Test Result For Driver ___
    (0) No specimen test given
    (1) Drug(s) not found in specimen
    (2) Drug(s) found in specimen, (specify):
    ______________________
    (3) Specimen test given, results unknown or not obtained
    (8) No driver present
    (9) Unknown if specimen test given

17. Driver's Zip Code ___ ___ ___ ___ ___

    (00001) Driver not a resident of U.S. or territories
    _______ Code actual 5-digit zip code
    (99998) No driver present
    (99999) Unknown

18. Driver's Race/Ethnic Origin ___
    (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
    (7) Other (specify):
    ______________________
    (8) No driver present
    (9) Unknown

# CODES FOR BODY TYPE

## CDS APPLICABLE VEHICLES

*Automobiles*
- (01) Convertible (excludes sun-roof, t-bar)
- (02) 2-door sedan, hardtop, coupe
- (03) 3-door/2-door hatchback
- (04) 4-door sedan, hardtop
- (05) 5-door/4-door hatchback
- (06) Station wagon (excluding van and truck based)
- (07) Hatchback, number of doors unknown
- (08) Other automobile type (specify): ____________________
- (09) Unknown automobile type

*Automobile Derivatives*
- (10) Auto based pickup (includes El Camino, Caballero, Ranchero, Brat, and Rabbit pickup)
- (11) Auto based panel (cargo station wagon, auto based ambulance/hearse)
- (12) Large limousine - more than four side doors or stretched chassis
- (13) Three-wheel automobile or automobile derivative

*Utility Vehicles (≤ 4,500 kgs GVWR)*
- (14) Compact utility (Jeep CJ-2 - CJ-7, Scrambler, Golden Eagle, Renegade, Laredo, Wrangler, Cherokee [84 and after], Dispatcher, Raider, Bronco II, Bronco [76 and before], Explorer, S-10 Blazer, Geo Tracker, Bravada, S-15 Jimmy, Thing, Pathfinder, Trooper, Trooper II, Rodeo, Amigo, Navajo, 4-Runner, Montero, Passport, Samurai, Sidekick, Rocky)
- (15) Large utility (includes Jeep Cherokee [83 and before], Ramcharger, Trailduster, Bronco-fullsize [78 and after], fullsize Blazer, fullsize Jimmy, Hummer, Landcruiser, Rover, Scout, Yukon)
- (16) Utility station wagon (Chevy Suburban, GMC Suburban, Travelall, Grand Wagoneer, includes suburban limousine)
- (19) Utility, unknown body type

*Van Based Light Trucks (≤ 4,500 kgs GVWR)*
- (20) Minivan (Town and Country, Caravan, Grand Caravan, Voyager, Grand Voyager, Mini-Ram, Vista, Aerostar, Windstar, Villager, Lumina APV, Trans Sport, Silhouette, Astro, Safari, Toyota Van, Toyota Minivan, Previa, Nissan Minivan, Quest, Mitsubishi Minivan, Expo Wagon, Vanagon/Camper.)
- (21) Large van (B150-B350, Sportsman, Royal, Maxiwagon, Ram, Tradesman, Voyager [83 and before], E150-E350, Econoline, Clubwagon, Chateau, G10-G30, Chevy Van, Beauville, Sport Van, G15-G35, Rally Van, Vandura.)
- (22) Step van or walk-in van (≤ 4,500 kgs GVWR)
- (23) Van based motorhome (≤ 4,500 kgs GVWR)
- (24) Van based school bus (≤ 4,500 kgs GVWR)
- (25) Van based other bus (≤ 4,500 kgs GVWR)
- (28) Other van type (Hi-Cube Van, Kary) (specify): ____________________
- (29) Unknown van type

*Light Conventional Trucks (Pickup style cab, ≤ 4,500 kgs GVWR)*
- (30) Compact pickup (D50, Colt P/U, Ram 50, Dakota, Arrow Pickup [foreign], Ranger, Courier, S-10 , T-10, LUV, S-15, T-15, Sonoma, Datsun/Nissan Pickup, P'up, Mazda Pickup, Toyota Pickup, Mitsubishi Pickup)
- (31) Large Pickup (Jeep Pickup, Comanche, Ram Pickup, D100-D350, W100-W350, F100-F350, C10-C35, K10-K35, R10-R35, V10-V35, Silverado, Sierra, R100-R500, T100)
- (32) Pickup with slide-in camper
- (33) Convertible pickup
- (39) Unknown pickup style light conventional truck type

*Other Light Trucks (≤ 4,500 kgs GVWR)*
- (40) Cab chassis based (includes rescue vehicles, light stake, dump, and tow truck)
- (41) Truck based panel
- (42) Light truck based motorhome (chassis mounted)
- (45) Other light conventional truck type
- (48) Unknown light truck type
- (49) Unknown light vehicle type (automobile, utility, van, or light truck)

## OTHER VEHICLES

*Buses (Excludes Van Based)*
- (50) School bus (designed to carry students, not cross country or transit)
- (58) Other bus type (e.g., transit, intercity, bus based motorhome) (specify): ____________________
- (59) Unknown bus type

*Medium/Heavy Trucks (> 4,500 kgs GVWR)*
- (60) Step van (> 4,500 kgs GVWR)
- (61) Single unit straight truck (4,500 kgs < GVWR ≤ 8,850 kgs)
- (62) Single unit straight truck (8,850 kgs < GVWR ≤ 12,000 kgs)
- (63) Single unit straight truck (> 12,000 kgs GVWR)
- (64) Single unit straight truck, GVWR unknown
- (65) Medium/heavy truck based motorhome
- (67) Truck-tractor with no cargo trailer
- (68) Truck-tractor pulling one trailer
- (69) Truck-tractor pulling two or more trailers
- (70) Truck-tractor (unknown if pulling trailer)
- (78) Unknown medium/heavy truck type
- (79) Unknown truck type (light/medium/heavy)

*Motored Cycles (Does Not Include All-Terrain Vehicles/Cycles)*
- (80) Motorcycle
- (81) Moped (motorized bicycle)
- (82) Three-wheel motorcycle or moped
- (88) Other motored cycle (minibike, motorscooter) (specify): ____________________
- (89) Unknown motored cycle type

*Other Vehicles*
- (90) ATV (All-Terrain Vehicle) and ATC (All-Terrain Cycle)
- (91) Snowmobile
- (92) Farm equipment other than trucks
- (93) Construction equipment other than trucks
- (97) Other vehicle type
- (99) Unknown body type

## PRECRASH ENVIRONMENTAL DATA

19. Relation To Interchange Or Junction ___
    (0) Non-interchange area and non-junction
    (1) Interchange area related

    *Non-Interchange junctions*
    (2) Intersection related
    (3) Driveway, alley access related
    (4) Other junction (specify)
    ______________________
    (5) Unknown type of junction

    (9) Unknown

20. Trafficway Flow ___
    (0) Not physically divided (two way traffic)
    (1) Divided trafficway-median strip without positive barrier
    (2) Divided trafficway-median strip with positive barrier
    (3) One way traffic
    (9) Unknown

21. Number Of Travel Lanes ___
    (1) One
    (2) Two
    (3) Three
    (4) Four
    (5) Five
    (6) Six
    (7) Seven or more
    (9) Unknown

22. Roadway Alignment ___
    (1) Straight
    (2) Curve right
    (3) Curve left
    (9) Unknown

23. Roadway Profile ___
    (1) Level
    (2) Uphill grade (>2%)
    (3) Hill crest
    (4) Downhill grade (>2%)
    (5) Sag
    (9) Unknown

24. Roadway Surface Type ___
    (1) Concrete
    (2) Bituminous (asphalt)
    (3) Brick or block
    (4) Slag, gravel, or stone
    (5) Dirt
    (8) Other (specify): __________
    (9) Unknown

25. Roadway Surface Condition ___
    (1) Dry
    (2) Wet
    (3) Snow or slush
    (4) Ice
    (5) Sand, dirt, or oil
    (8) Other (specify): __________
    (9) Unknown

26. Light Conditions ___
    (1) Daylight
    (2) Dark
    (3) Dark, but lighted
    (4) Dawn
    (5) Dusk
    (9) Unknown

27. Atmospheric Conditions ___
    (0) No adverse atmospheric-related driving conditions
    (1) Rain
    (2) Sleet/hail
    (3) Snow
    (4) Fog
    (5) Rain and fog
    (6) Sleet and fog
    (7) Other (e.g., smog, smoke, blowing sand or dust, etc.) (specify):
    ______________________
    (9) Unknown

28. Traffic Control Device ___
    (0) No traffic control(s)
    (1) Traffic control signal (not RR crossing)

    *Regulatory*
    (2) Stop sign
    (3) Yield sign
    (4) School zone sign
    (5) Other regulatory sign (specify):
    ______________________
    (6) Warning sign (not RR crossing)
    (7) Unknown sign
    (8) Miscellaneous/other controls including RR controls (specify):
    ______________________
    (9) Unknown

29. Traffic Control Device Functioning ___
    (0) No traffic control device
    (1) Traffic control device not functioning (specify):
    ______________________
    (2) Traffic control device functioning properly
    (9) Unknown

## PRECRASH DRIVER RELATED DATA

30. Driver's Distraction/Inattention To Driving (Prior To Recognition Of Critical Event) ___ ___
(00) No driver present
(01) Attentive or not distracted
(02) Looked but did not see

*Distractions*
(03) By other occupant(s), (specify): ______
(04) By moving object in vehicle (specify): ______
(05) While talking or listening to cellular phone (specify location and type of phone): ______
(06) While dialing cellular phone (specify location and type of phone): ______
(07) While adjusting climate controls
(08) While adjusting radio, cassette, CD (specify): ______
(09) While using other device/object in vehicle (specify): ______
(10) Sleepy or fell asleep
(11) Distracted by outside person, object, or event (specify): ______
(12) Eating or drinking
(13) Smoking related
(97) Distracted/inattentive, details unknown
(98) Other, distraction (specify): ______
(99) Unknown

31. Pre-Event Movement (Prior to Recognition of Critical Event) ___ ___
(00) No driver present
(01) Going straight
(02) Decelerating in traffic lane
(03) Accelerating in traffic lane
(04) Starting in traffic lane
(05) Stopped in traffic lane
(06) Passing or overtaking another vehicle
(07) Disabled or parked in travel lane
(08) Leaving a parking position
(09) Entering a parking position
(10) Turning right
(11) Turning left
(12) Making a U-turn
(13) Backing up (other than for parking position)
(14) Negotiating a curve
(15) Changing lanes
(16) Merging
(17) Successful avoidance maneuver to a previous critical event
(97) Other (specify): ______
(99) Unknown

32. Critical Precrash Event ___ ___
*This Vehicle Loss of Control Due To:*
(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

*This Vehicle Traveling*
(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
(18) This vehicle decelerating
(19) Unknown travel direction

*Other Motor Vehicle In Lane*
(50) Other vehicle stopped
(51) Traveling in same direction with lower steady speed
(52) Traveling in same direction while decelerating
(53) Traveling in same direction with higher speed
(54) Traveling in opposite direction
(55) In crossover
(56) Backing
(59) Unknown travel direction of other motor vehicle in lane

*Other Motor Vehicle Encroaching Into Lane*
(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

*Pedestrian, Pedalcyclist, or Other Nonmotorist*
(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): ______

*Object or Animal*
(87) Animal in roadway
(88) Animal approaching roadway
(89) Animal—unknown location
(90) Object in roadway
(91) Object approaching roadway
(92) Object—unknown location
(98) Other critical precrash event (specify): ______
(99) Unknown

33. Attempted Avoidance Maneuver ___ ___
(00) No driver present
(01) No avoidance maneuver
(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
(98) Other action (specify):
______________________________
(99) Unknown

34. Pre-Impact Stability ___
(0) No driver present
(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):
______________________________
(9) Precrash stability unknown

35. Pre-Impact Location ___
(0) No driver present
(1) Stayed in original travel lane
(2) Stayed on roadway but left original travel lane
(3) Stayed on roadway, not known if left original travel lane
(4) Departed roadway
(5) Remained off roadway
(6) Returned to roadway
(7) Entered roadway
(9) Unknown

36. Accident Type ___ ___
(Note: Applicable codes on back of this page)
(00) No impact
Code the number of the diagram that best describes the accident circumstance
(98) Other accident type (specify):
______________________________
(99) Unknown

***STOP HERE IF GV07 DOES NOT EQUAL 01 - 49***

| 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 STA. OBJECT | 13 PEDESTRIAN/ ANIMAL | 14 END DEPARTURE | 15 SPECIFICS OTHER | 16 SPECIFICS UNKNOWN |
| II. Same Trafficway Same Direction | D Rear-End | 20 22 21 23 STOPPED 21, 22, 23 | 24 26 25 27 SLOWER 25, 26, 27 | 28 30 29 31 DECEL. 29, 30, 31 | (EACH • 32) SPECIFICS OTHER | (EACH • 33) SPECIFICS UNKNOWN | |
| | E. Forward Impact | 34 35 CONTROL/ TRACTION LOSS | 36 37 CONTROL/ TRACTION LOSS | 38 39 AVOID COLLISION WITH VEH. | 40 41 AVOID COLLISION WITH OBJECT | (EACH • 42) SPECIFICS OTHER | (EACH • 43) SPECIFICS UNKNOWN |
| | F. Sideswipe/ Angle | 44 45 | 46 45 47 | (EACH • 48) SPECIFICS OTHER | (EACH • 49) SPECIFICS UNKNOWN | | |
| III. Same Trafficway Opposite Direction | G. Head-On | 50 51 LATERAL MOVE | (EACH • 52) SPECIFICS OTHER | (EACH • 53) SPECIFICS UNKNOWN | | | |
| | H. Forward Impact | 54 55 CONTROL/ TRACTION LOSS | 56 57 CONTROL/ TRACTION LOSS | 58 59 AVOID COLLISION WITH VEH. | 60 61 AVOID COLLISION WITH OBJECT | (EACH • 62) SPECIFICS OTHER | (EACH • 63) SPECIFICS UNKNOWN |
| | I. Sideswipe/ Angle | 64 65 LATERAL MOVE | (EACH • 66) SPECIFICS OTHER | (EACH • 67) SPECIFICS UNKNOWN | | | |
| IV. Change Trafficway Vehicle Turning | J. Turn Across Path | 68 69 INITIAL OPPOSITE DIRECTIONS | 70 71 73 72 INITIAL SAME DIRECTIONS | (EACH • 74) SPECIFICS OTHER | (EACH • 75) SPECIFICS UNKNOWN | | |
| | K. Turn Into Path | 77 76 79 78 TURN INTO SAME DIRECTION | 81 80 83 82 TURN INTO OPPOSITE DIRECTIONS | (EACH • 84) SPECIFICS OTHER | (EACH • 85) SPECIFICS UNKNOWN | | |
| V. Intersecting Paths (Vehicle Damage) | L. Straight Paths | 87 86 | 88 89 | (EACH • 90) SPECIFICS OTHER | (EACH • 91) SPECIFICS UNKNOWN | | |
| VI. Miscellaneous | M. Backing Etc. | 92 BACKING VEH. | 93 OTHER VEH. OR OBJECT | 98 Other Accident Type<br>99 Unknown Accident Type<br>00 No Impact | | | |

## OCCUPANT RELATED

37. Driver Presence in Vehicle ____
(0) Driver not present
(1) Driver present
(9) Unknown

38. Number of Occupants This Vehicle ____ ____
(00-96) Code actual number of occupants for this vehicle
(97) 97 or more
(99) Unknown

39. Number of Occupant Forms Submitted ____ ____

## AIR BAG RELATED

40. Is this an AOPS Vehicle? ____
(0) No (includes unknown)
(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

41. Air Bag(s) Deployment, First Seat Frontal ____
(0) Not equipped or not available
(1) No air bags deployed

*Single Air Bag Vehicle*
(2) Driver air bag deployed
(3) Driver air bag, unknown if deployed

*Multiple Air Bag Vehicle*
(4) Driver side only deployed
(5) Passenger side only deployed
(6) Driver and passenger side deployed
(7) Driver and passenger side unknown if deployed
(8) Air bag(s) deployed, details unknown
(9) Unknown

42. Air Bag(s) Deployment, Other Than First Seat Frontal ____
(0) Not equipped with an "other" air bag
(1) Deployed during accident (as a result of impact)
(2) Deployed inadvertently just prior to accident
(3) Deployed, details unknown
(4) Deployed as a result of a noncollision event during accident sequence (e.g., fire, explosion, electrical)
(5) Unknown if deployed
(7) Nondeployed
(9) Unknown

*Specify type of "other" air bag present:* ____________

______________________________

## VEHICLE WEIGHT ITEMS

43. 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:____________________________

44. 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

Source:____________________________

## ROLLOVER DATA

45. Rollover ____ ____
(00) No rollover (no overturning)

*Rollover (primarily about the longitudinal axis)*
(01-16) Code the number of quarter turns
(17) Rollover, 17 or more quarter turns (specify): ____________
(98) Rollover--end-over-end (i.e., primarily about the lateral axis)
(99) Rollover (overturn), details unknown

46. Rollover Initiation Type ____ ____
(00) No rollover
(01) Trip-over
(02) Flip-over
(03) Turn-over
(04) Climb-over
(05) Fall-over
(06) Bounce-over
(07) Collision with another vehicle
(08) Other rollover initiation type specify): ____________
(98) Rollover--end-over-end
(99) Unknown rollover initiation type

47. Location of Rollover Initiation ____
(0) No rollover
(1) On roadway
(2) On shoulder—paved
(3) On shoulder—unpaved
(4) On roadside or divided trafficway median
(8) Rollover--end-over-end
(9) Unknown

48. Rollover Initiation Object Contacted ____ ____
(Note: Applicable codes on back of page)

49. Location on Vehicle Where Initial Principal Tripping Force Is Applied ____
(0) No rollover
(1) Wheels/tires
(2) Side plane
(3) End plane
(4) Undercarriage
(5) Other location on vehicle (specify): ____________
(6) Non-contact rollover forces (specify): ____________
(8) Rollover--end-over-end
(9) Unknown

50. Direction of Initial Roll ____
(0) No rollover
(1) Roll right - primarily about the longitudinal axis
(2) Roll left - primarily about the longitudinal axis
(8) Rollover--end-over-end
(9) Unknown roll direction

## CODES FOR ROLLOVER INITIATION OBJECT CONTACTED

(00) No rollover
(01-30) — Vehicle Number

Noncollision
(31) Turn-over — fall-over
(32) No rollover impact initiation (end-over-end)
(34) Jackknife

Collision With Fixed Object
(41) Tree (≤ 10 cm in diameter)
(42) Tree (> 10 cm in diameter)
(43) Shrubbery or bush
(44) Embankment

(45) Breakaway pole or post (any diameter)

Nonbreakaway Pole or Post
(50) Pole or post (≤ 10 cm in diameter)
(51) Pole or post (> 10 cm but ≤ 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
(70) Passenger car, light truck, van, or other vehicle not in-transport
(71) Medium/heavy truck or bus 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

## OVERRIDE/UNDERRIDE (THIS VEHICLE)

51. Front Override/Underride (this Vehicle) ___

52. Rear Override/Underride (this Vehicle) ___
    (0) No override/underride, or not an end-to-end impact between two CDS applicable vehicles, and no medium/heavy truck or bus underride

    *Override (see specific CDC)*
    *[Between 2 CDS applicable vehicles (Bodytype, GV07 = 1-49)]*
    (1) 1st CDC
    (2) 2nd CDC
    (3) Other not automated CDC (specify): ___

    *Underride (see specific CDC)*
    *[Between 2 CDS applicable vehicles (Bodytype, GV07 = 1-49)]*
    (4) 1st CDC
    (5) 2nd CDC
    (6) Other not automated CDC (specify): ___

    (7) Medium/heavy truck or bus override (of any configuration)
    (9) Unknown

## HEADING ANGLE AT IMPACT FOR HIGHEST DELTA V

Values: (000)-(359) Code actual value
(997) Noncollision
(998) Impact with object
(999) Unknown

53. Heading Angle For This Vehicle ___ ___ ___

54. Heading Angle For Other Vehicle ___ ___ ___

## RECONSTRUCTION DATA

55. Towed Trailing Unit ___
    (0) No towed unit
    (1) Yes—towed trailing unit
    (9) Unknown

56. Documentation of Trajectory Data for This Vehicle ___
    (0) No
    (1) Yes

57. 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

## ACCIDENT RECONSTRUCTION PROGRAMS HIGHEST DELTA V

58. Basis for Total (Resultant) Delta V (highest) ___ ___

    (00) No vehicle inspection

    *Delta V Calculated*
    (01) Reconstruction program -damage only routine
    (02) Reconstruction program -damage and trajectory routine
    (03) Missing vehicle algorithm

    *Delta V Not Calculated*
    (04) At least one vehicle (which may be this vehicle) is beyond the scope of an acceptable reconstruction program, regardless of collision conditions.

    *All vehicles within scope (CDC applicable) of reconstuction program but one of the collision conditions is beyond the scope of the reconstruction program or other acceptable reconstruction technique, regardless of adequacy of damage data.*

    (05) Rollover
    (06) Other non-horizontal forces
    (07) Sideswipe type damage
    (08) Severe override
    (09) Yielding object
    (10) Overlapping damage
    (11) All vehicle and collision conditions are within scope of one of the acceptable reconstruction programs, but there is insufficient data available, (specify): ___

    (98) Other, (specify): ___

## COMPUTER GENERATED CRASH SEVERITY

59. Total Delta V ___ ___ ___

_________ Nearest kmph (highest)

_________ Nearest kmph (secondary)

(NOTE: 000 means less than 0.5 kmph)
(160)159.5 kmph and above
(999)Unknown

Highest

60. Longitudinal Component of Delta V + – ___ ___ ___

_________ Nearest kmph (highest)

_________ Nearest kmph (secondary)

(NOTE: __000 means greater than −0.5 kmph and less than +0.5 kmph)
(±160) ±159.5 kmph and above
(__999) Unknown

Highest

61. Lateral Component of Delta V + – ___ ___ ___

_________ Nearest kmph (highest)

_________ Nearest kmph (secondary)

(NOTE: __000 means greater than −0.5 kmph and less than +0.5 kmph)
(±160) ±159.5 kmph and above
(_999) Unknown

62. Energy Absorption ___ ___ ___, ___ 0 0

_________ Nearest 100 joules (highest)

_________ Nearest 100 joules (secondary)

(NOTE: 0000 means less than 50 joules)
(9997) 999,650 joules or more
(9999) Unknown

Highest

63. Impact Speed ___ ___ ___

_________ Nearest kmph (highest)

_________ Nearest kmph (secondary)

(NOTE: 000 means less than 0.5 kmph)
(160) 159.5 kmph and above
(998) Trajectory algorithm not run
(999) Unknown

## DELTA V CONFIDENCE LEVEL

64. Confidence In Reconstruction Program Results (For Highest Delta V) ___
(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

## OTHER SPEED ESTIMATE

Highest

65. Barrier Equivalent Speed ___ ___ ___

_________ Nearest kmph (highest)

_________ Nearest kmph (secondary)

(NOTE: 000 means less than 0.5 kmph)
(160) 159.5 kmph and above
(999) Unknown

**IS MISSING VEHICLE ALGORITHM APPLICABLE FOR THIS VEHICLE? [ ] YES [ ] NO**

**IF YES: IS A COMPLETED PROGRAM SUMMARY INCLUDED? [ ] YES [ ] NO**

## ESTIMATED DELTA V

66. Estimated Highest Delta V (Researcher Determined) ___
    (0) Reconstruction Delta V coded

    *Estimated Delta V*
    (1) Less than 10 kmph
    (2) ≥ 10 kmph but < 25 kmph
    (3) ≥ 25 kmph but < 40 kmph
    (4) ≥ 40 kmph but < 55 kmph
    (5) ≥ 55 kmph

    *Other estimates of damage severity*
    (6) Minor
    (7) Moderate
    (8) Severe

    (9) Unknown

## VEHICLE INSPECTION

67. Type of Vehicle Inspection ___
    (0) No inspection
    (1) Vehicle fully repaired-no damage evident
    (2) Partial inspection (specify):
    ______________________
    (3) Complete inspection

***** IF THE CDS APPLICABLE VEHICLE WAS NOT INSPECTED (I.E., GV67=0), *****

**DO NOT COMPLETE THE EXTERIOR AND INTERIOR VEHICLE FORMS**

***** IF GV07 DOES NOT EQUAL 01-49, DO NOT COMPLETE *****

**THE EXTERIOR VEHICLE, INTERIOR VEHICLE,**

**OCCUPANT ASSESSMENT, AND OCCUPANT INJURY FORMS.**

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

# EXTERIOR VEHICLE FORM

NATIONAL ACCIDENT SAMPLING SYSTEM
CRASHWORTHINESS DATA SYSTEM

1. Primary Sampling Unit Number ___ ___

2. Case Number - Stratum ___ ___ ___ ___

3. Vehicle Number ___ ___

## VEHICLE IDENTIFICATION

VIN ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ Model Year ___ ___

Vehicle Make (specify): ______________ Vehicle Model (specify): ______________

## LOCATOR

Locate the end of the damage with respect to the vehicle's damaged center point or bumper corner for end impacts or an undamaged axle for side impacts.

| Specific Impact No. | Location of Direct Damage | Location of Field L | Location of Max Crush |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

## CRUSH PROFILE IN CENTIMETERS

NOTES: Identify the plane at which the C-measurements are taken (e.g., at bumper, above bumper, at sill, above sill, etc.) and label adjustments (e.g., free space).

Measure C1 to C6 from driver to passenger side in front or rear impacts and rear to front in side impacts.

Free space value is defined as the distance between the baseline and the original body contour taken at the individual C locations. This may include the following: bumper lead, bumper taper, side protrusion, side taper, etc. Record the value for each C-measurement and maximum crush.

Use as many lines/columns as necessary to describe each damage profile.

| Specific Impact Number | Plane of Impact C-Measurements | Direct Damage Width (CDC) | Direct Damage Max Crush | Field L | $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ | ±D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
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# 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

**TIRE—WHEEL DAMAGE**

| a. Rotation physically restricted | | b. Tire deflated | |
|---|---|---|---|
| RF | ____ | RF | ____ |
| LF | ____ | LF | ____ |
| RR | ____ | RR | ____ |
| LR | ____ | LR | ____ |

(1) Yes (2) No (8) NA (9) Unk.

**TYPE OF TRANSMISSION**

☐ Manual ☐ Automatic

END SHIFT ≥ 10 CM

☐ Yes ☐ No

**ORIGINAL SPECIFICATIONS**

| | | |
|---|---|---|
| Wheelbase | ____________ | cm |
| Overall Length | ____________ | cm |
| Maximum Width | ____________ | cm |
| Curb Weight | ____________ | kg |
| Average Track | ____________ | cm |
| Front Overhang | ____________ | cm |
| Rear Overhang | ____________ | cm |
| Undeformed End Width | ____________ | cm |
| Engine Size: cyl./displ. | ____________ | L |

**WHEEL STEER ANGLES**

(For locked front wheels or displaced rear axles only)

RF ± ___ ___ °

LF ± ___ ___ °

RR ± ___ ___ °

LR ± ___ ___ °

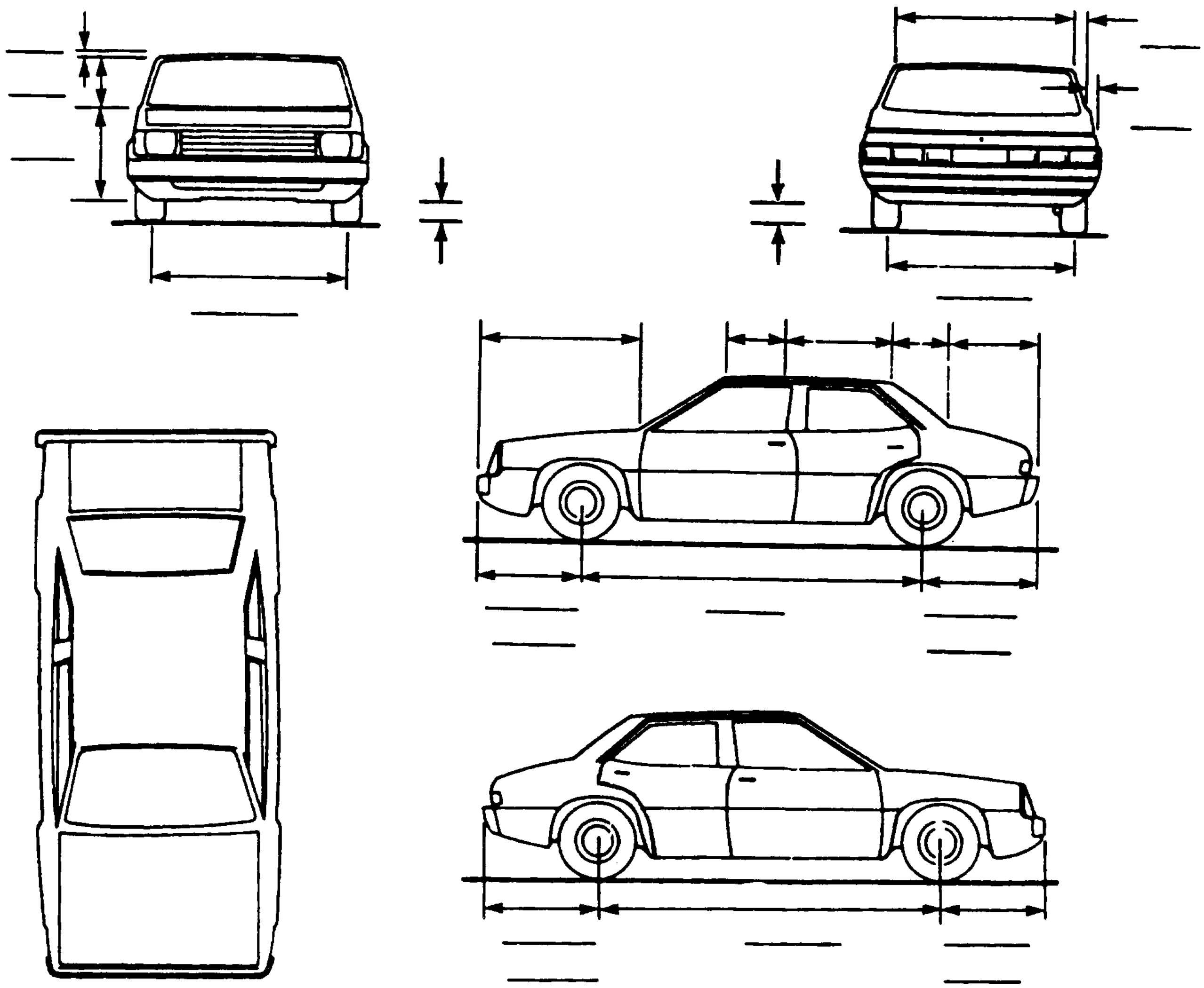
Within ± 5 degrees

**DRIVE WHEELS**

☐ FWD ☐ RWD ☐ 4WD

Approximate Cargo Weight ________ kg

**MEASUREMENTS IN CENTIMETERS**



NOTES: 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.

Annotate any damage caused by extrication such as component removal by torching, prying, or hydraulic shears.

## CDC WORKSHEET

### CODES FOR OBJECT CONTACTED

(01-30) — Vehicle Number

Noncollision
- (31) Overturn — rollover (excludes end-over-end)
- (32) Rollover—end-over-end
- (33) Fire or explosion
- (34) Jackknife
- (35) Other intraunit damage (specify): ____________
- (36) Noncollision injury
- (38) Other noncollision (specify): ____________
- (39) Noncollision — details unknown

Collision With Fixed Object
- (41) Tree (≤ 10 cm in diameter)
- (42) Tree (> 10 cm in diameter)
- (43) Shrubbery or bush
- (44) Embankment
- (45) Breakaway pole or post (any diameter)

Nonbreakaway Pole or Post
- (50) Pole or post (≤ 10 cm in diameter)
- (51) Pole or post (> 10 cm but ≤ 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
- (70) Passenger car, light truck, van, or other vehicle not in-transport
- (71) Medium/heavy truck or bus not in-transport
- (72) Pedestrian
- (73) Cyclist or cycle
- (74) Other nonmotorist or conveyance ____________
- (75) Vehicle occupant
- (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

### DEFORMATION CLASSIFICATION BY EVENT NUMBER

| Accident Event Sequence Number | Object Contacted | (1) (2) Direction of Force (degrees) | Incremental Value of Shift | (3) Deformation Location | (4) Specific Longitudinal or Lateral Location | (5) Specific Vertical or Lateral Location | (6) Type of Damage Distribution | (7) Deformation Extent |
|---|---|---|---|---|---|---|---|---|
| __ __ | __ __ | __ __ __ | __ __ | __ | __ | __ | __ | __ __ |
| __ __ | __ __ | __ __ __ | __ __ | __ | __ | __ | __ | __ __ |
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| __ __ | __ __ | __ __ __ | __ __ | __ | __ | __ | __ | __ __ |
| __ __ | __ __ | __ __ __ | __ __ | __ | __ | __ | __ | __ __ |

## 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. $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ | 22. ±D |
|---|---|---|---|---|---|---|---|
| ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ± ___ ___ ___ |

Second Highest Delta "V"

| 23. L | 24. $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ | 25. ±D |
|---|---|---|---|---|---|---|---|
| ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ___ ___ ___ | ± ___ ___ ___ |

26. Undeformed End Width (Coded when highest severity impact is an end plane impact.) ___ ___ ___
    - _____ Code to the nearest centimeter
    - (250) 250 centimeters or more
    - (998) No highest severity end plane impact
    - (999) Unknown

27. Direct Damage Width (For highest severity impact) ___ ___ ___
    - _____ Code to the nearest centimeter
    - (250) 250 centimeters or more
    - (999) Unknown

28. Original Wheelbase ___ ___ ___
    - _____ Code to the nearest centimeter
    - (650) 650 centimeters or more
    - (999) Unknown
    - ___ ___ ___ . ___ inches X 2.54 = ___ ___ ___ centimeters

29. Original Average Track Width ___ ___ ___
    - _____ Code to the nearest centimeter
    - (185) 185 centimeters or more
    - (999) Unknown
    - ___ ___ ___ . ___ inches X 2.54 = ___ ___ ___ centimeters

## AUTOMATIC RESTRAINTS

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

### AIR BAGS

| | | Left Front | Right Front | Other |
|---|---|---|---|---|
| FIRST | Availability/Function | | | |
| | Deployment | | | |
| | Failure | | | |

**Air Bag System Availability/Function**
(0) Not equipped/not available
(1) Air bag

*Non-functional*
(2) Air bag disconnected (specify): ____________
(3) Air bag not reinstalled
(9) Unknown

**Are There Indications of Air Bag System Failure? (This Occupant Position)**
(0) Not equipped/not available
(1) No
(2) Yes (specify): ____________
(9) Unknown

**Frontal Air Bag System Deployment (This Occupant Position)**
(0) Not equipped/not available
(1) Deployed during accident (as a result of impact)
(2) Deployed inadvertently just prior to accident
(3) Deployed, accident sequence undetermined
(4) Deployed as a result of a noncollision event during accident sequence (e.g., fire, explosion, electrical)
(5) Unknown if deployed
(7) Nondeployed
(9) Unknown

**Air Bag(s) Deployment, *Other* Than First Seat Frontal (This Occupant Position)**
(0) Not equipped with an *"other"* air bag
(1) Deployed during accident (as a result of impact)
(2) Deployed inadvertently just prior to accident
(3) Deployed, details unknown
(4) Deployed as a result of a noncollision event during accident sequence (e.g., fire, explosion, electrical)
(5) Unknown if deployed
(7) Nondeployed
(9) Unknown

### AUTOMATIC BELTS

| | | Left | Right |
|---|---|---|---|
| FIRST | Availability/Function | | |
| | Use | | |
| | Type | | |
| | Proper Use | | |
| | Failure Modes | | |

**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

*Non-functional*
(4) Automatic belts destroyed or rendered inoperative
(9) Unknown

**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)
(3) Automatic belt use unknown
(9) Unknown

**Automatic (Passive) Belt System Type**
(0) Not equipped/not available
(1) Non-motorized system
(2) Motorized system
(9) Unknown

**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

*Automatic Belt Used Improperly*
(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

**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

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

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

32. Is This A Multi-Stage Manufactured Vehicle And/Or A Certified Altered Vehicle? ___
    (0) No post manufacturer modifications
    (1) Yes - post manufacturer modifications (specify): ______________________
    ______________________
    ______________________
    (Include photograph of CERTIFICATION PLACARD in case report)
    (9) Unknown if vehicle is modified

## FIRE OCCURRENCE

33. Fire Occurrence ___
    (0) No fire

    Yes, fire occurred
    (1) Minor
    (2) Major
    (9) Unknown

34. Origin of Fire ___
    (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

## FUEL SYSTEM

35. Location of Fuel Tank-1 Filler Cap ___

36. Location of Fuel Tank-2 Filler Cap ___
    (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

37. Type of Fuel Tank-1 ___

38. Type of Fuel Tank-2 ___
    (0) No fuel tank (electrical vehicle)
    (1) Metallic
    (2) Non-metallic
    (9) Unknown

39. Location of Fuel Tank-1 ___

40. Location of Fuel Tank-2 ___
    (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

41. Damage to Fuel Tank-1 ___

42. Damage to Fuel Tank-2 ___
    (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

43. Leakage Location of Fuel System-1 ____

44. Leakage Location of Fuel System-2 ____
   (0) No fuel tank
   (1) No fuel leakage

   *Primary Area Of Leakage*
   (2) Tank
   (3) Filler neck
   (4) Cap
   (5) Lines/pump/filter
   (6) Vent/emission recovery
   (8) Other (specify):________________
   (9) Unknown

45. Fuel Type-1 ____ ____

46. Fuel Type-2 ____ ____

   *Single Fuel Type*
   (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): ________________

   *Electric Powered or Electric/Solar Powered Vehicles*
   (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

47. Is This Vehicle Equipped With More Than Two Fuel Tanks? ____
   (0) No (one or two tanks only)

   *Yes - More Than Two Tanks*
   (1) Yes -- no damage to any tank or filler cap and no fuel system leakage
   (2) Yes -- no damage to any tank or filler cap but there is fuel system leakage (specify leakage location): ________________
   (3) Yes -- damage to an additional tank or filler cap and there is fuel system leakage (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

## COMMENTS

________________

*** STOP: IF THE CDS APPLICABLE VEHICLE WAS NOT TOWED ***

(GV10=0)

DO NOT COMPLETE THE INTERIOR VEHICLE FORM.

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

# INTERIOR VEHICLE FORM

NATIONAL ACCIDENT SAMPLING SYSTEM
CRASHWORTHINESS DATA SYSTEM

1. Primary Sampling Unit Number ___ ___
2. Case Number - Stratum ___ ___ ___ ___
3. Vehicle Number ___ ___

## INTEGRITY

4. Passenger Compartment Integrity ___ ___

(00) No integrity loss

Yes, Integrity Was Lost Through
(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
(98) Other combination of above (specify):
______________________
(99) Unknown

### Door, Tailgate or Hatch Opening

5. LF___ 6. RF___ 7. LR___ 8. RR___ 9. TG/H___

(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

### Damage/Failure Associated with Door, Tailgate or Hatch Opening in Collision. If IV05-IV09 ≠ 2, Then code Ø

10. LF___ 11. RF___ 12. LR___ 13. RR___ 14. TG/H___

(0) No door/gate/hatch or door not opened

Door, Tailgate or Hatch Came Open During Collision
(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

## GLAZING

### Type of Window/Windshield Glazing

15. WS___ 16. LF___ 17. RF___ 18. LR___ 19. RR___
20. BL___ 21. Roof___ 22. Other___

(0) No glazing
(1) AS-1 — Laminated
(2) AS-2 — Tempered
(3) AS-3 — Tempered-tinted (original)
(4) AS-2 — Tempered-with after market tint
(5) AS-3 — Tempered-tinted (with additional after market tint)
(6) AS-14 — Glass/Plastic
(7) Glazing removed prior to accident
(8) Other (specify):
______________________
(9) Unknown

### Window Precrash Glazing Status

23. WS___ 24. LF___ 25. RF___ 26. LR___ 27. RR___
28. BL___ 29. Roof___ 30. Other___

(0) No glazing
(1) Fixed
(2) Closed
(3) Partially opened
(4) Fully opened
(7) Glazing removed prior to accident
(9) Unknown

### Glazing Damage from Impact Forces

31. WS___ 32. LF___ 33. RF___ 34. LR___ 35. RR___
36. BL___ 37. Roof___ 38. Other___

(0) No glazing
(1) 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
(9) Unknown if damaged

### Glazing Damage from Occupant Contact

39. WS___ 40. LF___ 41. RF___ 42. LR___ 43. RR ___
44. BL___ 45. Roof___ 46. Other___

(0) No glazing
(1) No occupant contact to glazing
(2) Glazing contacted by occupant but no glazing damage
(3) Glazing in place and cracked by occupant contact
(4) Glazing in place and holed by occupant contact
(5) Glazing out-of-place (cracked or not) by occupant contact and not holed by occupant contact
(6) Glazing out-of-place by occupant contact and holed by occupant contact
(7) Glazing removed prior to accident
(8) Glazing disintegrated by occupant contact
(9) Unknown if contacted by occupant

# INTRUSION WORKSHEET

***NOTE: SKETCH INTRUDED AREAS***

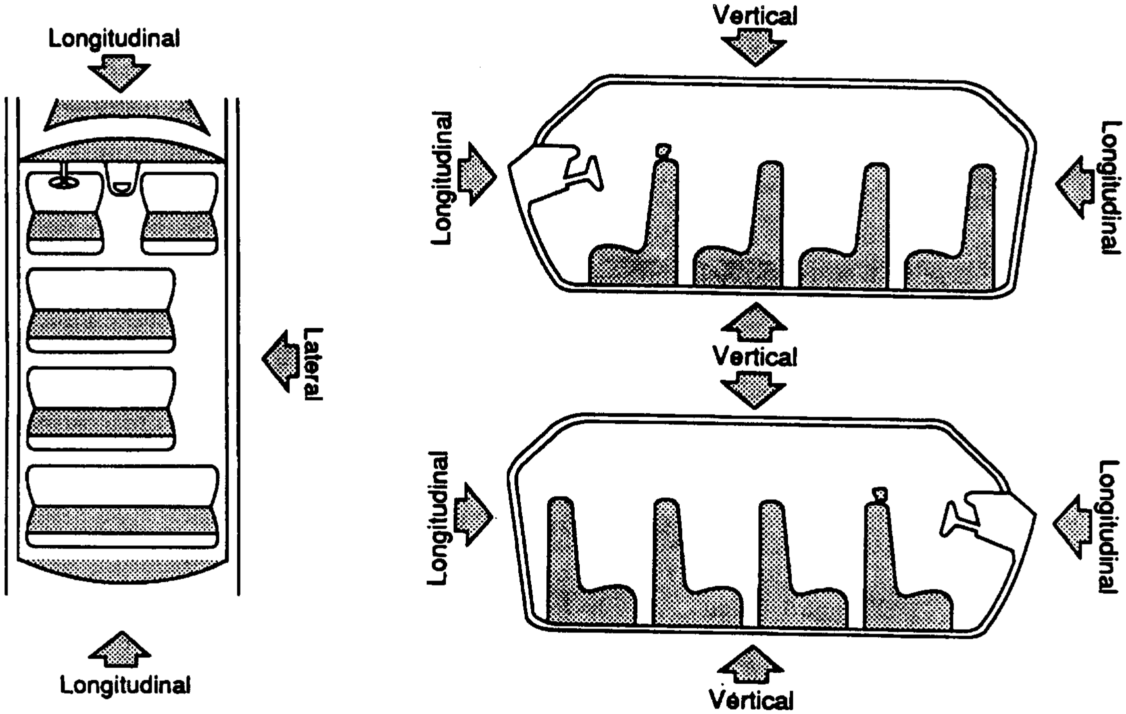
Row Width (cm)

______

______

______

______




| LOCATION OF INTRUSION | INTRUDED COMPONENT | (All Measurements Are In Centimeters) COMPARISON VALUE | — | INTRUDED VALUE | = | INTRUSION | DOMINANT CRUSH DIRECTION |
|---|---|---|---|---|---|---|---|
| | | | — | | = | | |
| | | | — | | = | | |
| | | | — | | = | | |
| | | | — | | = | | |
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| | | | — | | = | | |
| | | | — | | = | | |
| | | | — | | = | | |

Document no more than the 15 most severe intrusions

## OCCUPANT AREA INTRUSION

Note: If no intrusions, leave variables IV47-IV86 blank.

| | 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.___ |

### LOCATION OF INTRUSION

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

### INTRUDING COMPONENT

*Interior Components*
- (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) Side panel - forward of the A1/A2-pillar
- (11) Door panel (side)
- (12) Side panel - rear of the B-pillar
- (13) Roof (or convertible top)
- (14) Roof side rail
- (15) Windshield
- (16) Windshield header
- (17) Window frame
- (18) Floor pan (includes sill)
- (19) Backlight header
- (20) Front seat back
- (21) Second seat back
- (22) Third seat back
- (23) Fourth seat back
- (24) Fifth seat back
- (25) Seat cushion
- (26) Back door/panel (e.g., tailgate)
- (27) Other interior component (specify): ______________

*Exterior Components*
- (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

### MAGNITUDE OF INTRUSION

- (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

### DOMINANT CRUSH DIRECTION

- (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

87. Steering Column Type ___
(1) Fixed column
(2) Tilt column
(3) Telescoping column
(4) Tilt and telescoping column
(8) Other column type (specify): ____________________
(9) Unknown

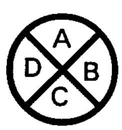
88. Tilt Steering Column Adjustment ___
(0) No tilt steering column
(1) Full up
(2) Between full up and center
(3) Center
(4) Between center and full down
(5) Full down
(9) Unknown

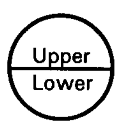
89. Telescoping Steering Column Adjustment ___
(0) No telescoping steering column
(1) Full back
(2) Between full back and midpoint
(3) Midpoint
(4) Between midpoint and full forward
(5) Full forward
(9) Unknown

90. Steering Rim/Spoke Deformation ___ ___
_____Code actual measured deformation to the nearest centimeter
(00) No steering rim deformation
(01-14) Actual measured value in centimeters
(15) 15 centimeters or more
(98) Observed deformation cannot be measured
(99) Unknown

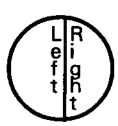
91. Location of Steering Rim/Spoke Deformation ___ ___
(00) No steering rim deformation

*Quarter Sections*
(01) Section A
(02) Section B
(03) Section C
(04) Section D




*Half Sections*
(05) Upper half of rim/spoke
(06) Lower half of rim/spoke
(07) Left half of rim/spoke
(08) Right half of rim/spoke




(09) Complete steering wheel collapse
(10) Undetermined location
(99) Unknown

## INSTRUMENT PANEL

92. Odometer Reading ___ ___ ___,000

_____ kilometers
Code to the nearest 1,000 kilometers
(000) No odometer
(001) Less than 1,500 kilometers
(500) 499,500 kilometers or more
(999) Unknown

___ ___ ___, ___ ___ ___ miles X 1.6093 = ___ ___ ___, ___ ___ ___ kilometers

Source: ____________________

93. Instrument Panel Damage from Occupant Contact? ___
(0) No
(1) Yes
(9) Unknown

94. Type of Knee Bolster Covering ___
(0) No knee bolster
(1) Padded
(2) Rigid plastic
(8) Other (specify): ____________________
(9) Unknown

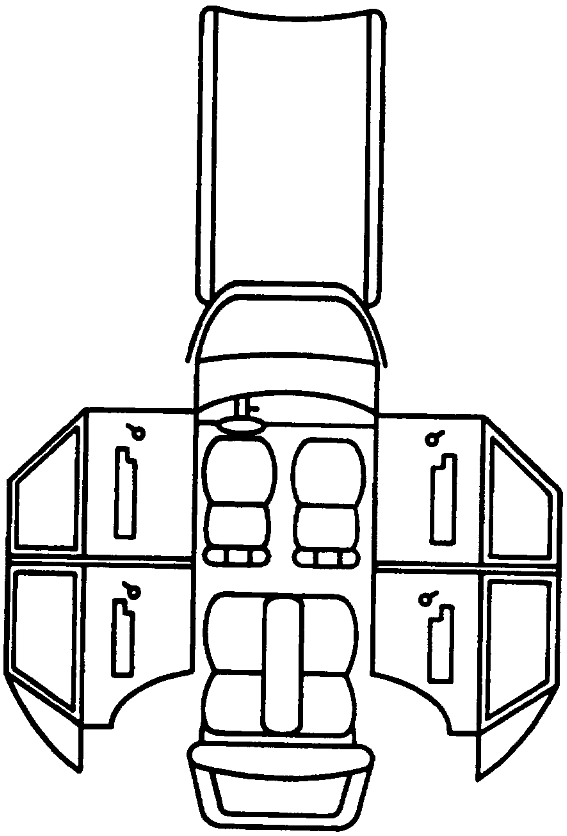
95. Knee Bolsters Deformed from Occupant Contact? ___
(0) No knee bolster
(1) No deformation
(2) Yes - deformation
(9) Unknown

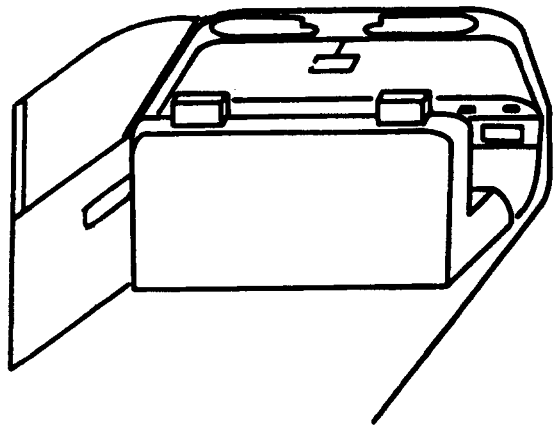
96. Did Glove Compartment Door Open During Collision(s)? ___
(0) No glove compartment door
(1) No - door did not open
(2) Yes - door opened
(9) Unknown

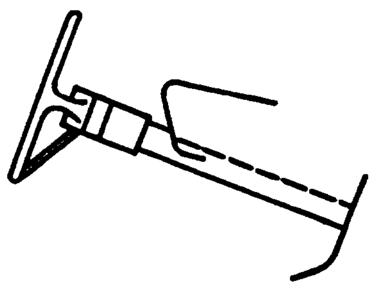
97. Adaptive (Assistive) Driving Equipment ___
(0) No adaptive driving equipment
(1) Adaptive driving equipment installed
(Check all that apply.)
[ ] Hand controls for braking/acceleration
[ ] Steering control devices (attached to OEM steering wheel
[ ] Steering knob attached to steering wheel
[ ] Low effort power steering (unit or device)
[ ] Replacement steering wheel (i.e., reduced diameter)
[ ] Joy-stick steering controls
[ ] Wheelchair tie-downs
[ ] Modification to seat belts (specify): ____________________
[ ] Additional or relocated switches (specify): ____________________
[ ] Raised roof
[ ] Wall-mounted head rest (used behind wheelchair)
[ ] Other adaptive device (specify): ____________________
(9) Unknown

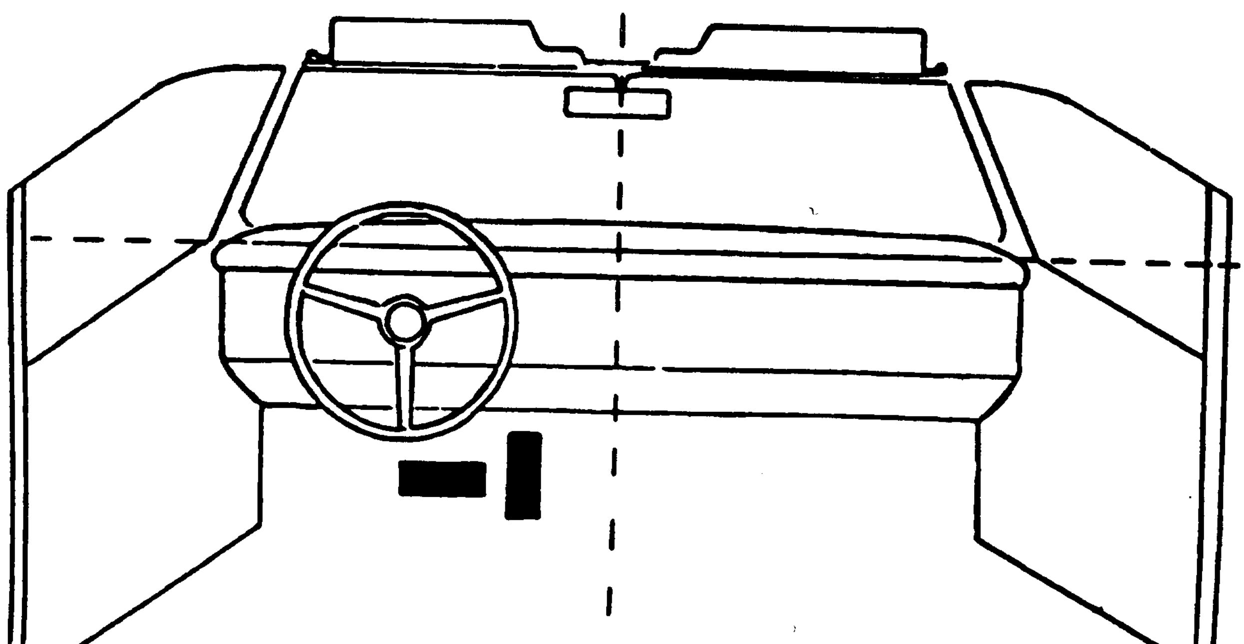
## VEHICLE INTERIOR SKETCHES

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

FRONT
(001) Windshield
(002) Mirror
(003) Sunvisor
(004) Steering wheel rim
(005) Steering wheel hub/spoke
(006) Steering wheel (combination of codes 004 and 005)
(007) Steering column,transmission selector lever, other attachment
(008) Cellular telephone or CB radio
(009) Add on equipment(e.g., tapedeck, air conditioner)
(010) Left instrument panel and below
(011) Center instrument panel and below
(012) Right instrument panel and below
(013) Glove compartment door
(014) Knee bolster
(015) Windshield including one or more of the following: front header, A (A1/A2)-pillar, instrument panel, mirror, or steering assembly (driver side only)
(016) Windshield including one or more of the following: front header, A (A1/A2)-pillar, instrument panel, or mirror (passenger side only)
(017) Windshield reinforced by exterior object, (specify): ____
(019) Other front object (specify): ____

LEFT SIDE
(051) Left side interior surface, excluding hardware or armrests
(052) Left side hardware or armrest
(053) Left A (A1/A2)-pillar
(054) Left B-pillar
(055) Other left pillar (specify): ____
(056) Left side window glass
(057) Left side window frame
(058) Left side window sill
(059) Left side window glass including one or more of the following: frame, window sill, A (A1/A2)-pillar, B-pillar, or roof side rail.
(060) Other left side object (specify): ____

RIGHT SIDE
(101) Right side interior surface, excluding hardware or armrests
(102) Right side hardware or armrest
(103) Right A (A1/A2)-pillar
(104) Right B-pillar
(105) Other right pillar (specify): ____
(106) Right side window glass
(107) Right side window frame
(108) Right side window sill
(109) Right side window glass including one or more of the following: frame, window sill, A (A1/A2)-pillar, B-pillar, or roof side rail.
(110) Other right side object (specify): ____

INTERIOR
(151) Seat, back support
(152) Belt restraint webbing/buckle
(153) Belt restraint B-pillar or door frame attachment point
(154) Other restraint system component (specify): ____
(155) Head restraint system
(160) Other occupants (specify): ____
(161) Interior loose objects
(162) Child safety seat (specify): ____
(163) Other interior object (specify): ____

AIR BAG
(170) Air bag-driver side
(175) Air bag compartment cover-driver side
(180) Air bag-passenger side
(185) Air bag compartment cover-passenger side
(190) Other air bag (specify) ____
(195) Other air bag compartment cover (specify) ____

ROOF
(201) Front header
(202) Rear header
(203) Roof left side rail
(204) Roof right side rail
(205) Roof or convertible top

FLOOR
(251) Floor (including toe pan)
(252) Floor or console mounted transmission lever, including console
(253) Parking brake handle
(254) Foot controls including parking brake

REAR
(301) Backlight (rear window)
(302) Backlight storage rack, door, etc.
(303) Other rear object (specify): ____

ADAPTIVE (ASSISTIVE) DRIVING EQUIPMENT
(401) Hand controls for braking/acceleration
(402) Steering control devices (attached to OEM steering wheel)
(403) Steering knob attached to steering wheel
(405) Replacement steering wheel (i.e., reduced diameter)
(406) Joy stick steering controls
(407) Wheelchair tie-downs
(408) Modification to seat belts, (specify): ____
(409) Additional or relocated switches, (specify): ____
(410) Raised roof
(411) Wall mounted head rest (used behind wheel chair)
(412) Other adaptive device (specify): ____

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

# 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 |
|---|---|---|---|---|
| FIRST | Availability | | | |
| | Evidence of usage | | | |
| | Used in this crash? | | | |
| | Proper Use | | | |
| | Failure Modes | | | |
| | Anchorage Adjustment | | | |
| SECOND | Availability | | | |
| | Evidence of usage | | | |
| | Used in this crash? | | | |
| | Proper Use | | | |
| | Failure Modes | | | |
| | Anchorage Adjustment | | | |
| OTHER | Availability | | | |
| | Evidence of usage | | | |
| | Used in this crash? | | | |
| | Proper Use | | | |
| | Failure Modes | | | |
| | Anchorage Adjustment | | | |

**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

**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 belt used with child safety seat (specify): ____________
(99) Unknown if belt used

**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 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

**Shoulder Belt Upper Anchorage Adjustment**

(0) No shoulder belt
(1) No upper anchorage adjustment for shoulder belt

*Adjustable shoulder Belt Upper Anchorage*

(2) In full up position
(3) In mid position
(4) In full down position
(5) Position unknown
(9) Unknown if position has adjustable upper anchorage adjustment

# FIRST SEAT FRONTAL AIR BAGS

NOTES: Encode the applicable data ***for the driver and first seat passenger*** 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.

| | Driver | Passenger |
|---|---|---|
| Type of air bag? | | |
| Flaps open at tear points? | | |
| Flaps damaged? | | |
| Air bag damaged? | | |
| Source of air bag damage | | |
| Air bag tethered? | | |
| Air bag have vent ports? | | |
| Other occupant contact air bag? | | |
| Occupant wearing eyewear? | | |

**Type of Air Bag**

(0) Not equipped/not available
(1) Original manufacturer installed system
(2) Retrofitted air bag
(3) Replacement air bag
(8) Unknown type of air bag
(9) Unknown

**Did Air Bag Module Cover Flap(s) Open At Designated Tear Points?**

(0) Not equipped/not available
(1) No
(2) Yes
(3) Deployed, unknown if flap(s) opened at designated tear points
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

**Were Air Bag Module Cover Flap(s) Damaged?**

(0) Not equipped/not available
(1) No
(2) Yes (specify): ____________
(3) Deployed, unknown if air bag module cover flap(s) damaged
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

**Was There Damage To The Air Bag?**

(00) Not equipped/not available
(01) Not damaged

*Yes - Air Bag Damage*

(02) Ruptured
(03) Cut
(04) Torn
(05) Holed
(06) Burned
(07) Abraded
(88) Other damage (specify): ____________
(95) Damaged, details unknown
(96) Deployed, unknown if damaged
(97) Not deployed
(98) Unknown if deployed
(99) Unknown

**Source of Air Bag Damage**

(00) Not equipped/not available
(01) Not damaged
(02) Object worn by occupant, (specify): ____________
(03) Object carried by occupant, (specify): ____________
(04) Adaptive/assistive controls, (specify): ____________
(05) Fire in vehicle
(06) Thermal burns
(07) Rescue or emergency efforts
(88) Other damage source (specify): ____________
(95) Damaged, unknown source
(96) Deployed, unknown if damaged
(97) Not deployed
(98) Unknown if deployed
(99) Unknown

**Was The Air Bag Tethered?**

(0) Not equipped/not available
(1) No
(2) Yes (specify number of tether straps): ____________
(3) Deployed, unknown if tethered
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

**Did The Air Bag Have Vent Ports?**

(0) Not equipped/not available
(1) No
(2) Yes (specify number of vent ports): ____________
(3) Deployed, unknown if vent ports present
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

**Was the Air Bag in this Occupant's Position Contacted by Another Occupant?**

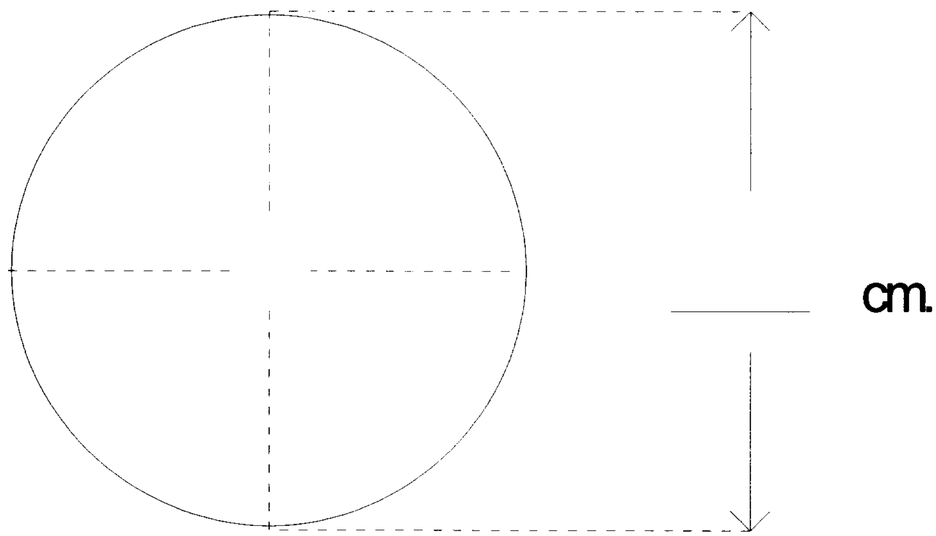
(0) Not equipped/not available
(1) No
(2) Yes (specify): ____________
(3) Deployed, unknown if other occupant contact to air bag
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

**Was This Occupant Wearing Eye-wear?**

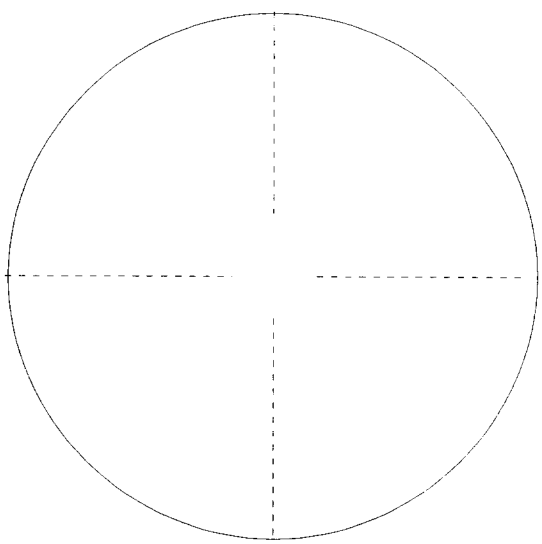
(0) Not equipped/not available
(1) No
(2) Eyeglasses/sunglasses
(3) Contact lenses
(4) Deployed, unknown if eyewear worn
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

## DRIVER AIR BAG DAMAGE AND CONTACT SKETCHES

1. SKETCH DAMAGE AND CONTACT EVIDENCE ON DRIVER AIR BAG (Front)



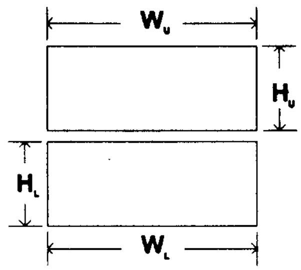

2. SKETCH DAMAGE AND CONTACT EVIDENCE ON DRIVER AIR BAG (Back)



## DRIVER AIR BAG SKETCHES (Cont'd)

3. DRIVER AIR BAG MODULE COVER FLAP SIZE (DOUBLE)

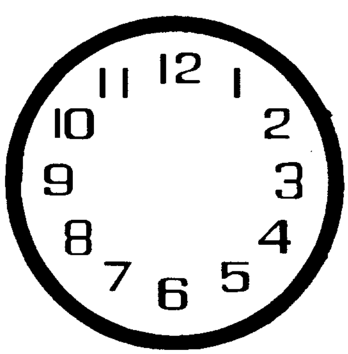
| a. Upper Flap | b. Lower Flap |
|---|---|
| width ($W_U$) ________ | width ($W_L$) ______ |
| height ($H_U$) ________ | height ($H_L$) ______ |




4. SKETCH OF OTHER TYPE OF AIR BAG MODULE FLAP AND SIZE

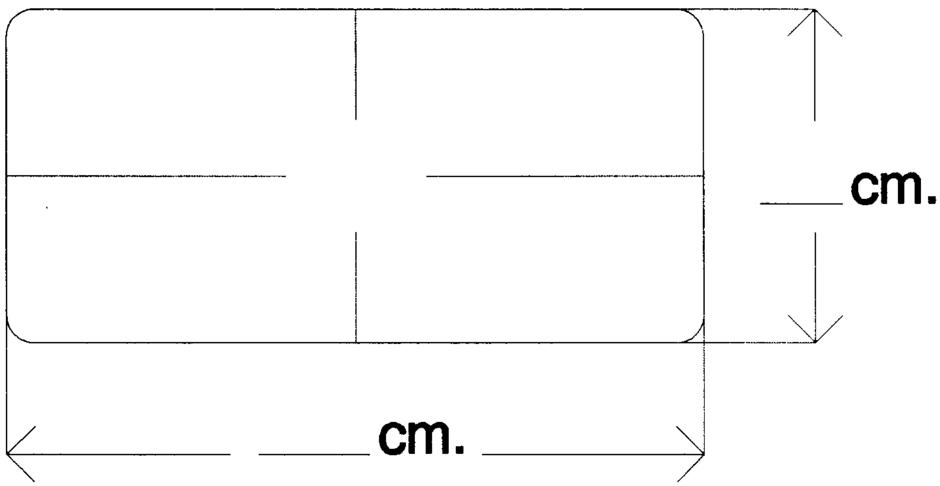
5. SKETCH OF OTHER TYPE OF AIR BAG VENT PORTS

6. SKETCH LOCATION OF CIRCULAR AIR BAG VENT PORTS

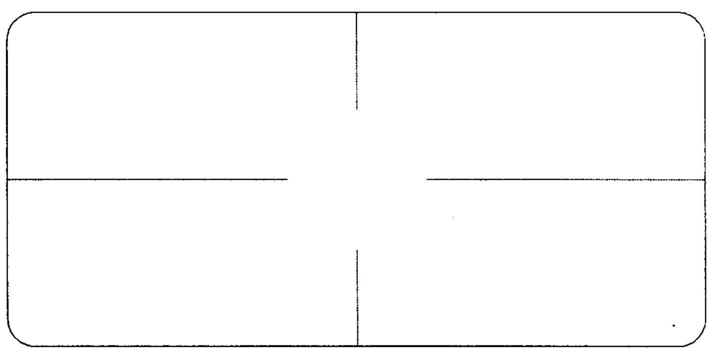


## PASSENGER AIR BAG DAMAGE AND CONTACT SKETCHES

1.SKETCH DAMAGE AND CONTACT EVIDENCE ON PASSENGER AIR BAG (Front)




2. SKETCH DAMAGE AND CONTACT EVIDENCE ON PASSENGER AIR BAG (Back)

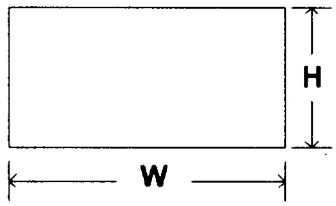


## PASSENGER AIR BAG SKETCHES (Cont'd)

3. PASSENGER AIR BAG MODULE COVER FLAP SIZE (SINGLE)
   a. Flap

      width (W) ________

      height (H) __________




4. PASSENGER AIR BAG MODULE COVER FLAP SIZE (DOUBLE)

   a. Upper Flap

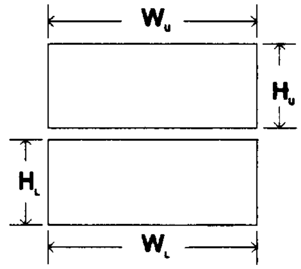
      width ($W_U$) __________

      height ($H_U$) __________

   b. Lower Flap

      width ($W_L$) _______

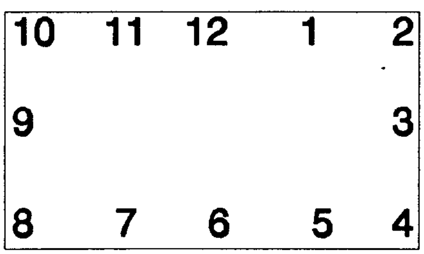
      height ($H_L$) _______




5. SKETCH OF OTHER TYPE OF AIR BAG MODULE FLAP AND SIZE

6. SKETCH OF OTHER TYPE OF AIR BAG VENT PORTS

7. SKETCH LOCATION OF RECTANGULAR AIR BAG VENT PORTS



## *"OTHER"* AIR BAG DAMAGE AND CONTACT SKETCHES

1. SKETCH DAMAGE AND CONTACT EVIDENCE ON *"OTHER"* AIR BAG (Front)

2. SKETCH DAMAGE AND CONTACT EVIDENCE ON *"OTHER"* AIR BAG (Back)

## *"OTHER"* AIR BAG SKETCHES (Cont'd)

3. SKETCH AIR BAG MODULE FLAP AND SIZE OR OPENING FOR AIRBAG

4. SKETCH AIR BAG VENT PORTS

## 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 |
|---|---|---|---|---|
| FIRST | Head Restraint Type/Damage | | | |
| | Seat Type | | | |
| | Seat Performance | | | |
| | Seat Orientation | | | |
| | Seat Track Position | | | |
| | Seat Back Incline Pre/Post Impact | | | |
| SECOND | Head Restraint Type/Damage | | | |
| | Seat Type | | | |
| | Seat Performance | | | |
| | Seat Orientation | | | |
| | Seat Track Position | | | |
| | Seat Back Incline Pre/Post Impact | | | |
| THIRD | Head Restraint Type/Damage | | | |
| | Seat Type | | | |
| | Seat Performance | | | |
| | Seat Orientation | | | |
| | Seat Track Position | | | |
| | Seat Back Incline Pre/Post Impact | | | |
| OTHER | Head Restraint Type/Damage | | | |
| | Seat Type | | | |
| | Seat Performance | | | |
| | Seat Orientation | | | |
| | Seat Track Position | | | |
| | Seat Back Incline Pre/Post Impact | | | |

**DESCRIBE ANY INDICATION OF ABNORMAL OCCUPANT POSTURE**

**(I.E., UNUSUAL OCCUPANT CONTACT PATTERN)**

## HEAD RESTRAINTS/SEAT EVALUATION

**A-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

**B-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

**C-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 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

**D-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

**E-Seat Track Adjusted Position Prior To Impact**
(0) Occupant not seated or no seat
(1) Non-adjustable seat track

*Adjustable Seat Track*
(2) Seat at forward most track position
(3) Seat between forward most and middle track positions
(4) Seat at middle track position
(5) Seat between middle and rear most track positions
(6) Seat at rear most track position
(9) Unknown

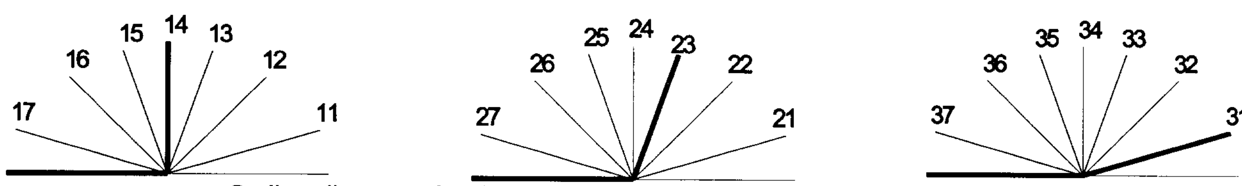
**F-Seat Back Incline Prior and Post Impact**
(00) Occupant not seated or no seat
(01) Not adjustable

*Upright prior to impact*
(11) Moved to completely rearward position
(12) Moved to rearward midrange position
(13) Moved to slightly rearward position
(14) Retained pre-impact position
(15) Moved to slightly forward position
(16) Moved to forward midrange position
(17) Moved to completely forward position

*Slightly reclined prior to* impact
(21) Moved to completely rearward position
(22) Moved to rearward midrange position
(23) Retained pre-impact postion
(24) Moved to upright position
(25) Moved to slightly forward position
(26) Moved to forward midrange position
(27) Moved to completely forward position

*Completely reclined prior to impact*
(31) Retained pre-impact position
(32) Moved to rearward midrange position
(33) Moved to slightly rearward position
(34) Moved to upright position
(35) Moved to slightly forward position
(36) Moved to forward midrange position
(37) Moved to completely forward position

(99) Unknown



Coding diagrams for *Seat Back Incline Position Prior and Post Impact*

**DESCRIBE ANY INDICATION OF ABNORMAL OCCUPANT POSTURE (I.E., UNUSUAL OCCUPANT CONTACT PATTERN)**

# 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 | | | | | |

1. 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):
   ____________________
   (8) Unknown child safety seat type
   (9) Unknown if child safety seat used

2. Child Safety Seat Orientation

   (00) No child safety seat

   Designed for Rear Facing for This Age/Weight
   (01) Rear facing
   (02) Forward facing
   (08) Other orientation (specify):
   ____________________
   (09) Unknown orientation

   Designed for Forward Facing for This Age/Weight
   (11) Rear facing
   (12) Forward facing
   (18) Other orientation (specify):
   ____________________
   (19) Unknown orientation

   Unknown Design or Orientation For This Age/Weight, or Unknown Age/Weight
   (21) Rear facing
   (22) Forward facing
   (28) Other orientation (specify):
   ____________________
   (29) Unknown orientation

   (99) Unknown if child safety seat used

3. Child Safety Seat Harness Usage

4. Child Safety Seat Shield Usage

5. Child Safety Seat Tether Usage
   Note: Options Below Are Used for Variables 3-5.

   (00) No child safety seat

   Not Designed with Harness/Shield/Tether
   (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

   Designed With Harness/Shield/Tether
   (11) Harness/shield/tether not used
   (12) Harness/shield/tether used
   (19) Unknown if harness/shield/tether used

   Unknown If Designed With Harness/Shield/Tether
   (21) Harness/shield/tether not used
   (22) Harness/shield/tether used
   (29) Unknown if harness/shield/tether used

   (99) Unknown if child safety seat used

6. Child Safety Seat Make/Model
   (Specify make/model and occupant number)

   ______________________________
   ______________________________
   ______________________________
   ______________________________

## 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 on vehicle interior sketch)

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

1. Primary Sampling Unit Number ___ ___
2. Case Number - Stratum ___ ___ ___ ___
3. Vehicle Number ___ ___
4. Occupant Number ___ ___

## OCCUPANT'S CHARACTERISTICS

5. Occupant's Age ___ ___
   Code actual age at time of accident.
   (00) Less than one year old (specify by month):
   ______________________
   (97) 97 years and older
   (99) Unknown

6. Occupant's Sex ___
   (1) Male
   (2) Female-not reported pregnant
   (3) Female-pregnant-1st trimester(1st-3rd month)
   (4) Female-pregnant-2nd trimester(4th-6th month)
   (5) Female-pregnant-3rd trimester(7th-9th month)
   (6) Female-pregnant-term unknown
   (9) Unknown

7. Occupant's Height ___ ___ ___
   Code actual height to the nearest centimeter.
   (999) Unknown

   ___ ___ inches X 2.54 = ___ ___ ___ centimeters

8. Occupant's Weight ___ ___ ___
   Code actual weight to the nearest kilogram.
   (999) Unknown

   ___ ___ ___ pounds X .4536 = ___ ___ ___ kilograms

9. Occupant's Role ___
   (1) Driver
   (2) Passenger
   (9) Unknown

## OCCUPANT'S SEATING

10. Occupant's Seat Position ___ ___

    *Front Seat*
    (11) Left side
    (12) Middle
    (13) Right side
    (14) Other (specify):______________
    (15) On or in the lap of another occupant

    *Second Seat*
    (21) Left side
    (22) Middle
    (23) Right side
    (24) Other (specify):______________
    (25) On or in the lap of another occupant

    *Third Seat*
    (31) Left side
    (32) Middle
    (33) Right side
    (34) Other (specify):______________
    (35) On or in the lap of another occupant

    *Fourth Seat*
    (41) Left side
    (42) Middle
    (43) Right side
    (44) Other (specify):______________
    (45) On or in the lap of another occupant

    (97) In or on unenclosed area
    (98) Other seat (specify):______________
    (99) Unknown

11. Occupant's Posture ___
    (0) Normal posture

    *Abnormal posture*
    (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):
    ______________________
    (9) Unknown

## EJECTION/ENTRAPMENT

12. Ejection ___
    - (0) No ejection
    - (1) Complete ejection
    - (2) Partial ejection
    - (3) Ejection, unknown degree
    - (9) Unknown

13. Ejection Area ___
    - (0) No ejection
    - (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

14. Ejection Medium ___
    - (0) No ejection
    - (1) Door/hatch/tailgate
    - (2) Nonfixed roof structure
    - (3) Fixed glazing
    - (4) Nonfixed glazing (specify): ___
    - (5) Integral structure
    - (8) Other medium (specify): ___
    - (9) Unknown

15. Medium Status (Immediately Prior To Impact) ___
    - (0) No ejection
    - (1) Open
    - (2) Closed
    - (3) Integral structure
    - (9) Unknown

16. Entrapment ___
    - (0) Not entrapped/exit not inhibited
    - (1) Entrapped/pinned - mechanically restrained
    - (2) Could not exit vehicle due to jammed doors, fire, etc. (specify): ___
    - (9) Unknown

17. Occupant Mobility ___
    - (0) Occupant fatal before removed from vehicle
    - (1) Removed from vehicle while unconscious or not oriented to time or place
    - (2) Removed from vehicle due to perceived serious injuries
    - (3) Exited vehicle with some assistance
    - (4) Exited vehicle under own power
    - (5) Occupant fully ejected
    - (8) Removed from vehicle for other reasons (specify): ___
    - (9) Unknown

## BELT SYSTEM FUNCTION

18. 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

19. Manual (Active) Belt System Use ___ ___
(00) None used, not available, or belt removed/destroyed
(01) Inoperative (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 belt used with child safety seat (specify): ___
(99) Unknown if belt used

20. 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

21. 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

22. Manual Shoulder Belt Upper Anchorage Adjustment ___
(0) No manual shoulder belt
(1) No upper anchorage adjustment for manual shoulder belt

*Adjustable shoulder Belt Upper Anchorage*
(2) In full up position
(3) In mid position
(4) In full down position
(5) Position unknown
(9) Unknown if position has adjustable upper anchorage adjustment

23. 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

*Non-functional*
(4) Automatic belts destroyed or rendered inoperative
(9) Unknown

24. 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

25. Automatic (Passive) Belt System Type ___
(0) Not equipped/not available
(1) Non-motorized system
(2) Motorized system
(9) Unknown

26. 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

*Automatic Belt Used Improperly*
(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

27. 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

## POLICE REPORTED RESTRAINT USE

28. Police Reported Belt Use ___
    - (0) None used
    - (1) Police did not indicate belt use
    - (2) Shoulder belt
    - (3) Lap belt
    - (4) Lap and shoulder belt
    - (5) Belt used, type not specified
    - (6) Child safety seat
    - (7) Automatic belt
    - (8) Other type belt, (specify): ___
    - (9) Police indicated "unknown"

29. Police Reported Air Bag Availability/Function ___
    - (0) No air bag available
    - (1) Police did not indicate air bag availability/function
    - (2) Deployed
    - (3) Not deployed
    - (4) Unknown if deployed
    - (9) Police indicated "unknown"

Check the Primary Source Used In Determining Belt Use.

- [ ] Vehicle inspection
- [ ] Official injury data
- [ ] Driver/occupant interview
- [ ] Other (specify): ___
- [ ] Unknown if belt used

___

___

___

___

## AIR BAG SYSTEM FUNCTION

30. Frontal Air Bag System Availability/Function (This Occupant Position) ___
    - (0) Not equipped/not available
    - (1) Air bag

    *Non-functional*
    - (2) Air bag disconnected (specify): ___
    - (3) Air bag not reinstalled
    - (9) Unknown

31. Frontal Air Bag System Deployment (This Occupant Position) ___
    - (0) Not equipped/not available
    - (1) Deployed during accident (as a result of impact)
    - (2) Deployed inadvertently just prior to accident
    - (3) Deployed, details unknown
    - (4) Deployed as a result of a noncollision event during accident sequence (e.g., fire, explosion, electrical)
    - (5) Unknown if deployed
    - (7) Nondeployed
    - (9) Unknown

32. Other Than First Seat Frontal Air Bag Availability/Function (This Occupant Position) ___
    - (0) Not equipped/not available
    - (1) Air bag

    *Non-functional*
    - (2) Air bag disconnected (specify): ___
    - (3) Air bag not reinstalled
    - (9) Unknown

    *Specify type of "other" air bag present:* ___

33. Air Bag(s) Deployment, Other Than First Seat Frontal (This Occupant Position) ___
    - (0) Not equipped with an "other" air bag
    - (1) Deployed during accident (as a result of impact)
    - (2) Deployed inadvertently just prior to accident
    - (3) Deployed, details unknown
    - (4) Deployed as a result of a noncollision event during accident sequence (e.g., fire, explosion, electrical)
    - (5) Unknown if deployed
    - (7) Nondeployed
    - (9) Unknown

34. Are There Indications of Air Bag System Failure? (This Occupant Position) ___
    - (0) Not equipped/not available
    - (1) No
    - (2) Yes (specify): ___
    - (9) Unknown

## FIRST SEAT FRONTAL AIR BAG SYSTEM EVALUATION

35. Had Vehicle Been in Previous Accident(s)? ____
(0) Not equipped/not available
(1) No previous accidents

*Yes*
(2) Previous accident(s) without deployment(s)
(3) One previous accident with deployment
(4) More than one previous accident with at least one deployment
(8) Previous accidents, unknown deployment status
(9) Unknown

36. Type of Air Bag ____
(0) Not equipped/not available
(1) Original manufacturer installed system
(2) Retrofitted air bag
(3) Replacement air bag
(8) Unknown type of air bag
(9) Unknown

37. Had Any Prior Maintenance/Service Been Performed On This Air Bag System? ____
(0) Not equipped/not available
(1) No prior maintenance
(2) Yes, prior maintenance (specify):
______________________________
(9) Unknown

38. Air Bag Deployment Accident Event Sequence Number ____ ____
(00) Not equipped/not available
____ Code the accident event sequence number that initiated the air bag deployment
(96) Deployed, unknown event
(97) Not deployed
(98) Unknown if deployed
(99) Unknown

39. CDC For Air Bag Deployment Impact ____
(0) Not equipped/not available
(1) Highest delta V
(2) Second highest delta V
(3) Other non-coded delta V (specify):
______________________________
(6) Deployed, unknown event
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

40. Longitudinal Component of Delta V For Air Bag Deployment Impact + / − ____ ____ ____ ____
(_000) Not equipped/not available
*Code the value of the delta V for the impact that initiated the air bag deployment*
(_996) Deployment, unknown longitudinal Delta V
(_997) Not deployed
(_998) Unknown if deployed
(_999) Unknown

41. Did Air Bag Module Cover Flap(s) Open At Designated Tear Points? ____
(0) Not equipped/not available
(1) No
(2) Yes
(3) Deployed, unknown if flap(s) opened at designated tear points
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

42. Were Air Bag Module Cover Flap(s) Damaged? ____
(0) Not equipped/not available
(1) No
(2) Yes (specify): ____________________
(3) Deployed, unknown if air bag module cover flap(s) damaged
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

43. Was There Damage To The Air Bag? ____ ____
(00) Not equipped/not available
(01) Not damaged

*Yes - Air Bag Damage*
(02) Ruptured
(03) Cut
(04) Torn
(05) Holed
(06) Burned
(07) Abraded
(88) Other damage (specify):
______________________________
(95) Damaged, details unknown
(96) Deployed, unknown if damaged
(97) Not deployed
(98) Unknown if deployed
(99) Unknown

## FIRST SEAT FRONTAL AIR BAG SYSTEM EVALUATION *continued*

44. Source of Air Bag Damage ___ ___
(00) Not equipped/not available
(01) Not damaged
(02) Object worn by occupant, (specify):
______________________
(03) Object carried by occupant, (specify):
______________________
(04) Adaptive/assistive controls, (specify):
______________________
(05) Fire in vehicle
(06) Thermal burns
(07) Rescue or emergency efforts
(88) Other damage source (specify):
______________________
(95) Damaged, unknown source
(96) Deployed, unknown if damaged
(97) Not deployed
(98) Unknown if deployed
(99) Unknown

45. Was The Air Bag Tethered? ___
(0) Not equipped/not available
(1) No
(2) Yes (specify number of tether straps):
______________________
(3) Deployed, unknown if tethered
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

46. Did The Air Bag Have Vent Ports? ___
(0) Not equipped/not available
(1) No
(2) Yes (specify number of vent ports):
______________________
(3) Deployed, unknown if vent ports present
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

47. Was the Air Bag in this Occupant's Position Contacted by Another Occupant? ___
(0) Not equipped/not available
(1) No
(2) Yes (specify):
______________________
(3) Deployed, unknown if other occupant contact to air bag
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

48. Was This Occupant Wearing Eye-wear? ___
(0) Not air bag equipped/air bag not available
(1) No
(2) Eyeglasses/sunglasses
(3) Contact lenses
(4) Deployed, unknown if eyewear worn
(7) Not deployed
(8) Unknown if deployed
(9) Unknown

## HEAD RESTRAINT AND SEAT EVALUATION

49. 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

50. 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) Box mounted seat (i.e., van type)
(10) Other seat type (specify):
______________________
(99) Unknown

51. 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

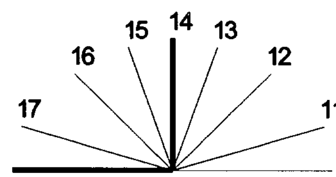
52. Seat Track Adjusted Position Prior To Impact ___
(0) Occupant not seated or no seat
(1) Non-adjustable seat track

*Adjustable Seat Track*
(2) Seat at forward most track position
(3) Seat between forward most and middle track positions
(4) Seat at middle track position
(5) Seat between middle and rear most track positions
(6) Seat at rear most track position
(9) Unknown

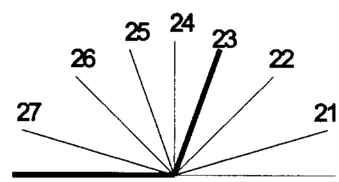
## HEAD RESTRAINT AND SEAT EVALUATION *continued*

53. Seat Back Incline Prior and Post Impact ___ ___
    (00) Occupant not seated or no seat
    (01) Not adjustable

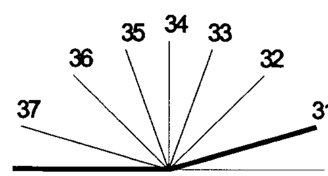
***Upright prior to impact***
(11) Moved to completely rearward position
(12) Moved to rearward midrange position
(13) Moved to slightly rearward position
(14) Retained pre-impact position
(15) Moved to slightly forward position
(16) Moved to forward midrange position
(17) Moved to completely forward position




***Slightly reclined prior to impact***
(21) Moved to completely rearward position
(22) Moved to rearward midrange position
(23) Retained pre-impact position
(24) Moved to upright position
(25) Moved to slightly forward position
(26) Moved to forward midrange position
(27) Moved to completely forward position




***Completely reclined prior to impact***
(31) Retained pre-impact position
(32) Moved to rearward midrange position
(33) Moved to slightly rearward position
(34) Moved to upright position
(35) Moved to slightly forward position
(36) Moved to forward midrange position
(37) Moved to completely forward position




(99) Unknown

54. 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

55. 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

56. Type of Child Safety Seat ___
    (0) No child safety seat
    (1) Infant seat
    (2) Toddler seat
    (3) Convertible seat
    (4) Booster seat - with shield
    (5) Booster seat - without shield
    (7) Other type child safety seat (specify):
    ______________________
    (8) Unknown child safety seat type
    (9) Unknown if child safety seat used

57. Child Safety Seat Orientation ___ ___
    (00) No child safety seat

    *Designed for Rear Facing for This Age/Weight*
    (01) Rear facing
    (02) Forward facing
    (08) Other orientation (specify):
    ______________________
    (09) Unknown orientation

    *Designed For Forward Facing for This Age/Weight*
    (11) Rear facing
    (12) Forward facing
    (18) Other orientation (specify):
    ______________________
    (19) Unknown orientation

    *Unknown Design or Orientation For This Age/Weight, or Unknown Age/Weight*
    (21) Rear facing
    (22) Forward facing
    (28) Other orientation (specify):
    ______________________
    (29) Unknown orientation

    (99) Unknown if child safety seat used

58. Child Safety Seat Harness Usage ___ ___

59. Child Safety Seat Shield Usage ___ ___

60. Child Safety Seat Tether Usage ___ ___

    Note: Options below applicable to Variables OA58-OA60.
    (00) No child safety seat

    *Not Designed With Harness/Shield/Tether*
    (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

    *Designed With Harness/Shield/Tether*
    (11) Harness/shield/tether not used
    (12) Harness/shield/tether used
    (19) Unknown if harness/shield/tether used

    *Unknown If Designed With Harness/Shield/Tether*
    (21) Harness/shield/tether not used
    (22) Harness/shield/tether used
    (29) Unknown if harness/shield/tether used

    (99) Unknown if child safety seat used

## INJURY CONSEQUENCES

61. Injury Severity (Police Rating) ___

(0) O - 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

62. Treatment - Mortality ___
(0) No treatment
(1) Fatal
(2) Fatal - ruled disease (specify):

_______________________________

*Nonfatal*
(3) Hospitalization
(4) Transported and released
(5) Treatment at scene - nontransported
(6) Treatment later
(7) Treatment - other (specify):

_______________________________

(8) Transported to a medical facility-unknown if treated
(9) Unknown

63. Type Of Medical Facility (for Initial Treatment) ___
(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):

_______________________________

(9) Unknown

64. Hospital Stay ___ ___
(00) Not Hospitalized
____Code the number of days (up through 60) that the occupant stayed in hospital.
(61) 61 days or more
(99) Unknown

65. Working Days Lost ___ ___
____Code the number of days (up through 60) that the occupant lost from work due to the accident
(00) No working days lost
(61) 61 days or more
(62) Fatally injured
(97) Not working prior to accident
(99) Unknown

**STOP WORK HERE**

**VARIABLES 66-74**

**TO BE CODED BY THE ZONE CENTER**

# *TO BE CODED BY THE ZONE CENTER*

## INJURY CONSEQUENCES

66. Time to Death ___ ___
_____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 = 31, 2 days = 32, ... n days = 30 +n up through 30 days = 60)
(00) Not fatal
(96) Fatal - ruled disease
(99) Unknown

67. 1st Medically Reported Cause of Death ___ ___

68. 2nd Medically Reported Cause of Death ___ ___

69. 3rd Medically Reported Cause of Death ___ ___
_____Code the Occupant Injury from line number(s) for the medically reported injury(s) which reportedly contributed to this occupant's death
(00) Not fatal or no additional causes
(96) Mode of death given but specific injuries are not linked to cause of death. (specify):
_______________
(97) Other result (includes fatal ruled disease) (specify):
_______________
(99) Unknown

70. Number of Recorded Injuries for This Occupant ___ ___
_____Code the actual number of injuries recorded for this occupant.
(00) No recorded injuries
(97) Injured, details unknown
(99) Unknown if injured

## TRAUMA DATA

71. 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

72. Was the Occupant Given Blood? ___
(1) No - blood not given
(2) Yes - blood given (specify units):_______________
(9) Unknown if blood given

73. Arterial Blood Gases (ABG) - $HCO_3$ ___ ___
(00) Not injured
(01) Injured, ABGs not measured or reported
(02-50) Code the actual value of the $HCO_3$
(96) ABGs reported , $HCO_3$ unknown
(97) Injured, details unknown
(99) Unknown if injured

## BELT USE DETERMINATION

74. 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

U.S. Department of Transportation

National Highway Traffic Safety Administration

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

# OCCUPANT INJURY FORM

NATIONAL ACCIDENT SAMPLING SYSTEM
CRASHWORTHINESS DATA SYSTEM

1. Primary Sampling Unit Number ___ ___
2. Case Number - Stratum ___ ___ ___ ___
3. Vehicle Number ___ ___
4. Occupant Number ___ ___

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 | A.I.S. - 90 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. ___ ___ |

 **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.**

| | | A.I.S. - 90 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 |
| 11th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 12th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 13th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 14th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 15th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 16th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 17th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 18th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 19th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 20th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 21st | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 22nd | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 23rd | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 24th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |
| 25th | ___ | ___ | ___ | ___ ___ | ___ ___ | ___ | ___ | ___ ___ ___ | ___ | ___ | ___ ___ |

## OCCUPANT INJURY CLASSIFICATION

**Body Region**

(1) Head
(2) Face
(3) Neck
(4) Thorax
(5) Abdomen
(6) Spine
(7) Upper Extremity
(8) Lower Extremity
(9) Unspecified

**Type of Anatomic Structure**

(1) Whole Area
(2) Vessels
(3) Nerves
(4) Organs (includes Muscles/ligaments)
(5) Skeletal (includes joints)
(6) Head - LOC
(9) Skin

**Specific Anatomic Structure**

Vessels, Nerves, Organs, Bones, Joints are assigned consecutive two digit numbers beginning with 02.

The exceptions to this rule apply to:

Whole Area
(02) Skin - Abrasion
(04) Skin - Contusion
(06) Skin - Laceration
(08) Skin - Avulsion
(10) Amputation
(20) Burn
(30) Crush
(40) Degloving
(50) Injury - NFS
(90) Trauma, other than mechanical

Head - LOC
(02) Length of LOC

(04) Level
(06) of
(08) Consciousness

(10) Concussion

Spine
(02) Cervical
(04) Thoracic
(06) Lumbar

**Level of Injury**

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 NFS as to severity or where only one injury is given in the dictionary for that anatomic structure. 99 is assigned to any injury NFS as to lesion or severity.

**Abbreviated Injury Scale**

(1) Minor Injury
(2) Moderate Injury
(3) Serious Injury
(4) Severe Injury
(5) Critical Injury
(6) Maximum (untreatable)
(7) Injured, unknown severity

**Aspect**

(1) Right
(2) Left
(3) Bilateral
(4) Central
(5) Anterior
(6) Posterior
(7) Superior
(8) Inferior
(9) Unknown
(0) Whole region

## SOURCE OF INJURY DATA

OFFICIAL RECORDS
(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

UNOFFICIAL RECORDS
(5) Lay coroner report
(6) E.M.S. personnel
(7) Interviewee
(8) Other source (specify):
______________________
(9) Police

## INJURY SOURCE CONFIDENCE LEVEL

(1) Certain
(2) Probable
(3) Possible
(9) Unknown

## DIRECT/INDIRECT INJURY

(1) Direct contact injury
(2) Indirect contact injury
(3) Noncontact injury
(7) Injured, unknown source

## INJURY SOURCES

**FRONT**

(001) Windshield
(002) Mirror
(003) Sunvisor
(004) Steering wheel rim
(005) Steering wheel hub/spoke
(006) Steering wheel (combination of codes 004 and 005)
(007) Steering column, transmission selector lever, other attachment
(008) Cellular telephone or CB radio
(009) Add on equipment (e.g., tape deck, air conditioner)
(010) Left instrument panel and below
(011) Center instrument panel and below
(012) Right instrument panel and below
(013) Glove compartment door
(014) Knee bolster
(015) Windshield including one or more of the following: front header, A (A1/A2)-pillar, instrument panel, mirror, or steering assembly (driver side only)
(016) Windshield including one or more of the following: front header, A (A1/A2)-pillar, instrument panel, or mirror (passenger side only)
(017) Windshield reinforced by exterior object (specify) ____________
(019) Other front object (specify): ____________

**LEFT SIDE**

(051) Left side interior surface, excluding hardware or armrests
(052) Left side hardware or armrest
(053) Left A (A1/A2)-pillar
(054) Left B-pillar
(055) Other left pillar (specify): ____________
(056) Left side window glass
(057) Left side window frame
(058) Left side window sill
(059) Left side window glass including one or more of the following: frame, window sill, A (A1/A2)-pillar, B-pillar, or roof side rail.
(060) Other left side object (specify): ____________

**RIGHT SIDE**

(101) Right side interior surface, excluding hardware or armrests
(102) Right side hardware or armrest
(103) Right A (A1/A2)-pillar
(104) Right B-pillar
(105) Other right pillar (specify): ____________
(106) Right side window glass
(107) Right side window frame
(108) Right side window sill
(109) Right side window glass including one or more of the following: frame, window sill, A (A1/A2)-pillar, B-pillar, or roof side rail.
(110) Other right side object (specify): ____________

**INTERIOR**

(151) Seat, back support
(152) Belt restraint webbing/buckle
(153) Belt restraint B-pillar or door frame attachment point
(154) Other restraint system component (specify): ____________
(155) Head restraint system
(160) Other occupants (specify): ____________
(161) Interior loose objects
(162) Child safety seat (specify): ____________
(163) Other interior object (specify): ____________

**AIR BAG**

(170) Air bag-driver side
(171) Air bag-driver side and eyewear
(172) Air bag-driver side and jewelry
(173) Air bag-driver side and object held
(174) Air bag-driver side and object in mouth
(175) Air bag compartment cover-driver side
(176) Air bag compartment cover-driver side and eyewear
(177) Air bag compartment cover-driver side and jewelry
(178) Air bag compartment cover-driver side and object held
(179) Air bag compartment cover-driver side and object in mouth
(180) Air bag-passenger side
(181) Air bag-passenger side and eyewear
(182) Air bag-passenger side and jewelry
(183) Air bag-passenger side and object held
(184) Air bag-passenger side and object in mouth
(185) Air bag compartment cover-passenger side
(186) Air bag compartment cover-passenger side and eyewear
(187) Air bag compartment cover-passenger side and jewelry
(188) Air bag compartment cover-passenger side and object held
(189) Air bag compartment cover-passenger side and object in mouth
(190) Other air bag (specify) ____________
(195) Other air bag compartment cover (specify) ____________

**ROOF**

(201) Front header
(202) Rear header
(203) Roof left side rail
(204) Roof right side rail
(205) Roof or convertible top

**FLOOR**

(251) Floor (including toe pan)
(252) Floor or console mounted transmission lever, including console
(253) Parking brake handle
(254) Foot controls including parking brake

**REAR**

(301) Backlight (rear window)
(302) Backlight storage rack, door, etc.
(303) Other rear object (specify): ____________

**ADAPTIVE (ASSISTIVE) DRIVING EQUIPMENT**

(401) Hand controls for braking/acceleration
(402) Steering control devices (attached to OEM steering wheel)
(403) Steering knob attached to steering wheel
(405) Replacement steering wheel (i.e., reduced diameter)
(406) Joy stick steering controls
(407) Wheelchair tie-downs
(408) Modification to seat belts, (specify): ____________
(409) Additional or relocated switches, (specify): ____________
(410) Raised roof
(411) Wall mounted head rest (used behind wheel chair)
(412) Other adaptive device (specify): ____________

**EXTERIOR of OCCUPANT'S VEHICLE**

(451) Hood
(452) Outside hardware (e.g., outside mirror, antenna)
(453) Other exterior surface or tires (specify): ____________
(454) Unknown exterior objects

**EXTERIOR OF OTHER MOTOR VEHICLE**

(501) Front bumper
(502) Hood edge
(503) Other front of vehicle (specify): ____________
(504) Hood
(505) Hood ornament
(506) Windshield, roof rail, A-pillar
(507) Side surface
(508) Side mirrors
(509) Other side protrusions (specify): ____________
(510) Rear surface
(511) Undercarriage
(512) Tires and wheels
(513) Other exterior of other motor vehicle (specify): ____________
(514) Unknown exterior of other motor vehicle

**OTHER VEHICLE OR OBJECT IN THE ENVIRONMENT**

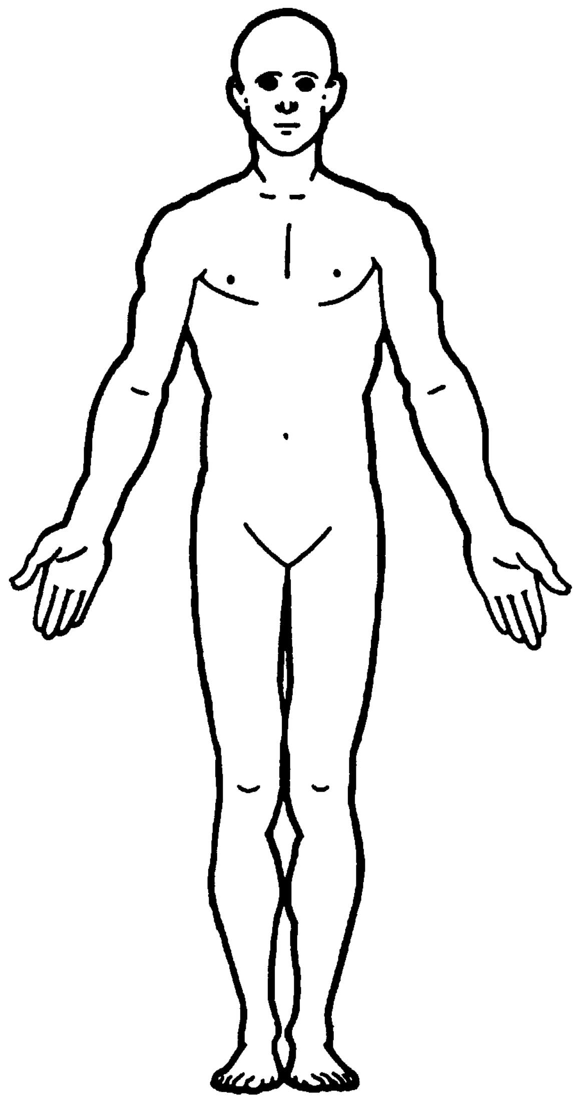
(551) Ground
(598) Other vehicle or object (specify): ____________
(599) Unknown vehicle or object

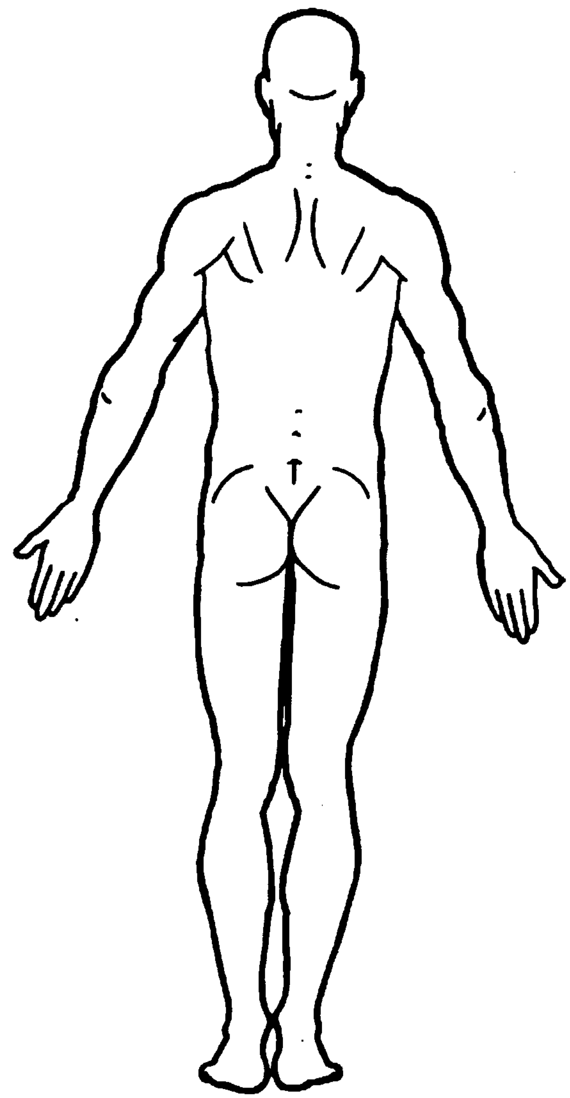
**NONCONTACT INJURY**

(601) Fire in vehicle
(602) Flying glass
(603) Other noncontact injury source (specify): ____________
(604) Air bag exhaust gases
(697) Injured, unknown source

## 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 interviewee data are unavailable.)





# OFFICIAL INJURY DATA — SKELETAL INJURIES

Restrained?

___ No

___ Yes

Blood Alcohol Level (mg/dl)

BAL = ____

Glasgow Coma Scale Score

GCSS = __ __

Units of Blood Given

Units = ____

Arterial Blood Gases

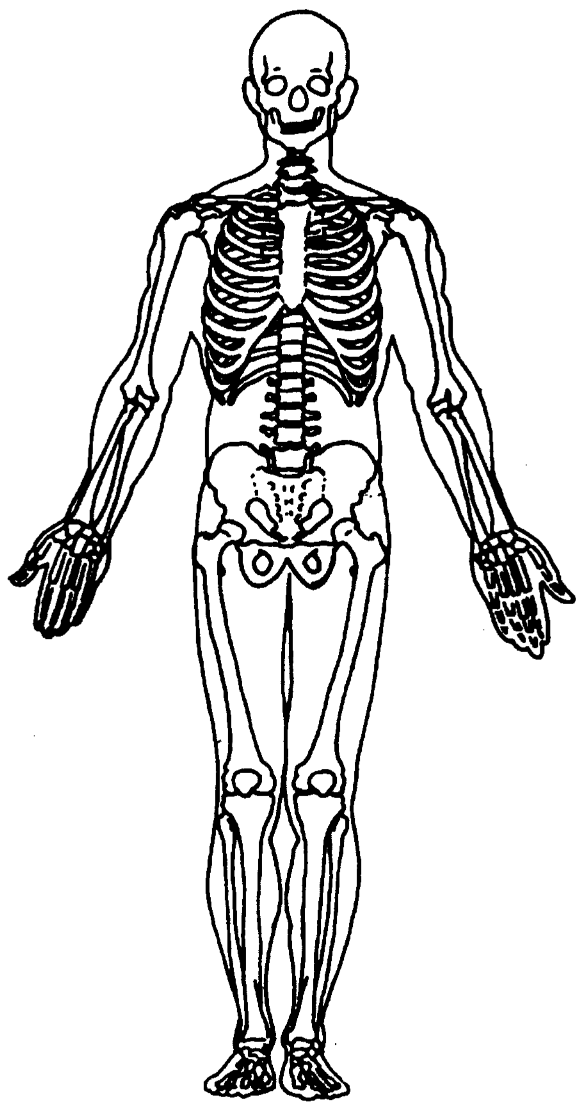
pH = __.__

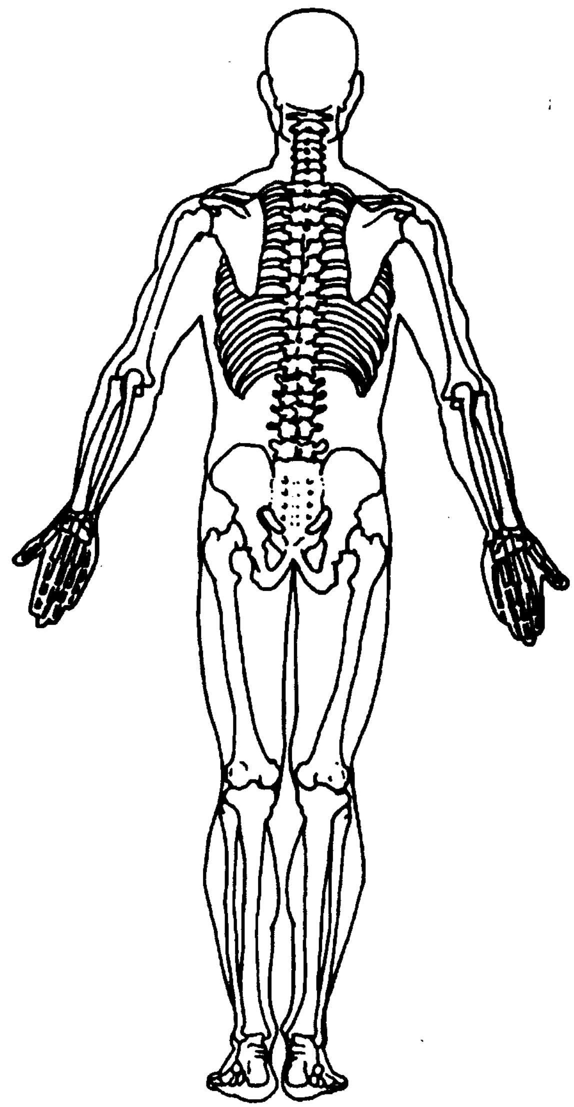
$PO_2$ = ____

$PCO_2$ ____

$HCO_3$ ____

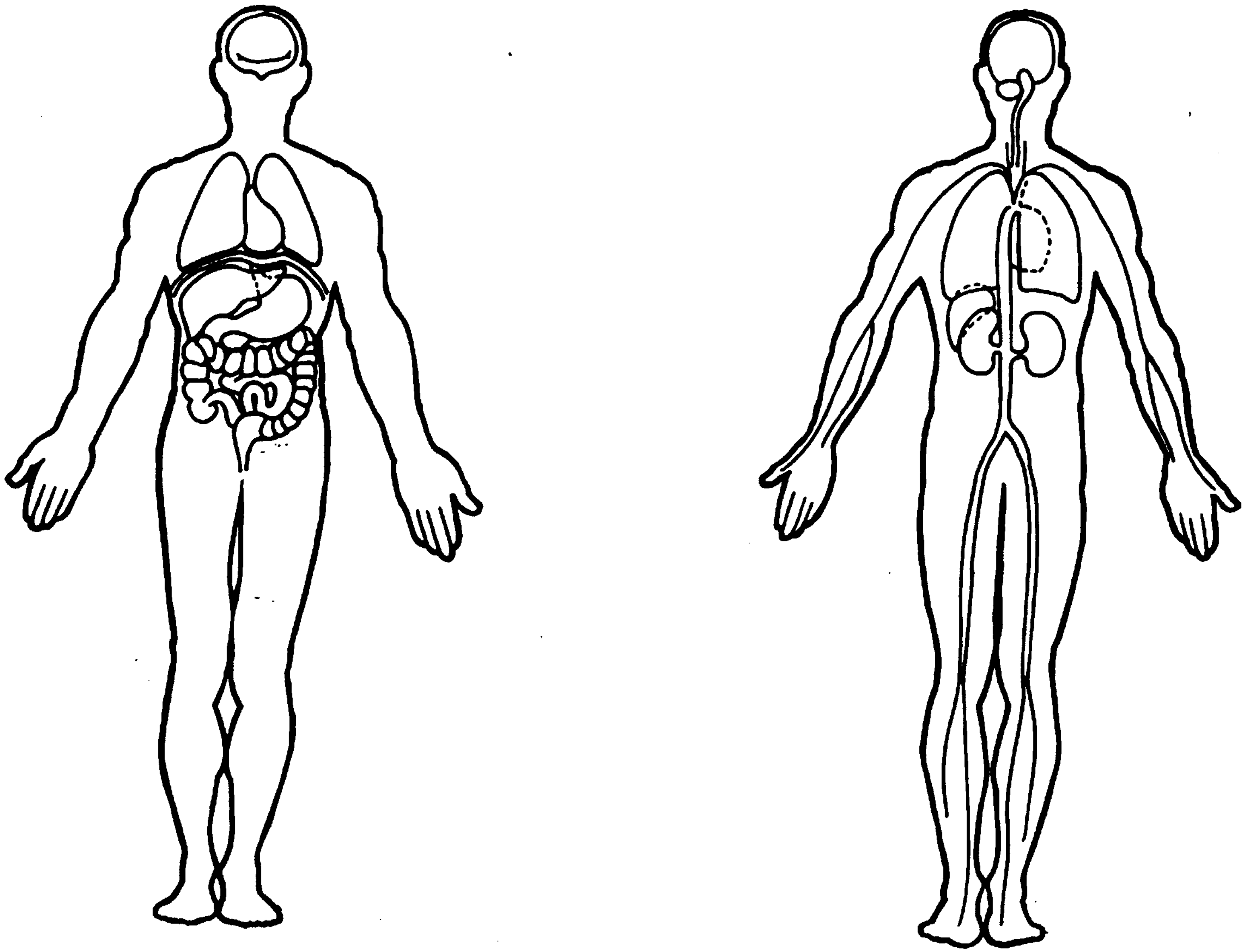
Indicate the Location, Specific Anatomic Structure, Detail (size, depth, fracture type, head injury clinical signs and neurological deficits), and Source of all injuries indicated by official sources (or from PAR or other unofficial sources if medical records and interviewee data are unavailable.)





## 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 interviewee data are unavailable.)



# Appendix D. CRASHPC and OLDMISSPC Summary

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/underride 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 E. 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 E1 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 E2 provides Comprehensive Harm figures that include quantities representing values for pain and suffering costs that are excluded in the "economic" cost schedule.

Table E1. 1994 Economic Harm from Crash Injuries

| Survivor's Maximum AIS | | Unit Costs (2) (1994 Dollars) | Incidence (3) | Economic Harm (4) (Billion Dollars) |
|---|---|---|---|---|
| Minor | 1 | $3,777 | 4,626,495 | $17 |
| Moderate | 2 | $31,164 | 398,553 | $12 |
| Serious | 3 | $98,011 | 166,845 | $16 |
| Severe | 4 | $221,494 | 17,123 | $4 |
| Critical | 5 | $697,533 | 6,914 | $5 |
| Fatalities | 6 | $822,328 | 40,676 | $33 |
| **1994 National Estimate of Total Economic Harm** | | | | **$87** |

Table E2. 1994 Comprehensive* Harm from Crash Injuries

| Survivor's Maximum AIS | | Unit Costs (5) (1994 Dollars) | Incidence (3) | Comprehensive* Harm (Billion Dollars) |
|---|---|---|---|---|
| Minor | 1 | $10,840 | 4,626,495 | $50 |
| Moderate | 2 | $133,700 | 398,553 | $53 |
| Serious | 3 | $472,290 | 166,845 | $79 |
| Severe | 4 | $1,193,860 | 17,123 | $20 |
| Critical | 5 | $2,509,310 | 6,914 | $17 |
| Fatalities | 6 | $2,854,500 | 40,676 | $116 |
| **1994 National Estimate of Total Comprehensive Harm** | | | | **$335** |

*Comprehensive cost estimates include economic cost components plus values for reduced quality of life.

## References

(1) Malliaris, A., ,Hitchcock, R, Hedlund, J, *A Search for Priorities in Crash Protection*, SAE, 820242, 1982.

(2) NHTSA, *The Economic Cost of Motor Vehicle Crashes, 1994*, DOT HS 808 425, July 1996, Table 2, p. 8.

(3) **NHTSA, *THE ECONOMIC COST OF MOTOR VEHICLE CRASHES, 1994*, DOT HS 808 425, JULY 1996, TABLE 3, P. 9.**

(4) **NHTSA, *THE ECONOMIC COST OF MOTOR VEHICLE CRASHES, 1994*, DOT HS 808 425, JULY 1996, TABLE 1, P. 7.**

(5) **NHTSA, *THE ECONOMIC COST OF MOTOR VEHICLE CRASHES, 1994*, DOT HS 808 425, JULY 1996, TABLE A-1, P. 59.**

# Appendix F. Statistical Methods

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

**ASSIGNING CRASH TYPE AND GENERAL AREA OF DAMAGE, AND**
**THE SAMPLING ERRORS FOR THE WEIGHTED AVERAGE COUNTS OVER THE 1994-1996 PERIOD.**

The method for producing estimates from the 1994-1996 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 for cases that have a certain characteristic, an estimate of the national total for that characteristic can be produced.

## ASSIGNING CRASH TYPE AND GENERAL AREA OF DAMAGE

TWO DIFFERENT PROCEDURES WERE USED TO ASSIGN GENERAL AREA OF DAMAGE (GAD1) WHERE IT WAS CODED AS UNKNOWN IN THE NASS/CDS VEHICLE EXTERIOR (VE) FORM. THE FIRST METHOD USES INFORMATION FROM ELSEWHERE IN THE NASS/CDS DATA FILES, AND THE SECOND IMPUTES UNKNOWNS BASED UPON A UNIVARIATE DISTRIBUTION.

### 1. ASSIGNMENT BASED UPON OTHER INFORMATION IN THE NASS/CDS DATA FILES

THE SAS PROGRAM SHOWN BELOW WAS USED TO ASSIGN GAD1 FROM THE EVENT FILE TO VEHICLES WHERE GAD1 IS MISSING OF THE VE FILE. THE VEHICLES (TOWED CARS AND LIGHT TRUCKS) CAN BE CLASSIFIED INTO THREE GROUPS WITH A DIFFERENT APPROACH FOR EACH:

FOR THE FIRST GROUP, DAMAGE AREA WAS FOUND BY MATCHING ACCSEQ1 ON THE VE FORM WITH ACCSEQ ON THE EVENT FILE.
FOR THE SECOND GROUP, THAT HAD NO VE FORM, DAMAGE AREA WAS FOUND BY LINKING (USING VEHNO ON THE GV FILE AND VEHNUM / OBJCONT ON THE EVENT FILE) TO THE ONLY DAMAGE FOR THAT VEHICLE THAT WAS LISTED ON THE EVENT FILE.
FOR THE THIRD GROUP, THAT HAD NO VE FORM AND COULD NOT BE LINKED THROUGH VEHNUM / OBJCONT, DAMAGE AREA WAS FOUND BY IDENTIFYING THE COLLISION PARTNER IN THE DELTA V EVENT, AND USING ACCSEQ1 FROM THE PARTNER TO LINK TO THE EVENT FILE (THIS PARTNER WAS THE ONLY OTHER LIGHT VEHICLE IN THE CRASH THAT HAD DELTA V ESTIMATED BY THE MISSING VEHICLE ALGORITHM FOR A COLLISION WITH THE VEHICLE IN QUESTION).

THE NUMBERS OF VEHICLES IN THE 3 YEAR SAMPLE THAT WERE ASSIGNED GAD1 USING THIS METHOD ARE SUMMARIZED AS FOLLOWS:

**TABLE F-1**
**CARS AND LIGHT TRUCKS WITH GAD1 ASSIGNED FROM EVENT FORM,**
**UNWEIGHTED SAMPLE COUNT**

| YEAR | METHOD 1 | METHOD 2 | METHOD 3 | TOTAL |
|---|---|---|---|---|
| 1994 | 79 | 120 | 24 | 223 |
| 1995 | 219 | 336 | 69 | 624 |
| 1996 | 223 | 385 | 67 | 675 |
| TOTAL | 521 | 841 | 160 | 1522 |

### SAS PROGRAM ASSIGNING GAD FROM EVENT FILE:

```
*** run this program for each of the years needed, then
combine final data sets (unkn94, unkn95, unkn96), sort
by year psu caseno vehno, and merge with VE file to
include newly assigned gad info ** ;

libname nass94 'd:\nass\nass94';
options ls=78 pagesize=500;
proc format;
value anydv
   0='DV unknown'
   1='DV known';

value veform
   0='No VE form'
   1='VE form';

value matchveh
   0='No match'
   1='Match';

data gvve1;
* Select towed light passenger vehicles,
  create a 0-1 variable (ANYDV) for delta V availability,
  create a 0-1 variable (VEFORM) for VE form availability;
merge nass94.gv nass94.ve(in=a);
by psu caseno vehno;
if 1<=bodytype<=49;
keep psu caseno vehno
     dvtotal accseq1 gad1 objcont1
     dvbasis anydv veform;
if dvtotal>=0 then anydv=1;
else anydv=0;
veform=a;


data gad_n1 gad_y1;
* Subset to vehicles with delta V estimated
  by the missing vehicle algorithm;
* Creat files for vehicles with GAD1 unknown (GAD_N1)
  and with GAD1 known and from a vehicle impact (GAD_Y1);
* This latter file will be used as a source of ACCSEQ1
  when there is no VE form for the other vehicle;
set gvve1;
if anydv=1 and dvbasis=3;
if gad1=' ' or gad1='9' then output gad_n1;
```

```
else if 1<=objcont1<=30 then output gad_y1;

data ve_y1 (keep=psu caseno vehno dvtotal accseq)
     ve_n1 (keep=psu caseno vehno dvtotal);
* From vehicles with delta V but not GAD1,
  create subfiles for those with (VE_Y1) versus
  without (VE_N1) a VE form;
* Rename ACCSEQ1 for merging with the Event file;
set gad_n1;
if veform=1 then do;
   accseq=accseq1;
    output ve_y1;
end;
else output ve_n1;

data vehveh1;
* Create a file with a record for each vehicle-damage
  combination listed on the Event file for collisions
  between two light passenger vehicles, and
  rename the variables so they can be merged and used
  with the combined GV-VE data selected above;
set nass94.event;
keep psu caseno vehno accseq gadev vehcont;
if 1<=vehnum<=30 and 1<=class1<=49
   then list1='LV';
if (1<=objcont<=30 and 1<=class2<=49) or objcont=70
   then list2='LV';
if list1='LV' and list2='LV';
vehno=vehnum;
gadev=gadev1;
vehcont=objcont;
output;
if list2='LV' then do;
   vehno=objcont;
   gadev=gadev2;
   vehcont=vehnum;
   output;
end;

proc sort data=vehveh1;
by psu caseno vehno accseq;

data ve_y2;
* For vehicles with an estimated delta V, with a VE form,
  with ACCSEQ1 coded, but with GAD1 unknown, merge with
  the Vehicle-Event file using the renamed ACCSEQ variable;
merge ve_y1(in=a) vehveh1;
by psu caseno vehno accseq;
```

```
if a=1;

data ve_n2;
* For vehicles with an estimated delta V, but without a VE form,
  merge with the Vehicle-Event file using the renamed VEHNO
variable;
* This produces more than one record per vehicle
  for those vehicles with more than one vehicle-vehicle
collision;
merge ve_n1(in=a) vehveh1;
by psu caseno vehno;
if a=1;

data ve_n_s1(keep=psu caseno vehno
             dvtotal accseq gadev vehcont)
     ve_n_m1(keep=psu caseno vehno
             dvtotal);
 * For vehicles with an estimated delta V, but without a VE form,
  separate into those with only one versus more than one
  vehicle-vehicle collision;
set ve_n2;
by psu caseno vehno;
if first.vehno*last.vehno=1 then output ve_n_s1;
else output ve_n_m1;

data ve_n_m2;
* Remove redundant entries for the identification
  file of vehicles without a VE form,
  and with more than one vehicle-vehicle collision;
set ve_n_m1;
by psu caseno vehno;
if first.vehno;
matchno=vehno;


data gad_y2;
* Vehicles with delta V estimated by the missing vehicle
algorithm
  and with a VE form are a source of ACCSEQ1 for the other
vehicle
  when that other vehicle has no VE form;
set gad_y1;
keep psu caseno partner matchno accseq;
partner=vehno;
matchno=objcont1;
accseq=accseq1;

proc sort data=gad_y2;
```

```
by psu caseno matchno;

data ve_n_m3;
* For vehicles with delta V estimated by the missing vehicle
algorithm,
  without a VE form, and with more than one vehicle-vehicle
collision,
  add ACCSEQ1 from the impacting vehicle involved;
merge ve_n_m2(in=a) gad_y2(in=b);
by psu caseno matchno;
if a=1;
matchveh=b;
drop matchno;
data ve_n_m4 leftovr1;
* For vehicles with an estimated delta V, but without a VE form,
  and with more than one vehicle-vehicle collision,
  and with ACCSEQ1 added from the impacting vehicle,
  separate leftover vehicles with more than one collision
  identified in this manner;
set ve_n_m3;
by psu caseno vehno;
if matchveh=1 and first.vehno*last.vehno=1
    then output ve_n_m4;
else output leftovr1;
data ve_n_m5;
merge ve_n_m4(in=a) vehveh1;
by psu caseno vehno accseq;
if a=1;

data unkn94; set ve_y2 ve_n_s1 ve_n_m5;  year=94;
proc freq data=unkn94; tables gadev /missing;
run;
```

## 2. ASSIGNMENT OF CRASH TYPE AND GAD1 BASED UPON IMPUTATION

**THE UNKNOWNS REMAINING AFTER PERFORMING THE ABOVE PROCEDURE WERE IMPUTED BASED UPON A UNIVARIATE DISTRIBUTION OF CRASH TYPE. THE TABLE BELOW ILLUSTRATES THE STEPS TAKEN.**

**TABLE F-2**
**IMPUTATION OF UNKNOWN GAD1 AND CRASH TYPE,**
**TOWED LIGHT TRUCKS, TOTAL SAMPLE FOR 1994-1996**

| ROW | CRASH TYPE | STEP 1 | STEP 2 | PERCENT |
|---|---|---|---|---|
| 1 | ROLLOVER 1-3 | 578 | 613 | 11.8% |
| 2 | ROLLOVER 4+ | 418 | 444 | 8.6% |
| 3 | ROLLOVER E/E | 15 | 16 | 0.3% |
| 4 | ROLLOVER ? | 62 | | |
| 5 | ROLLOVER TOTAL | 1073 | 1073 | 20.7% |
| | | | | |
| 6 | SINGLE FRONT | 450 | 679 | 13.1% |
| 7 | SINGLE SIDE | 93 | 140 | 2.7% |
| 8 | SINGLE REAR | 9 | 14 | 0.3% |
| 9 | SINGLE T/U | 0 | 0 | 0.0% |
| 10 | SINGLE GAD? | 281 | | |
| 11 | SINGLE TOTAL | 833 | 833 | 16.1% |
| | | | | |
| 12 | MULTI FRONT | 1709 | 2380 | 46.0% |
| 13 | MULTI SIDE | 497 | 692 | 13.4% |
| 14 | MULTI REAR | 141 | 196 | 3.8% |
| 15 | MULTI T/U | 2 | 3 | 0.1% |
| 16 | MULTI GAD? | 922 | | |
| 17 | MULTI TOTAL | 3271 | 3271 | 63.2% |
| | | | | |
| 18 | TOTAL | 5177 | 5177 | 100% |

The column "step 1" shows the univariate distribution, including unknowns, from the CDS data set after running the SAS program described above. The column "step 2" has the 3 types of unknowns (rollover, type unknown, single vehicle crash with unknown GAD, and multi-vehicle crash with unknown GAD) redistributed into the major crash types according to the proportion of known crash types for that group. For example, the 62 light trucks shown in "step 1", row 4, are redistributed among rows 1 through 3 in "step 2."

## 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 F3) AND FOR OCCUPANT CHARACTERISTICS (TABLE F4). 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 1994-1996 CDS DATA. BY ADDING AND SUBTRACTING ONE STANDARD ERROR TO THE ASSOCIATED ESTIMATE, APPROXIMATE 68% 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 846,069 CARS. TO CALCULATE ONE STANDARD ERROR FOR THIS ESTIMATE, USE TABLE F3 IN THIS APPENDIX. SINCE 846,069 DOES NOT APPEAR IN TABLE F3, USE LINEAR INTERPOLATION FROM THE STANDARD ERROR VALUES FOR THE ESTIMATES 800,000 AND 900,000. ONE APPROXIMATE STANDARD ERROR WOULD BE 83,400+4,508=87,908. THE CONFIDENCE INTERVAL FOR THIS ESTIMATE WOULD BE 846,069 +OR- 87,908 OR 758,161 TO 933,977.

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 F3**
**CRASH-INVOLVED VEHICLE CHARACTERISTICS ESTIMATE AND STANDARD ERRORS**

| Estimate | Standard Error | Estimate | Standard Error |
|---|---|---|---|
| 500 | 500 | 100,000 | 13,600 |
| 1,000 | 700 | 200,000 | 24,100 |
| 5,000 | 1,700 | 300,000 | 34,200 |
| 10,000 | 2,600 | 400,000 | 44,100 |
| 20,000 | 4,100 | 500,000 | 53,900 |
| 30,000 | 5,500 | 600,000 | 63,800 |
| 40,000 | 6,800 | 700,000 | 73,600 |
| 50,000 | 8,000 | 800,000 | 83,400 |
| 60,000 | 9,100 | 900,000 | 93,200 |
| 70,000 | 10,300 | 1,000,000 | 103,100 |
| 80,000 | 11,400 | 1,100,000 | 113,000 |
| 90,000 | 12,500 | 1,200,000 | 122,900 |

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

Where

a= 4.922079
b= 0.034691
x= estimate
SE= Standard Error

**TABLE F4**
**CRASH-INVOLVED OCCUPANT CHARACTERISTICS ESTIMATE AND STANDARD ERRORS**

| Estimate | Standard Error | Estimate | Standard Error |
|---|---|---|---|
| 500 | 300 | 100,000 | 19,000 |
| 1,000 | 400 | 200,000 | 40,100 |
| 5,000 | 1,200 | 300,000 | 63,300 |
| 10,000 | 2,200 | 400,000 | 88,300 |
| 20,000 | 4,000 | 500,000 | 115,000 |
| 30,000 | 5,800 | 600,000 | 143,000 |
| 40,000 | 7,600 | 700,000 | 172,500 |
| 50,000 | 9,400 | 800,000 | 203,200 |
| 60,000 | 11,300 | 900,000 | 235,200 |
| 70,000 | 13,200 | 1,000,000 | 268,200 |
| 80,000 | 15,100 | 1,100,000 | 302,400 |
| 90,000 | 17,000 | 1,200,000 | 337,600 |

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

Where

a= 3.837986
b= 0.04538
x= estimate
SE= Standard Error