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**CASE STUDIES
OF MOTOR VEHICLE FIRES**

by

Leland E. Shields
Leland E. Shields, Inc.

Robert R. Scheibe
GT Engineering

Timothy E. Angelos
Design Research Engineering, LLC

Roberta Mann
Torrance Memorial Burn Center

Washington State Transportation Center (TRAC)
University of Washington, Box 354802
University District Building
1107 NE 45th Street, Suite 535
Seattle, Washington 98105-4631

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Case Studies of Motor Vehicle Fires

Final Report

1.0 Abstract

In 1967, Federal Motor Vehicle Safety Standard 301 was first issued. Its stated purpose was to “reduce deaths and injuries occurring from fires that result from fuel spillage during and after motor vehicle crashes [1].” Since that time, many studies have evaluated the effectiveness of this standard as well as fire safety in general. Most of the studies were analyses of motor vehicle crash databases providing little or no detailed information as to the actual fuels involved in ignition, ignition sources, propagation paths and times, and injury mechanisms.

In this final report, the methodologies used in data collection and summaries of results from case studies of motor-vehicle fires are presented. These case studies were conducted to provide sufficient detail of collision-fire incidents to further understanding of the cause(s) of fire, fire propagation rates and paths, and the mechanism and extent of resultant injuries. Methodologies described include detailed data collection forms and instructions, event selection criteria, the network of contacts established to provide timely notification of events, and systems necessary to protect privacy and comply with privacy regulations of participating agencies. Study of each selected event includes interviews, inspections of vehicles and crash sites, incident reconstruction, and analysis of injury mechanisms. Data collected are available in more detail within a database developed using Microsoft Access 2000. An Adobe Acrobat (PDF) version of the database is also available. This report provides the context of collected data and an introduction to accessing data within the database.

While fires resulting from collisions are rare and occur due to the confluence of improbable events, case studies show that fires can occur in a wide range of crash circumstances and severity. Data presented herein illustrate cases that include a wide variety of post-collision ignition times, fluid system breaches, ignition source availability, impact types and impact severity. Photographs, inspection results, witness statements and investigator experience are the bases for the data presented. The database and supporting final report are presented to provide basic data for its inherent value; few general conclusions are imparted.

2.0 Introduction

Statistical studies of automotive collision-fires have been conducted for more than thirty years to examine trends of such events, the types of collisions, areas and types of vehicles involved, as well as the effectiveness of Federal Motor Vehicle Safety Standard 301 [2, 3, 4, 5]. Motor vehicle incident databases lack detail regarding fire events and often only provide affirmation of fire occurrence. Yet there have been very few publicly available studies that included vehicle field inspections such that conclusions could be drawn as to actual causation and propagation factors of the fires. The few available publications containing case studies of automobile collision-fires have not been extensive or have not included field investigation [6, 7, 8, 9]. While

case studies in the field are labor intensive to perform, they are an independent source of specific information about collision-fires [10,11].

For fires to initiate, specific combinations of fuels, oxygen and ignition energy are required. Specific combinations of fuel and oxygen are again required to promote propagation, along with significant dependence on the location of the fire and the type and amount of combustible material in the area of ignition, adjacent surface properties for heat reflection, and local air flow and ambient weather conditions [12, 13, 14]. Numerous researchers have demonstrated the difficulty of reenacting realistic vehicle fire scenarios in the laboratory. Attempts to initiate non-collision vehicle fires with only the resources normally available in the vehicle have often failed either to initiate or propagate the fire [12, 13, 14]. In addition to the numerous variables related to the fire, small differences in crash configuration can make significant differences in the propensity to burn. The tremendous complexity of collision-fire events makes association between laboratory tests and field incidents even more difficult.

In this study, a total of 35 incidents were investigated from a pool of 367 incidents for which notification was received. Three of the 35 incidents were non-collision events. Twenty-one events included impacts to the front, four events were rear impacts, and five involved rollovers (Tables 8 and 9). These thirty-five incidents involved 59 occupants of which 12 sustained burn injuries. Seven incidents included at least one fatality in the vehicle in which fire originated, of which one fatality was reported to have been the result of fire injury. A summary of the 35 incidents investigated for field investigation is tabulated in Section 9, Table 11.

The field investigations described herein include information obtained through interviews of police and fire personnel and witnesses to estimate time from impact to fire initiation, propagation time to the interior, location of initiation, and path of propagation. Considering the stressful circumstances, all witness observations were used with caution. Witness time estimates in particular were not considered precise without corroborating information. Field inspections of vehicles were performed to independently evaluate initiation locations, fuel and ignition sources available, and propagation paths. Where applicable, incident reconstruction was conducted to provide an estimate of delta V^1 as an objective measure of collision severity.

Given the nature of case studies, it should be understood that individual observations do not define trends in failure modes that are representative of specific vehicle makes and models. Also, inspectors were not authorized to disassemble vehicles during inspections, so observations were limited to exposed components. Independent laboratory tests or reenactments of incidents were not performed to confirm inspector assessments. Additionally, severe impact and fire damage often compromise evidence of fire causation. Therefore, inspector evaluations of fuels, ignition sources and times should be considered the authors' estimate of the most likely conditions involved. The authors do not expect their conclusions to be precise in all cases. Case studies do, however, demonstrate the range of possible factors related to collision-fires and resultant injuries associated with impact or fire. The authors expect that a range of factors presented in these case studies will be useful to designers, regulators, and investigators alike. The collision-fires studied included most-likely assessments indicating ignition of many automotive fluids by electrical

¹ Delta V is the change of velocity of the vehicle that takes place during the collision event as a result of impact.

sources, mechanical spark and autoignition, with large and small fires ensuing from most underhood fluids.

The study also included an evaluation of fire propagation paths. Windshields, dash panel openings, open doors and openings from deformed sheet metal were all found to contribute to propagation to the interior.

All subject participants who were injured during the events under study were asked for release of medical records relevant to the events. Participants appeared to be particularly concerned with privacy regarding medical records and conditions; they were more often willing to discuss the events of the incidents and allow inspection of the vehicles than provide medical information. Many subjects first agreed to provide medical releases but never returned additional phone calls or the signed forms. It was also apparent that the incidents involving the greatest injuries were more likely to involve attorneys concerned about their clients' participation in the study. Consequently, medical data collected were sparse and the sample not representative of all incidents. Still, data collected do provide insights into the circumstances in which burn injuries occur due to motor-vehicle fires.

3.0 Research Participants

The prime contractor for Case Studies in Motor Vehicle Fires is the Washington State Transportation Center (TRAC) at the University of Washington. TRAC is a cooperative transportation research agency with members including the University of Washington, Washington State University, and the Washington State Department of Transportation. From its offices at the University of Washington in Seattle, TRAC coordinates research resources to address multidisciplinary applied research problems. This research was conducted with expertise in vehicle systems and fire investigations provided by Leland E. Shields, Inc. in Seattle, Washington, Golder Associates Inc., in Redmond, Washington, and Design Research Engineering, L.L.C., in Novi, Michigan. Robert Scheibe, formerly with Golder Associates, is now with GT Engineering in Redmond, WA. Expertise in analysis of trauma and burn injury was provided by Dr. Roberta Mann, Director of the Torrance Memorial Burn Center in Torrance, California.

4.0 Selection of Collision-fire Incidents

Incident samples were selected to identify vehicle and collision factors in fire and injury causation. Cases were drawn from incidents involving 1990 model year design and newer passenger cars, pickup trucks, sport utility vehicles and vans, built by various manufacturers. Selection was also based on the extent of impact, fire damage and injury.

While it was understood that numerous vehicle, collision, and environmental factors are involved in the incidence of fire, it was also clear that it was not practical to control for all in the selection process for at least two reasons: 1) it is very difficult if not impossible to perform detailed investigations of enough observations to differentiate numerous variables, and 2) collision-fire events are rare and difficult to learn of in a timely manner for investigation. Therefore, samples were drawn from a limited pool of candidates.

The established selection criteria were intended to illustrate the range of factors involved in collision-fires and to raise questions for further study. As the project evolved, the criteria used for selection developed in two levels of priority as described below.

4.1 Primary Selection Criteria

Vehicle Age at Time of Collision-Fire Event:

Collision-fire vehicles selected were in production from 1990 model year or thereafter. By this criterion, a 1989 vehicle may be included if essentially the same design continued in production until at least 1990. The intent of this criterion is to investigate fire causation in vehicles of current or near-current vehicle models so that study results will be relevant to modern vehicle technology.

Extent of Vehicle Damage: It is difficult to determine specific fire causation and propagation factors in vehicles with extensive damage from both impact and fire. To maximize the information learned from each incident selected, samples were taken from three categories:

- 1) Vehicles with minor fire damage and any degree of impact damage.
- 2) Vehicles with minor collision damage and any degree of fire damage.
- 3) Incidents in which fatalities or burn injuries were involved with any degree of collision and fire damage.

For those incidents with either minor impact or fire damage, fire causation factors could be identified with a higher degree of confidence. For incidents with both extensive impact and fire damage, investigation still provided insight into causation of injuries, propagation times and entrapment issues.

Gasoline-powered vehicles only: In order to limit the scope of the already broad and complex problem, selection was restricted to gasoline-powered vehicles only.

All incidents for which notification was received were screened first to confirm that the vehicle age was within the specified range. Then information was gathered as necessary to determine the extent of collision and fire damage. If it was determined that valuable information could be gleaned from investigation, the incident was selected.

4.2 Secondary Selection Criteria

Before initiating research, TRAC identified four collision and vehicle factors for which it would be desirable to have some distribution within the sample: location of impact, vehicle type, size, and manufacturer. TRAC never intended to obtain a representative sample of any factors. Rather, the intention was to find examples of incidents over a broad range of field experience. For example, it would not have been suitable if all incidents studied were frontal impacts. Through the random process of notification, the incidents referred to TRAC were naturally distributed among the categories cited. While keeping these collision and vehicle factors as guidelines,

TRAC did not find it necessary to use any of them for screening during selection. *All selection has been determined from the primary factors alone.* Details of the collision and vehicle factors are listed below for reference.

Location of Significant Impact to Vehicle:

Frontal impacts (clock points 11, 12, 1, no rollover)
Rear-end impacts (clock points 5, 6, 7, no rollover)
Side impacts (clock points 2, 3, 4, and 8, 9, 10, no rollover)
Rollover included (Other impact locations may also be involved)

Vehicle Size:

The sample includes light trucks (pickups, sport utility vehicles and vans), and various sizes of passenger cars.

Manufacturers:

The sample included vehicles produced by a wide variety of manufacturers. No appropriate incident was excluded based on the manufacturer of the subject vehicle.

5.0 Notification of Events

An important component of the investigation was the establishment of a network of contacts at federal, state and municipal levels, in both public and private sectors, to alert the project team to collision-fire events. A considerable expenditure of project resources was required to obtain sufficient numbers of events for investigation.

The establishment of a broad network of contacts to alert the project team to collision-fire events was critical to the investigation. The effort to create the network at federal, state and municipal levels targeted states in proximity to the team centers in Seattle, Detroit, and Buffalo. Some additional states were included due to their own enthusiasm for participation. States that agreed to cooperate were Washington, Oregon, California, Idaho, Illinois, Indiana, Ohio, Minnesota, New York, Connecticut, New Jersey, Texas, Colorado and Missouri. Of these, a smaller number of states were able to maintain field awareness of the project and regularly provide notification of events. Due to minimal participation of agencies on the East Coast, the Buffalo team center did not participate in data collection.

The notification system was designed to require a minimum of effort on the part of all participating agencies. A toll-free phone call, fax, or e-mail note to project team headquarters at TRAC in Seattle was sufficient to begin investigation of an event. A one-page flyer with a description of the type of incidents and information being sought was distributed in both hard copy and electronic format to a wide variety of sources around the country. Assistance on a national basis was solicited from:

- National Highway Traffic Safety Administration (NHTSA) regional offices
- National Automotive Sampling System (NASS), operated through the NHTSA
- International Association of Chiefs of Police (IACP)
- National insurance companies
- Electronic media and literature search services

State assistance was sought through:

- State highway police or patrol organizations
- State fire marshals' offices
- State traffic safety agencies
- State DOT incident management offices
- State motor vehicle incident records agencies
- State major crash investigation units

Local assistance was requested through

- City and county police and fire districts
- County fire marshals' offices

Effort was directed toward reaching organizations with access to the most centralized vehicle data in order to minimize the number of contacts necessary. Several issues were encountered in this process. First, organizations that become central repositories for such information typically do not have the data centralized for many months or even years. Such notice of a fire event would not be received until long after most subject vehicles were destroyed. Hence, it became necessary to solicit notification assistance on a less centralized basis, adding exponentially to the process of establishing a network. Second, organizations with access to records such as these are typically governmental; as such, they are busy and often not staffed adequately to devote much time to sifting through incident records for collision-fire events. Further, some records-keeping agencies do not code fires, or perhaps do not distinguish in their coding between collision and non-collision fires, rendering computerized searches less expedient. Finally, collision-fire events are infrequent, and as such, the staff involved may encounter them so rarely that they forget to contact the team when such an event occurs.

It was found that the most successful approach to establishing a network was to start with contacts at the national level (NHTSA, NASS, IACP, etc.) and 1) have notification flyers sent out in a broad manner to blanket the regions of interest, and 2) obtain personal contacts in these regions of interest and make individual phone calls followed by a letter. Simultaneously, state agencies, especially law enforcement and fire officials were approached by phone and letter, and similarly, police and fire agencies from the most populous cities in each state were contacted.

Assistance was also sought from the private sector in developing the notification network. Researchers at one major national insurance company provided notification of collision-fire events from their national database.

Privacy issues also constrained the process at all levels. In many states, police accident reports (PARs) contain information that is considered confidential. In Washington for instance, there is a statute that forbids state and local law enforcement agencies from sharing PARs with anyone not directly associated with the incident. Even if there was no specific statute, some agencies were hesitant to share the names of victims and witnesses, fearing that a release of such information would put them at risk.

To address privacy concerns, several steps were taken. First, for the issue of state regulations forbidding release of data, several states from the initial target list were chosen for concentration because access to police reports was less restrictive. Second, it was found that for some states with restrictions on PARs, there were no such restrictions on fire incident reports. Hence, police agencies that were willing to notify of collision-fire incidents needed only to alert the research team to the incident date, location, and the responding fire department. The team was then able to legally receive contact information for the incident victims and witnesses from fire agencies. Third, team members worked with police and fire agencies in each state to resolve their questions about privacy protections incorporated within the study. Written procedures and contact scripts were extensively reviewed to confirm that subjects were informed about the project and that participation was voluntary.

For the broader concern of control of confidential information, a Certificate of Confidentiality (COC) was obtained from the National Institutes of Health. This certificate helped protect the research team from involuntary disclosure of personally identifying information, such as pursuant to a subpoena in litigation involving the incidents. The receipt of the COC was also useful in convincing state agencies that were hesitant to participate that the research team had taken significant steps to protect sensitive data.

6.0 Data Collection

Nine forms were developed for collection of data related to each of the collision-fire incidents under investigation. The forms were filled out by investigating engineers and medical personnel familiar with their use. A number of the forms and procedures were based on the National Automotive Sampling System and were developed by the National Highway Traffic Safety Administration. They were kept as similar as possible for data fields that were comparable.

The forms were designed to be a general, comprehensive, standardized means for collecting data of interest for each incident investigated. Although the forms were developed to be self-explanatory and used only by a small number of trained individuals, supplemental instructions were written to assist in the consistency of form completion, especially for questions where there may be some ambiguity.

The nine forms developed for the research effort are listed below.

- Case Summary Worksheet
- General Vehicle Form
- Interview Form
- Exterior Vehicle Form
- Interior Vehicle Form

Field Fire Investigation Form
Incident Site Form
Incident Reconstruction Form
Occupant Injury Assessment Form (Engineers and Medical)

A copy of the forms can be found in Appendix A; instructions for their use are included in Appendix B. Instructions are not provided for every field in the form. Instructions were included for any field with an identified ambiguity prior to or during study execution. Clarifications were added to the instructions any time investigators raised questions about an entry in order to both maintain coding consistency and to document the coding practice. At the conclusion of the project, the authors intend to dispose of original data forms for the protection of the subjects' privacy. Relevant data have been maintained in the database.

7.0 Summary of Events for which Notification was Received

TRAC received notification of 367 incidents between June of 1997 and January of 1999. By the end of January of 1999, the target total of 35 incidents had been selected for detailed investigation. Table 1 summarizes the criteria used to reject the balance of the incidents.

Some states sent notification only after the reports were entered into their centralized statewide system. In such cases, most of the reports had aged such that it was unlikely that the vehicles were still available for inspection. If damage was minor, vehicles were repaired, and if the damage was extensive the vehicles would already have been sold for scrap. Efforts were still made to contact subjects for some of the aged reports when the case raised issues of particular interest. Thus, the highest percentage (33%) of rejections were based on the practical potential for vehicle availability. The next highest category for rejection, vehicle age, was based on the selection criteria seeking recent model vehicles. These two categories together accounted for the majority of incidents not selected for field investigation.

Participation in the study required a significant commitment by subjects. First contacts with subjects included several minutes of a scripted description of the project, initial questions about the nature of the event, and logistic questions regarding location of the vehicle. If subjects agreed to participate, the interview alone lasted another 20-30 minutes on the phone. In the 12% of cases in which cooperation was refused, some 1) were clearly due to subjects unwilling to commit the time, 2) were due to subjects unwilling to provide information they considered private that would be required for staff to locate the vehicles, and 3) involved attorneys concerned that participation would have risk for their client's cases.

The balance of rejected cases were due to a variety of practical reasons, such as incidents related to vehicle types not included in the selection criteria.

Criteria	Percentage of Total	Comment
Incident Age	33%	Long time from incident to notification such that vehicle and witnesses would be hard to locate
Vehicle Age	27%	Vehicle did not meet selection criteria for age
No Cooperation	12%	Subject chose not to participate
Extent of Damage	11%	Extensive fire and/or collision damage
Vehicle Type	7%	Vehicle was not a passenger car or light truck
Logistic	6%	Vehicle destroyed, participants could not be located, information not available
Study Ended	2%	Notification was received after the study ended
No Fire	1%	No fire in vehicle
Non-Collision	1%	Non-collision events were not solicited or selected in the early part of the study

As in the sample selected for field investigation, the majority of incidents for which notification was received involved passenger cars subject to fire (Table 2). The sample selected included a somewhat greater percentage of vans and sport utility vehicles and lower percentage of pickups than the incidents for which notification was received.

Vehicle Type (Subject to Fire)	Percentage
Passenger Car	62.4%
Pickup	14.9%
Sport Utility Vehicle	9.9%
Heavy Truck	5.9%
Van	5.9%
Other	0.7%
Medium Truck	0.3%

Percentages are based on those events for which vehicle type was known

Frontal impacts dominated the impact types for fires in vehicles investigated in detail and for all those reported to TRAC (Table 3). Two (or more) vehicle impacts were involved in just under half of the detailed investigations and over 60% of those reported to TRAC. The sample selected

for field investigations included cases similar to the significant impact types and objects of impact from those reported.

Impact Type	Percentage of Total	Object of Impact	Percentage of Total
Front	61%	Fixed	32%
Multiple	11%	Passenger Car	26%
Rear	8%	Heavy Truck	17%
Rollover	8%	Pickup	12%
Non Collision	6%	Van	4%
Side	2%	Other	4%
Undercarriage	2%	Sport Utility Vehicle	3%
Right	1%	Medium Truck	2%
Left	1%		
Of those with multiple impacts, 57% included frontal, and 43% included rollover		Events with more than one object of impact or unknown objects of impact were not included.	

In the course of documenting reported incidents and obtaining enough information to select those for more detailed investigation, the research staff had an opportunity to learn about a great number of fire incidents. A few observations were made during this process.

- 1) There were several unfortunate instances in which witnesses refrained from assisting occupants of fire vehicles because of their fear of the vehicle exploding like commonly seen on television. In interviewing subjects, it was apparent that individuals often had the misconception that vehicles explode catastrophically. While it would not be considered prudent to casually approach a burning vehicle, the perception of violence held by many may inhibit intervention in instances where it could be helpful. However, in many instances, witnesses did approach vehicles to assist in extrication and subjected themselves to burns during their considerable efforts.
- 2) Some incidents of post-collision fire occurred in unexpected ways and after relatively low energy impacts. One report described a fire initiating while the vehicle was being towed, presumably a significant period of time after impact and rest. The low energy events included three incidents of impact with deer (one selected for detailed investigation); one of these three incidents was reported after the data collection had concluded and was therefore not included in the tabulation.
- 3) A high proportion of fires reported originated in vehicle engine compartments, many likely initiating from sources other than gasoline (Table 11).

8.0 Database of Results

Data and photographs collected during the 35 field investigations have been included in an electronic database; the database provides the most comprehensive presentation of study results, containing the primary fields defining vehicle and collision factors (when appropriate), and describing observations related to potential fuels, ignition sources and propagation paths. To protect the privacy of subjects, the database does not include personal identifiers, dates, vehicle identification numbers, or the state in which the incident occurred. The database does contain photographs and the significant technical information collected for each incident. Each record has a written summary (General Narrative) of all aspects of the case investigation for quick review.

The electronic database does not include tables for the Interview Form or any of the worksheets from the field data collection forms. Information captured in these fields was instead communicated in the narratives. Numerous other fields were included in the field data collection forms to assure capture of important information during inspections, consideration in evaluations and narrative descriptions; often the fields were not included in the electronic database to maintain a concise format. For example, the field data collection form for fire includes coding for the position of each window immediately prior to and during the initial fire. While the field does not appear in the electronic database, the information was included in the fire narrative regarding propagation path if it was relevant.

Photographs that were most descriptive of each incident were selected for inclusion in the database. A small number of "exemplar vehicle" photographs were taken of similar vehicles not subject to extreme impact damage or fire to show pre-incident system conditions and locations. Unfortunately, it was not practical with given resources to write a caption for each of the 446 photographs in the database; however, it is expected that database users will be able to interpret them. While the Microsoft Access version of the database does not provide a means to magnify selected areas of photographs, the images can be copied into other programs that will do so. On-screen magnification is possible when viewing the photographs in the Adobe Acrobat version of the database. Sufficient resolution has been provided to allow for high quality printed images and magnification.

The database, developed in Microsoft Access 2000, is stored on a single CD for ease of use. The tables within the database largely correspond to the forms previously described and are listed in Table 4. Database tables are linked by "Case No.," (the unique numeric identifier of each investigation)², "Vehicle No." and "Occupant No." fields. An Adobe Acrobat PDF version was also developed so that the data would be accessible on various computer platforms and to those without Microsoft Access familiarity.

² There is only one complication to the unique numbering system. In case 183, each of two vehicles independently caught fire after collision. Each vehicle appears separately in the database as Case No 1831 and 1832 respectively.

Table 4			
Designations of Electronic Tables and Forms			
Field Data Collection Form – Hard Copy	Table Name (Electronic)	Form Name (Electronic)	Description of Data Contained (In Electronic Database Tables)
General Vehicle Form	General Vehicle-1	General Vehicle 1	Basic incident information, including the General Narrative (summary).
General Vehicle Form	General Vehicle-2	General Vehicle 2	Additional incident data related to the subject (fire) vehicle.
Exterior Vehicle Form	Exterior Vehicle	Exterior Vehicle	Basic vehicle data, including make, model, model year.
Interior Vehicle Form	Interior Vehicle	Interior Vehicle	Occupant area intrusion
Field Fire Investigation Form	Field Fire Investigation	Fire Form	Specific observations of fluid systems, electrical systems, and potential ignition sources.
Field Fire Investigation Form	Field Fire Investigation	Fire Narratives	Summaries of fuel and ignition sources, and fire propagation information.
Incident Site Form	Accident Site	Accident Site	Speed limits for each vehicle
Incident Reconstruction Form	Accident Reconstruction	Accident Reconstruction	Crush damage measurements, estimated or calculated speeds and Delta V.
Occupant Injury Assessment Form (Engineers)	Injury Assess--Engineers-1	Occupant Injury Assessment Form-Engineers	Occupant data coded by engineering investigators related to restraint usage, ejection, entrapment, and reported medical treatment.
Occupant Injury Assessment (Medical)	Injury Assess Medical	Occupant Injury Assessment Form-Medical	AIS injury coding and medical assessment of cause of death (where possible).
	Graphics	Photographs	Photographs

9.0 Description of Incidents Included in the Sample

9.1 Incident Factors

Aggregate information is provided in Tables 5, 6, and 7 to summarize the types of incidents investigated and included in the database. Distributions based on the fire vehicle include vehicle type, model year, make, objects of impact, direction of impact (clock), and Delta V. Consistent with the intent of incident selection criteria as described above, it is clear that a large variety of incidents have been investigated.

Vehicles in Sample:

Table 5	
Vehicle Type	Count
Passenger Cars	22
Sport Utility Vehicles	5
Vans	5
Light Pickup Trucks	3
Total	35

Table 6	
Model Year	Count
1988	2
1990	4
1991	5
1992	4
1993	5
1994	4
1995	6
1996	1
1997	2
1998	1
1999	1
Total	35

Table 7	
Vehicle Make	Count
Ford	7
Chevrolet	4
Mitsubishi	3
Plymouth	3
Toyota	3
Dodge	2
Jeep	2
BMW	1
Chrysler	1
Honda	1
Lincoln	1
Mazda	1
Mercury	1
Nissan	1
Oldsmobile	1
Pontiac	1
Saturn	1
Subaru	1
Total	35

Collision Types

The Collision Damage Classification (CDC) system designated in SAE J224 [15] was used to characterize the incidents; appropriate coding was included in the Incident Reconstruction table and form. The objects impacted by the fire-vehicles are listed in Table 8. The distribution of CDC deformation locations on fire vehicles investigated is provided in Table 9.

Table 8	
Object Contacted or Event	Count
Non-collision fire events	3
Two-vehicle incidents	19
Rollover	5
Tree	4
Concrete traffic barrier	3
Ditch or culvert	2
Pole or post	2
Metal guard rail	1
Steel plate on roadway	1
Animal	1
Object fell from vehicle in-transport	1
Total	42

Table 9	
Deformation Location	Count
Non-Collision Fires	3
Front	21
Right	3
Top	4
Undercarriage	4
Rear	4
Unclassifiable	1
Total	40

Of the five rollover incidents listed in Table 8, one involved a rollover without other impacts, two also involved collisions with other vehicles, and two involved undercarriage impacts to a ditch or culvert. The total count of impacts is greater than the number of fire incident vehicles investigated because some vehicles had more than one impact related to the single fire event.

Principal direction of force (PDOF) in Table 10 was coded by vector directions associated with hours on an analog clock face as specified in the CDC. The database itself separately codes PDOF in degrees as well. One rollover incident with unclassified deformation location had damage on many surfaces of the vehicle. Consequently, direction of force was not coded and is therefore included as a blank in the Direction of Force table.

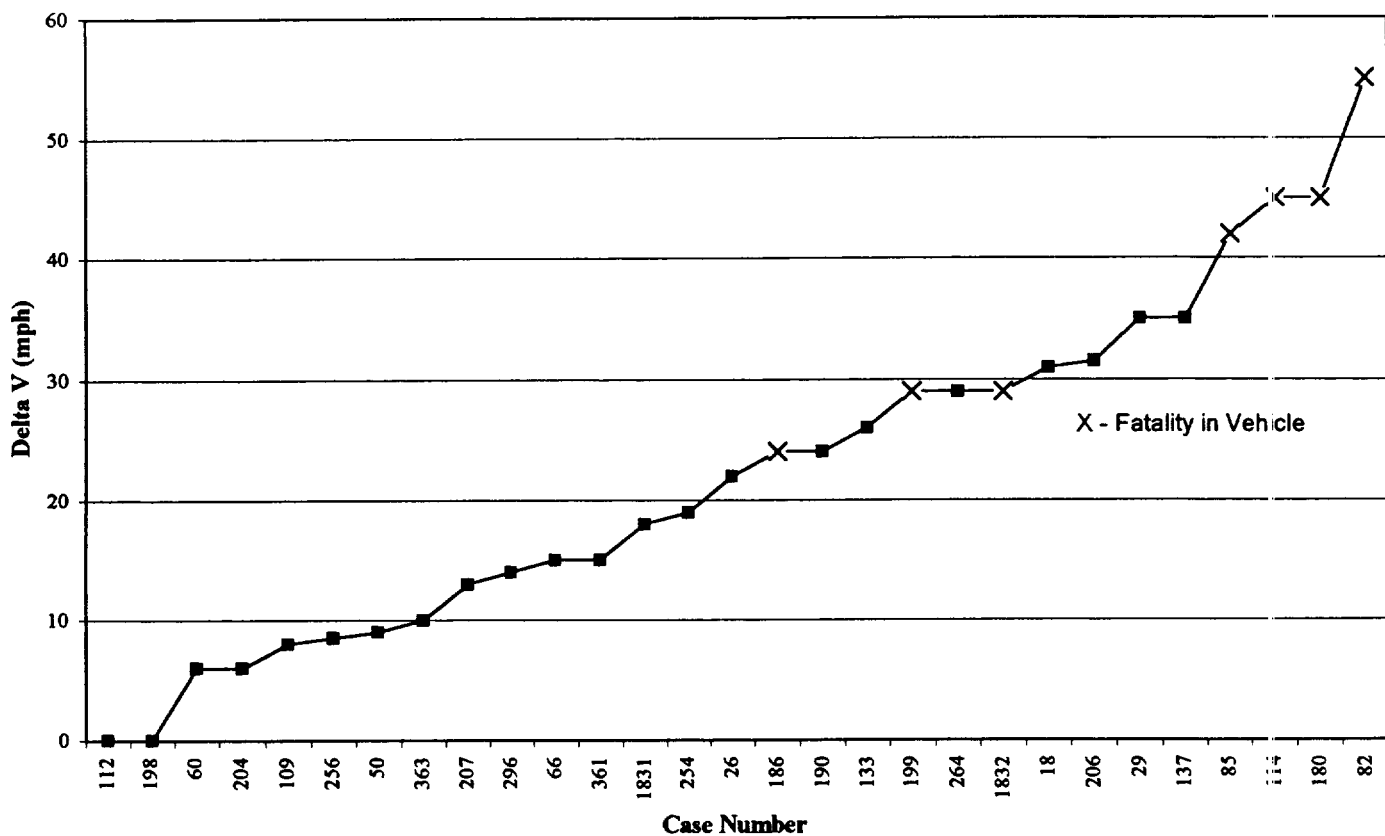
Direction of Force (Clock)	Count
Non-collision and blank	4
0	5
1	5
2	1
5	1
6	4
8	1
11	2
12	17
Total	40

Delta V was widely distributed within the sample investigated; two vehicles overrode objects on the roadway puncturing gas tanks without any significant change of vehicle velocity. Another incident resulted in a low Delta V after impact with a deer. Other single- and two-vehicle collisions had Delta V's estimated as high as 55 mph in rear impact and 45 mph in frontal impact to a tree. Delta V's presented in this text and in the accompanying graph are the average values taken from the minimum and maximum Delta V's estimated for each incident and as shown in the database. Because of various factors related to individual investigations, Delta V was calculated with a variation in precision from incident to incident.

As described in the Selection Criteria section, low energy impacts and vehicles with limited collision damage were actively sought for investigation. Therefore, the proportion of low energy impacts in the study cannot be construed as representative in any fashion; they do however provide additional insight into the potential for fire.

The graph showing distribution of Delta V's (Figure 1) presents values for those incidents where data were available and relevant.

Figure 1
Delta V Distribution by Case Number



Fire Fuel, Ignition and Propagation Factors Reported

The database provides detailed observations of each incident, explanations for conclusions reported, and relevant photographs. A summary of the evaluations of all 35 investigations, showing incident factors related to fire and injury is provided in Table 11.

**Table 11
Summary of Investigator Evaluations**

Case No.	Fire Vehicle	Impact Description	Estimated Delta V kph/ mph	Most Likely Fuel/Ignition Source(s) ³	Estimated Time to Ignition/Time to Interior ⁴ (minutes)	Initial Location of Fire	Reported Injuries: Fire Vehicle/ Other Vehicle	Assistance in Egress from Fire Vehicle
18	1992 Mitsubishi Eclipse	Frontal with front of pickup	47-53/ 29-33	Engine oil*, coolant/ exhaust manifold*, electrical or mechanical spark	<3/5-8	Engine compartment	Minor/none	Yes
26	1992 Ford Explorer	Right side with front of car	31-40/ 19-25	Coolant/electrical	Immediate/ 2-4	Engine compartment	Driver: ejected, broken vertebra/Driver: cuts, broken knee, back pain	Yes (for children)
29	1995 BMW 525i	Frontal with barrier, narrow	48-64/ 30-40	Gasoline*, coolant, polymeric/ electrical, exhaust manifold	2-5/4-6	Engine compartment	Driver: unconscious, passenger: spinal injuries	Yes
50	1996 Chrysler Sebring	Side with side of tractor-trailer	8-21/ 5-13	Most fluids except gasoline, polymeric/ electrical spark, exhaust manifold	3-5 ⁵ /4-6	Engine compartment	Driver: lacerations	No
60	1991 Plymouth Acclaim	Frontal with side of pickup	3-16/ 2-10	Coolant/ electric motor	8-10 ⁵ /extinguished 9-11 with no spread to interior	Engine compartment	None	No
66	1997 Plymouth Voyager	Frontal with side of van, underride	19-27/ 12-17	Gasoline*, other fluids/electrical or mechanical spark, exhaust manifold	Immediate/4-6	Engine compartment	Driver: broken hand/ Driver: cut to head	No
67	1991 Mitsubishi Eclipse	Override of culvert, rollover	Minor	Engine oil/exhaust pipe*, mechanical spark	~Immediate/ extinguished without spread to interior	Exhaust system, car inverted.	Driver: back pain, bruises, scratches	No

³ * Asterisk indicates one or more fuels or ignition sources are believed to be more likely than others present.

⁴ Times estimated from witness descriptions of events and responder logs. High estimates of propagation time used. Times are with respect to rest after impact.

⁵ Engine reported to be on after impact.

**Table 11 (Continued)
Summary of Investigator Evaluations**

Case No.	Fire Vehicle	Impact Description	Estimated Delta V kph/ mph	Most Likely Fuel/Ignition Source(s) ³	Estimated Time to Ignition/Time to Interior ⁴ (minutes)	Initial Location of Fire	Reported Injuries: Fire Vehicle/ Other Vehicle	Assistance in Egress from Fire Vehicle
82	1990 Lincoln Town Car	Rear-end by front of 3/4 ton van	80-97/ 50-60	Gasoline from tank/ electrical, mech. spark	Immediate/ fully engulfed within 9	Rear end and/or interior	Driver: fatality from blunt force injury. Passenger: fatality from unknown cause/Driver: none, five passengers: minor and major injuries	Driver remained in vehicle, passenger partially ejected
85	1994 Mazda 323	Rear-end by front of passenger car	64-71/ 40-44	Gasoline from tank/ electrical, mech. spark, exhaust manifold	Immediate/<2	Rear end and/or interior	Driver: fatality due to fire/ Minor injuries	Driver remained in vehicle
109	1995 Ford Escort	Frontal with rear of pickup	10-16/ 6-10	Engine oil* and coolant/exhaust manifold* and electrical	<2/extinguished in 5-10 min. with no spread to interior	Engine compartment	None	No
112	1991 Toyota Previa	Override of tow dolly	Minor	Gasoline from tank/ mechanical spark	Immediate/ immediate to exit paths	Pool fire under driver door	Driver and passenger burn injuries	No
114	1990 Dodge Caravan	Frontal impact with tree	64-80/ 40-50	All fluids/ electrical, mechanical spark, exhaust manifold	Immediate/1-3	Engine compartment	Driver: burns. Passengers: one fatal with unrelated burns, two seriously injured	Yes
121	1988 Plymouth Sundance	Undercarriage impact and rollover	Minor	Unknown fluid(s)/ Unknown	<5 ⁵ / fully engulfed within 10	Between front wheels on inverted car	Driver: non-incapacitating. Passenger: none	Yes
133	1993 Honda Prelude	Frontal with utility pole	37-45/ 23-28	Coolant, power steering fluid, polymeric/ electrical	5/<10	Engine compartment	Driver: incapacitating injuries	Yes
137	1994 Toyota Camry	Frontal with narrow object	50-63/ 31-39	Coolant*, brake fluid, polymeric/ electrical, mech. spark, exhaust manifold	1-2/<5	Engine compartment	Driver: bruised chest	Yes

**Table 11 (Continued)
Summary of Investigator Evaluations**

Case No.	Fire Vehicle	Impact Description	Estimated Delta V kph/mph	Most Likely Fuel/Ignition Source(s) ³	Estimated Time to Ignition/Time to Interior ⁴ (minutes)	Initial Location of Fire	Reported Injuries: Fire Vehicle/ Other Vehicle	Assistance in Egress from Fire Vehicle
180	1994 Saturn	Rear by front of passenger car	68-77/ 42-48	Gasoline from tank/ electrical, mech. spark	Immediate/1-3	Passenger compartment	Driver: fatal, cause unknown, likely due to trauma/ 2 pass., minor	Driver remained in vehicle
183.1 ⁶	1992 Chevrolet Sportvan	Rear by front of underriding pickup	23-35/ 14-22	Gasoline from tank/ electrical, mech. spark	Immediate/ fully engulfed within 11	Rear end	Driver: concussion, back injuries, burned arm. 3 passengers: minor injuries/ See case 183.2	Yes
183.2 ⁶	1993 Chevrolet Silverado Pickup	Frontal with rear of van	34-55/ 21-34	Power distribution box*, coolant, brake fluid/ electrical*, mech. spark	Unknown/ extinguished with no spread to interior	Engine compartment	Driver: fatal from impact/ See case 183.1	Driver remained in vehicle
186	1995 Chevrolet K-15 Pickup	Frontal with tree	35-42/ 22-26	Coolant, brake fluid, polymerics/electrical, mech. spark, exhaust manifold	Unknown/3-7	Engine compartment	Driver: fatal, cause unknown	Driver remained in vehicle
190	1995 Toyota Camry	Frontal with guard rail	34-42/ 21-26	Coolant, transmission fluid, polymerics/ electrical, mech. spark, exhaust manifold	1-4/ fully engulfed within 9	Engine compartment	Driver, passenger both had "other visible injuries"	Yes
198	1994 Dodge Caravan	Override of steel road plate	Minor	Gasoline from tank/ mechanical spark	Immediate/ immediate to exit paths	Pool fire under pass. compartment	Driver: burn injuries. 2 passengers: none	Unknown
199	1991 Ford Escort	Frontal with rear of car and tree	43-48/ 27-30	All fluids/exhaust manifold, electrical, mech. spark	<3/6-10	Engine compartment	Driver: fatal due to internal injuries/None	Yes
204	1988 Mercury Sable	Frontal with deer	8-13/ 5-8	Coolant, power steering, transmission fluid/exhaust manifold, electrical spark	5/unknown	Engine compartment	None	No

⁶ Samples 183.1 and 183.2 both involved in same collision incident; fires began independently. Front of vehicle from 183.2 struck rear of vehicle from 183.1.

**Table 11 (Continued)
Summary of Investigator Evaluations**

Case No.	Fire Vehicle	Impact Description	Estimated Delta V kph/ mph	Most Likely Fuel/Ignition Source(s) ³	Estimated Time to Ignition/Time to Interior ⁴ (minutes)	Initial Location of Fire	Reported Injuries: Fire Vehicle/ Other Vehicle	Assistance in Egress from Fire Vehicle
206	1991 Ford Ranger	Frontal with rear of minivan, rollover	45-56/ 28-35	Coolant, transmission fluid, polymerics/ exhaust manifold, electrical, mech. spark	1-2/2-3	Engine compartment	Driver: several broken bones/ Driver: possible injuries	No
207	1993 Jeep Grand Cherokee	Frontal with barrier after side impact from car	16-23/ 10-14	Coolant, gasoline/exhaust manifold, electrical, mech. spark	Immediate/ unknown	Engine compartment	Minor injuries/One passenger killed, other four occupants had range of injuries	Yes
254	1992 Oldsmobile 98	Frontal with side of pickup	27-34/ 17-21	Coolant, transmission fluid, brake fluid, polymerics/exhaust manifold, electrical, mech. spark	Unknown/unknown	Engine compartment	Driver: non-incapacitating injuries/ Driver: non-incapacitating injuries	Yes
256	1995 Nissan Pathfinder	Sideswipe of truck and rollover	Minor	Gasoline from filler neck/electrical, mech. spark	Immediate/ immediate	Right rear	Driver: injured arm and singed hair; Passenger: possible injuries/None	Driver assisted passenger
264	1990 Ford Tempo	Front with rear of minivan	42-52/ 26-32	Most fluids, polymerics/ electrical*, mech. spark	Immediate/ extinguished <2 min with no spread to interior	Engine compartment	Driver and two passengers: minor cuts and bruises/Unknown	No
285	1998 Subaru Legacy	Override of culvert and rollover	Minor	Engine oil*, brake fluid, coolant, polymerics/exhaust components, electrical, mech. spark	Unknown/unknown	Lower engine compartment	Fractured back, multiple bruises, abrasions, and lacerations	Yes
296	1995 Ford Taurus	Frontal with barrier after side contact with truck	16-27/ 10-17	Power steering and transmission fluid, coolant, polymerics/exhaust manifold, electrical	5-15/unknown	Engine compartment	Possible hip injury/ None	No

**Table 11 (Continued)
Summary of Investigator Evaluations**

Case No.	Fire Vehicle	Impact Description	Estimated Delta V kph/ mph	Most Likely Fuel/Ignition Source(s)³	Estimated Time to Ignition/Time to Interior⁴ (minutes)	Initial Location of Fire	Reported Injuries Fire Vehicle/ Other Vehicle	Assistance in Egress from Fire Vehicle
304	1999 Pontiac Grand Am	Non-collision		Power steering fluid*, coolant, gasoline/ exhaust manifold	N/A / extinguished without spread to interior	Engine compartment	None	No
361	1990 Ford Bronco II	Frontal with rear of tractor-trailer	16-32/ 10-20	Most fluids/exhaust manifold, electrical, mech. spark	Immediate/3-5	Engine compartment	Driver and three passengers: minor cuts, abrasions, and bruises/ None	No
363	1993 Chevrolet Cavalier	Frontal with tree	13-19/ 8-11	Coolant, brake fluid, polymerics/ electrical, mech. spark, exhaust manifold	Immediate/10-15	Engine compartment	Driver: minor injuries, 1 st passenger: no injuries, 2 nd passenger: non-incapacitating injuries	No
364	1993 Mitsubishi LRV minivan	Non-collision		gasoline/electrical spark	spread to interior	compartment		No
365	1997 Jeep Cherokee	Non-collision		Gasoline, power steering fluid, transmission fluid, polymerics/ electrical, exhaust manifold	N/A / extinguished before spreading to interior	Engine compartment	None	No

NOTE: Entries in the table that refer to "electrical" as an ignition source may include the possibility of electrical arc, spark, or resistance heating. Burn injuries are listed only in the affirmative; annotation was not provided if there were no burn injuries.

9.2 Injury Data and Medical review

Obtaining medical records related to collision-fire incidents was one of the most challenging aspects of the project. Several factors conspired to impede this goal: 1) Participants often felt a greater need to maintain privacy of medical records than data related to their vehicles or the incident. Even when there were indications of participant responsibility for the collision, some chose to provide incident data but not medical records. In some instances, a medical release form (and therefore the medical records) were received for one occupant of a vehicle but could not be obtained for others. Several participants agreed to provide access to their vehicles, were willing to be interviewed but would not sign for release of medical information. 2) Incidents with serious injury or fatality were more likely to have attorneys involved in personal injury claims. Typically, the attorneys were hesitant to allow their clients to participate in the research because of concern over how the findings would affect their case. 3) Hospitals, apparently having their own concerns over privacy, had lengthy and cumbersome processes for providing data even when release forms were received.

Of the 35 vehicles inspected for fire during the study, 32 were subject to post-collision fire. There were 59 occupants in these 32 vehicles; 12 occupants of nine vehicles had burn injuries. Of the eight fatalities in fire vehicles, four were unrelated to fire, two were due to unknown causes, one was due to an unknown cause but most likely unrelated to fire, and one was due to fire according to an autopsy.

Two additional factors should be noted in analyzing the injury data in the database. 1) An Occupant Injury Assessment Form – Medical was completed only for those incidents with enough information to complete an AIS scoring or to document burns from fire. Others with injury, as documented in the Occupant Injury Assessment Form – Engineers, may not have an associated medical review form. 2) Incidents were selected preferentially for limited collision damage (thus less likely to involve injury) and for injurious incidents with fire. With these competing selection criteria, the sample cannot be construed as representative of the distribution of injury severity in the population of all incidents. Table 12 summarizes the injuries in fire and other vehicles.

Table 12				
Police Reported Injury Severity	Fire Vehicle		Non-fire (Other) Vehicle	
	Count of Occupants	% of Total	Count of Occupants	% of Total
0 –No injury (0)	10	17	14	44
1 –Possible injury (C)	13	22	1	3
2 –Non-incapacitating injury (B)	17	29	9	28
3 –Incapacitating injury (A)	7	12	5	16
4 –Killed (K)	8	14	1	3
9 –Unknown (U)	4	7	2	6
Total	59		32	
3 Non-collision events (without injury) excluded				

10. Summary

This report describes the basis for data collected and provides an introduction to the database for use by other researchers in the field. In addition to methodology, the report contains a summary of the incidents for which notification was received as well as those that were selected for field investigation. For those selected, aggregate information about the vehicles, collisions (or lack thereof), fires, and injuries were also provided.

The data compiled and presented in the database show that the causes and severity of collision-related fires can vary widely and depend on numerous and complex factors. Field investigations can provide detail that assist in the characterization of causes for fire and injury. Fuels available for ignition, ignition sources, post-collision ignition times, and fire propagation depend on crash configurations, collision environment, and subtle or transient events such as fuel/air mixtures, surface temperatures, arcs, or sparks. Though in certain cases, even detailed field investigations may not provide conclusive evidence of post-collision fire causation, field investigations can provide valuable insight for investigators, regulators and the engineering community interested in understanding, and ultimately reducing, the incidence of automotive fires.

11. Acknowledgments

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Appendices

- A Data collection form
- B Data collection instructions

Appendix A: Data collection form



Case Summary worksheet

Case Number _____ Investigator Number _____

A. Description of the Incident Sequence and Incident Peculiarities

Provide a summary of the incident sequence as well as any particular event of the incident that is noteworthy. Use this for taking notes—crash narrative developed elsewhere.)

B. Impact Sequence for Vehicle 1 (Fire Vehicle)

Impact Sequence No.	Object/Vehicle Contacted	Notes

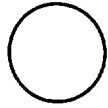
C. Vehicle Profile(s)

Vehicle No.	Year/Make/Model	Most Severe Collision Damage Based on Vehicle Inspection		Component Failure
		Damage Plane	Severity Description	

Case Summary Worksheet—Accident Diagram

Case Number _____
Incident Diagram

Investigator Number _____



North

Use this diagram to sketch critical positions and events
to summarize collision



General Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

Vehicle Identification

Official Records

1. Incident Time and Date

(a) Date of incident (MM/DD/YY) ___ / ___ / ___

(b) Time of incident (military) _____

2. Vehicle Model Year

Code the last two digits of the model year
(99) Unknown

3. Vehicle Make and Model

a. Make _____

b. Model _____

4. Vehicle Type

P = passenger car M = medium truck
L = light truck H = heavy truck
V = van O = other
U = utility vehicle

5. Vehicle Identification Number (VIN)

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 "?" in any unknown digits

6. Vehicle Special Use (This Trip)

- (0) No special use
- (1) Taxi
- (2) Commercial
- (3) Vehicle used as bus
- (4) Military
- (5) Police
- (6) Ambulance
- (7) Fire truck or car
- (8) Other (specify): _____
- (9) Unknown

7. Trailer towed Yes No

Describe _____

8a. Document Log (List reports, records, photos in hand)

8b. Documents Available (List reports, records, photos available but not in hand)

9. Police Reported Vehicle Disposition

- (0) Not towed due to vehicle damage
- (1) Towed due to vehicle damage
- (9) Unknown

10. Police Reported Travel Speed

Code to the nearest mph
(NOTE: 000 means less than 0.5 mph)
(888) None
(999) Unknown

11. Speed Limit

(000) No statutory limit
Code posted or statutory speed limit in mph
(999) Unknown

12a. Driver and Other Contributing Factors

(Check either driver or other contributing factor)

___ Driver ___ Other contributing factor

___ Impact sequence number

Describe _____

12b. Driver and Other Contributing Factors

(Check either driver or other contributing factor)

___ Driver ___ Other contributing factor

___ Impact sequence number

Describe _____

12c. Driver and Other Contributing Factors

(Check either driver or other contributing factor)

___ Driver ___ Other contributing factor

___ Impact sequence number

Describe _____

12d. Driver and Other Contributing Factors

(Check either driver or other contributing factor)

___ Driver ___ Other contributing factor

___ Impact sequence number

Describe _____

Add more pages to include more contributing factors

General Vehicle Form (Vehicle 1 Only)

Complete for each impact

Case Number _____ Vehicle Number 1 Impact Sequence Number _____ Investigator Number _____

Preocrash Environmental Data

13. 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

14. Relation to Roadway (at impact or ignition of non-collision fire) _____

- (1) On roadway
- (2) Shoulder
- (3) Median
- (4) Roadside
- (5) Outside right-of-way
- (6) Off roadway—location unknown
- (7) In parking lane
- (8) Gore
- (9) Unknown

15. Trafficway Flow _____

- (0) Not physically divided (two-way traffic)
- (1) Divided trafficway—minimum 1.2 m wide median strip without manufactured barrier
- (2) Divided trafficway—median strip with manufactured barrier
- (3) One-way traffic
- (9) Unknown

16. Number of Travel Lanes _____

- (1) One
 - (2) Two
 - (3) Three
 - (4) Four
 - (5) Five
 - (6) Six
 - (7) Seven or more
 - (9) Unknown
- (If trafficway not physically divided, count total lanes; otherwise (if divided), count lanes in direction of travel)

17. Roadway Alignment _____

- (1) Straight
- (2) Curve right
- (3) Curve left
- (9) Unknown

18. Roadway Profile _____

- (1) Level
- (2) Uphill grade (>2%)
- (3) Hill crest
- (4) Downhill grade (> 2%)
- (5) Sag
- (6) Grade unknown
- (9) Unknown

19. Roadway Surface Type _____

- (1) Concrete
- (2) Bituminous (asphalt)
- (3) Brick or block
- (4) Slag, gravel, or stone
- (5) Dirt
- (8) Other (specify): _____
- (9) Unknown

20. Roadway Surface Condition _____

- (1) Dry
- (2) Wet
- (3) Snow or slush
- (4) Ice
- (5) Sand, dirt, or oil
- (8) Other (specify): _____
- (9) Unknown

21. Light Conditions _____

- (1) Daylight
- (2) Dark
- (3) Dark, but lighted
- (4) Dawn
- (5) Dusk
- (9) Unknown

22. Atmospheric Conditions _____

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

23. 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) (specify): _____

- (7) Unknown sign
- (8) Miscellaneous/other controls including RR controls (specify): _____

- (9) Unknown

24. Traffic Control Device Functioning _____

- (0) No traffic control device
- (1) Traffic control device not functioning (specify): _____

- (2) Traffic control device functioning properly
- (9) Unknown

General Vehicle Form (Vehicle 1 Only)

Complete for each impact

Case Number _____

Vehicle Number 1

Impact Sequence Number _____

Investigator Number _____

Pre-Incident Driver Related Data

25. Driver's Distraction or Activity _____

(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/controls integral to vehicle
(specify): _____

(10) While using or reaching for device/object brought
into vehicle (specify): _____

(11) Sleepy or fell asleep

(12) Distracted by outside person, object, or event
(specify): _____

(13) Eating or drinking

(14) Smoking related

(97) Distracted/inattentive, details unknown

(98) Other distraction (specify): _____

(99) Unknown

26. 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

27. Critical Pre-Incident 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) Departure from end of road
- (15) Turning left at intersection
- (16) Turning right at intersection
- (17) Crossing over (passing through) intersection
- (18) This vehicle decelerating
- (19) Unknown travel direction

Critical Pre-Incident Event Options Continued
on Next Page ...

General Vehicle Form (Vehicle 1 Only)

Complete for each impact

Case Number _____

Vehicle Number 1

Impact Sequence Number _____

Investigator Number _____

Critical Pre-Incident Event Options (Continued)

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

28. 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

29. Pre-Incident 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): _____
- (8) Skidding – direction unknown
- (9) Precrash stability unknown

30. Pre-Incident 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 or original travel lane
- (4) Departed roadway
- (5) Remained off roadway
- (6) Returned to roadway
- (7) Entered roadway
- (9) Unknown

31. Incident Type _____

(Note: Applicable codes on next page)

- (00) No impact
Code the number of the diagram that best describes the incident circumstance
- (98) Other incident type (specify): _____

(99) Unknown

General Vehicle Form

Complete for each impact

Case Number _____ Vehicle Number 1 Impact Sequence Number _____ Investigator Number _____

Category	Configuration	Incident Types (includes intent)									
I Single Driver	A Right Roadside Departure	01 	02 	03 	04 Specifics Other	05 Specifics Unknown					
	B Left Roadside Departure	06 	07 	08 	09 Specifics Other	10 Specifics Unknown					
	C Forward Impact	11 	12 	13 	14 	15 Specifics Other	16 Specifics Unknown				
II Same Trafficway Same Direction	D Rear-End	20 	22 	24 	26 	30 					
	E Forward Impact	34 	35 	36 	37 	38 	39 	40 	41 	(Each • 42) Specifics Other	(Each • 43) Specifics Unknown
	F Sideswipe Angle	44 	45 	46 	47 	(Each • 48) Specifics Other	(Each • 49) Specifics Unknown				
III Same Trafficway Opposite Direction	G Head-On	50 	51 	(Each • 52) Specifics Other	(Each • 53) Specifics Unknown						
	H Forward Impact	54 	55 	56 	57 	58 	59 	60 	61 	(Each • 62) Specifics Other	(Each • 63) Specifics Unknown
	I Sideswipe Angle	64 	65 	(Each • 66) Specifics Other	(Each • 67) Specifics Unknown						
IV Change Trafficway Vehicle Turning	J Turn Across Path	68 	69 	70 	71 	72 	73 	(Each • 74) Specifics Other	(Each • 75) Specifics Unknown		
	K Turn Into Path	76 	77 	78 	79 	80 	81 	82 	83 	(Each • 84) Specifics Other	(Each • 85) Specifics Unknown
V Intersecting Paths (Vehicle Damage)	L Straight Paths	86 	87 	88 	89 	(Each • 90) Specifics Other	(Each • 91) Specifics Unknown				
VI Miscellaneous	M Backing Etc.	92 	93 	98 Other Incident Type	99 Unknown Incident Type	00 No Impact					

Interview Form—General Information

Case Number _____

Vehicle Number _____

Investigator Number _____

Interviewee _____

Accident Diagram



North

Use this diagram to sketch position and events as described by interviewee.

Interview Form—Crash Information

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

Crash Data Information (If possible, obtain this information from the driver):

Source of Information	<input type="checkbox"/> Driver <input type="checkbox"/> Other occupant <input type="checkbox"/> Witness at scene <input type="checkbox"/> Relative/friend
Travel Direction	<input type="checkbox"/> North <input type="checkbox"/> South <input type="checkbox"/> East <input type="checkbox"/> West (Or where were they coming from or going to?)
Type of Roadway	<input type="checkbox"/> One way <input type="checkbox"/> Two way Number of lanes each way _____ Divided highway? _____
Lane	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> Other Note: lane 1 is the right curb lane
Road Condition	<input type="checkbox"/> Dry <input type="checkbox"/> Wet <input type="checkbox"/> Snow <input type="checkbox"/> Slush <input type="checkbox"/> Ice <input type="checkbox"/> Sand, dirt, oil <input type="checkbox"/> Other (specify): _____
Lighting Conditions	<input type="checkbox"/> Daylight <input type="checkbox"/> Dawn <input type="checkbox"/> Dark <input type="checkbox"/> Dusk <input type="checkbox"/> Street lights on
Sign or Signal Present (check all that apply)	<input type="checkbox"/> Traffic control signal (includes flashing beacons, lane control signals, and green/amber/red signal) <input type="checkbox"/> Stop sign <input type="checkbox"/> Yield sign <input type="checkbox"/> School zone sign <input type="checkbox"/> Other regulatory sign (No "U" turn, left turn only, wrong way, etc.) specify: _____ <input type="checkbox"/> Warning sign (Winding road sign, stop ahead, intersection signs, etc.?) specify: _____ <input type="checkbox"/> Miscellaneous control (including railroad controls) specify: _____ <input type="checkbox"/> None <input type="checkbox"/> Unknown
Was the Control Functioning Properly?	<input type="checkbox"/> No traffic control device present <input type="checkbox"/> Not functioning properly (includes defaced, badly worn, covered with snow, rotated, etc.) specify: _____ <input type="checkbox"/> Functioning properly <input type="checkbox"/> Unknown
Travel Speed (in mph)	<input type="checkbox"/> Stopped <input type="checkbox"/> 1-10 <input type="checkbox"/> 11-20 <input type="checkbox"/> 21-30 <input type="checkbox"/> 31-40 <input type="checkbox"/> 41-50 <input type="checkbox"/> 51-60 <input type="checkbox"/> 61-70 <input type="checkbox"/> 70+ <input type="checkbox"/> Unknown
Before Impact, Intending To ...? (check all that apply)	<input type="checkbox"/> Go straight <input type="checkbox"/> Stopped <input type="checkbox"/> Turn left <input type="checkbox"/> Turn right <input type="checkbox"/> Slow down <input type="checkbox"/> Accelerate <input type="checkbox"/> Back up <input type="checkbox"/> Change lanes to right <input type="checkbox"/> Passing <input type="checkbox"/> Other (specify): _____ <input type="checkbox"/> Change lanes to left <input type="checkbox"/> Follow curve
Control Loss Due to Weather or Mechanical Problems?	<input type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/> Yes (describe)
Avoidance Actions?	<input type="checkbox"/> None <input type="checkbox"/> Accelerating <input type="checkbox"/> Unknown <input type="checkbox"/> Braking with lock-up <input type="checkbox"/> Steering left <input type="checkbox"/> Braking without lock-up <input type="checkbox"/> Steering right <input type="checkbox"/> Releasing brakes <input type="checkbox"/> Other (specify): _____
Location of Vehicle at Time of Impact?	<input type="checkbox"/> Original travel lane <input type="checkbox"/> Different travel lane <input type="checkbox"/> In intersection <input type="checkbox"/> Off roadway to right <input type="checkbox"/> Off roadway to left <input type="checkbox"/> Other (specify): _____

Interview Form—Crash Information

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

Speed at the Time of Impact (in mph) Stopped 1-10 11-20 21-30 31-40
 41-50 51-60 61-70 70+ Unknown

Describe all the impacts to the vehicle and how this vehicle moved to its stopped position after the collision

Rollover Data

Did this vehicle roll over during the crash?

Yes — ask the following questions: No — skip to "fire data" below
 Unknown — skip to "fire data" below

Rollover began (check those that apply) On roadway On shoulder On roadside or median
 Unknown

Rollover cause?

Other vehicle (specify vehicle number) _____

Contact with object (specify): _____

Other cause (specify): _____

Unknown

Direction of vehicle roll?

Toward the right (passenger side)
 Toward the left (driver side)
 End-over-end
 Unknown

Number of turns _____ Number of QUARTER TURNS Unknown

Plane in contact with ground at final rest?

Left side Top
 Right side Wheels
 Unknown

Fire Data

How long had car been driven before the collision-fire? _____

Did engine continue running after collision? _____

Describe when the fire occurred in sequence of events:

When during the sequence of events did you (or someone) turn off the ignition key?

Interview Form—Crash Information

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

Were you a witness to the vehicle fire?

- No — skip this section
 Unknown — skip this section
 Yes — ask the following questions:

Which vehicle? _____

Fire was first seen ...

- | | |
|---|--|
| <input type="checkbox"/> Under the hood | <input type="checkbox"/> In the trunk/cargo area |
| <input type="checkbox"/> Behind the instrument panel | <input type="checkbox"/> Under the vehicle |
| <input type="checkbox"/> In the passenger compartment | <input type="checkbox"/> From other involved vehicle |
| | <input type="checkbox"/> Unknown |

Smoke was first seen ...

- | | |
|---|--|
| <input type="checkbox"/> Under the hood | <input type="checkbox"/> In the trunk/cargo area |
| <input type="checkbox"/> Behind the instrument panel | <input type="checkbox"/> Under the vehicle |
| <input type="checkbox"/> In the passenger compartment | <input type="checkbox"/> From other involved vehicle |
| | <input type="checkbox"/> Unknown |

Where specifically did you first see fire/smoke? Describe:

What was the color of the smoke at the start of the fire?

- | | |
|--------------------------------|--------------------------------|
| <input type="checkbox"/> White | <input type="checkbox"/> Black |
| <input type="checkbox"/> Gray | <input type="checkbox"/> Other |

How long after impact did fire/smoke appear?

_____ (seconds or minutes)

Did you see/hear any explosions? When?

- Yes Describe _____
 No _____

Did you see any fluid leakage after impact? ___ Where?

What did you see? _____

Any odors of gasoline, coolant, etc? Describe: _____

How full was tank? When was it last filled? _____

Vehicle Information

Year, Make, and Model?

Year: 19 _____

Make: _____

Model: _____

Odometer Reading: _____ Body Style: _____

Engine Size: _____ L (cu. in.) Number of Cylinders: _____

Transmission: Auto _____ Manual _____

Interview Form—Crash Information

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

Additional Vehicle Information

Describe Post-Crash Damage

Doors or Hatch Open During the Crash?

LF RF LR RR Hatch

Other _____

"Y" = yes "N" = no "U" = unknown

Windows Break During the Crash?

WS LF RF LR RR
 BL Roof Other _____

"Y" = yes "N" = no "U" = unknown

Window Precrash Status

WS LF RF LR RR
 BL Roof Other _____

"O" = open "C" = closed
 "P" = partially open "U" = unknown

Cargo in the Vehicle?

No Unknown

Yes—describe (note if flammable):

Approximate weight: _____ pounds

Vehicle Modifications

Stereo Amplifier Alarm
 Running boards Roll bars Bumper modifications
 Trailer hitch Fuel system Body
 Cooling System Fog lights

Describe: _____

Interview Form—Crash Information

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

Service Data

Are you the owner of the vehicle? If not, who is? _____

Are you the most familiar with the service history of the vehicle? If not, who is? How can we contact them? _____

How long has the vehicle been owned by you (whoever)? _____

Has the car been regularly maintained? By whom (dealer, independent, self?) _____

How recently has the car received service work? What was done? When was oil level last checked? When was oil last changed or added? _____

Does this car have the original battery or is it a replacement? _____

Describe what sort of problems you've had with the car (electrical, fuel, runability, engine, transmission, cooling system, brakes, etc.) over the time you've owned it? _____

Were these problems resolved? What was done to resolve the problems? _____

Were you experiencing any problems with the car just prior to the accident/fire? _____

Any changes in performance/gas mileage? _____

Had you noticed any fluid leaks prior to the accident? Any smells (fuel, coolant, oil, "hot" fluids or metal)? Did you have any instrument panel indications of any problems prior to the accident? _____

Did you notice evidence of leaking fluids where you parked it at night? _____

Any known problems with cooling system (radiator, water pump, hoses, etc.)? _____

Any history of the vehicle overheating? _____

Has the vehicle been involved in any previous collisions? If yes, when? _____

If vehicle has been in any previous collisions, what damage was done? Was it repaired? Did the vehicle have any damage evident prior to the subject accident? _____

Interview Form—Occupant Data Questions

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

How many people were in the vehicle at the time of the crash? _____

	Driver	Occupant # _____	Occupant # _____
<p>Seating Position?</p> <p>Front Left (11) Front Middle (12) Front Right (13)</p> <p>Second Left (21) Second Middle (22) Second Right (23) Unknown (99)</p> <p>Third Left (31) Third Middle (32) Third Right (33)</p> <p>Other (SPECIFY in block) (XX A&B for two in same position)</p>	<p>FRONT LEFT</p>		
<p>Occupant Information</p>	<p><input type="checkbox"/> M</p> <p><input type="checkbox"/> F — Not pregnant</p> <p><input type="checkbox"/> F — Pregnant — # of months _____</p> <p><input type="checkbox"/> F — Unknown if pregnant</p> <p>Height (in.): _____</p> <p>Weight (lb.): _____</p> <p>Age: _____</p>	<p><input type="checkbox"/> M</p> <p><input type="checkbox"/> F — Not pregnant</p> <p><input type="checkbox"/> F — Pregnant — # of months _____</p> <p><input type="checkbox"/> F — Unknown if pregnant</p> <p>Height (in.): _____</p> <p>Weight (lb.): _____</p> <p>Age: _____</p>	<p><input type="checkbox"/> M</p> <p><input type="checkbox"/> F — Not pregnant</p> <p><input type="checkbox"/> F — Pregnant — # of months _____</p> <p><input type="checkbox"/> F — Unknown if pregnant</p> <p>Height (in.): _____</p> <p>Weight (lb.): _____</p> <p>Age: _____</p>

Was the driver doing any of the following? (check all that apply—and specify)

- Talking to or listening to another occupant (specify): _____
- Was there a moving object in vehicle (specify): _____
- Talking or listening on a cellular phone (specify): _____
- Dialing a cellular phone (specify): _____
- Adjusting climate control (specify): _____
- Adjusting radio, CD or cassette player (specify): _____
- Using other device or object in vehicle (specify): _____
- Sleepy / asleep (specify): _____
- Distracted by outside person, object, or event (specify): _____
- Eating or drinking (specify): _____
- Smoking (specify): _____
- Was any occupant smoking? _____
- Other (specify): _____
- Unknown

Interview Form—Occupant Data Questions

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

Restraint Information

How many people were in the vehicle at the time of the crash? _____

	Driver	Occupant # _____	Occupant # _____
Type of Seat Belt Available Note: If a belt is not available for a seat position, describe reason <input type="checkbox"/> Not in designated seating position <input type="checkbox"/> Cargo area	<input type="checkbox"/> Unknown <input type="checkbox"/> Lap belt <input type="checkbox"/> Shoulder belt <input type="checkbox"/> Lap & shoulder <input type="checkbox"/> Not available* *Describe:	<input type="checkbox"/> Unknown <input type="checkbox"/> Lap belt <input type="checkbox"/> Shoulder belt <input type="checkbox"/> Lap & shoulder <input type="checkbox"/> Not available* *Describe:	<input type="checkbox"/> Unknown <input type="checkbox"/> Lap belt <input type="checkbox"/> Shoulder belt <input type="checkbox"/> Lap & shoulder <input type="checkbox"/> Not available* *Describe:
Do Seat Belts Move Along a Motorized Track for this Seat? (i.e., 2-point automatic belt)	<input type="checkbox"/> Unknown <input type="checkbox"/> No <input type="checkbox"/> Yes *	<input type="checkbox"/> Unknown <input type="checkbox"/> No <input type="checkbox"/> Yes *	<input type="checkbox"/> Unknown <input type="checkbox"/> No <input type="checkbox"/> Yes *
• If "Yes," Were They Working Properly?	<input type="checkbox"/> Yes <input type="checkbox"/> No (describe)	<input type="checkbox"/> Yes <input type="checkbox"/> No (describe)	<input type="checkbox"/> Yes <input type="checkbox"/> No (describe)
Are Any Belts Attached to the Door? (i.e., 3-point automatic belt)	<input type="checkbox"/> Unknown <input type="checkbox"/> No <input type="checkbox"/> Yes *	<input type="checkbox"/> Unknown <input type="checkbox"/> No <input type="checkbox"/> Yes *	<input type="checkbox"/> Unknown <input type="checkbox"/> No <input type="checkbox"/> Yes *
• If "Yes," Does It Cross?	<input type="checkbox"/> Chest <input type="checkbox"/> Lap <input type="checkbox"/> Both	<input type="checkbox"/> Chest <input type="checkbox"/> Lap <input type="checkbox"/> Both	<input type="checkbox"/> Chest <input type="checkbox"/> Lap <input type="checkbox"/> Both
Occupant Wearing Any Seat Belt?	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown

Skip the Following If No Seat Belt Was Worn

Type of Belt Worn?	<input type="checkbox"/> Lap belt <input type="checkbox"/> Shoulder belt <input type="checkbox"/> Lap & shoulder <input type="checkbox"/> Unknown	<input type="checkbox"/> Lap belt <input type="checkbox"/> Shoulder belt <input type="checkbox"/> Lap & shoulder <input type="checkbox"/> Unknown	<input type="checkbox"/> Lap belt <input type="checkbox"/> Shoulder belt <input type="checkbox"/> Lap & shoulder <input type="checkbox"/> Unknown
---------------------------	--	--	--

Interview Form—Occupant Data Questions

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

	Driver	Occupant # _____	Occupant # _____
Lap Belt Situated?	<input type="checkbox"/> Low on lap	<input type="checkbox"/> Low on lap	<input type="checkbox"/> Low on lap
	<input type="checkbox"/> Across stomach	<input type="checkbox"/> Across stomach	<input type="checkbox"/> Across stomach
	<input type="checkbox"/> Other (specify): _____	<input type="checkbox"/> Other (specify): _____	<input type="checkbox"/> Other (specify): _____
	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown

Shoulder Belt Situated?	<input type="checkbox"/> Over shoulder	<input type="checkbox"/> Over shoulder	<input type="checkbox"/> Over shoulder
	<input type="checkbox"/> Under the arm	<input type="checkbox"/> Under the arm	<input type="checkbox"/> Under the arm
	<input type="checkbox"/> Behind back	<input type="checkbox"/> Behind back	<input type="checkbox"/> Behind back
	<input type="checkbox"/> Behind seat	<input type="checkbox"/> Behind seat	<input type="checkbox"/> Behind seat
	<input type="checkbox"/> Other (specify): _____	<input type="checkbox"/> Other (specify): _____	<input type="checkbox"/> Other (specify): _____
	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown

Describe any breaks, tears, or failure to any of the seat belts:

Ejection, Entrapment, Mobility Information

	Driver	Occupant # _____	Occupant # _____
Any Part of Body Thrown Outside the Vehicle During the Crash?	<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No
	<input type="checkbox"/> Yes *	<input type="checkbox"/> Yes *	<input type="checkbox"/> Yes *
	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown
	*If "Yes"—what part(s) were ejected, and what area of the vehicle was involved?: _____ _____	*If "Yes"—what part(s) were ejected, and what area of the vehicle was involved?: _____ _____	*If "Yes"—what part(s) were ejected, and what area of the vehicle was involved?: _____ _____

Interview Form—Occupant Data Questions

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

	Driver	Occupant # _____	Occupant # _____
Anyone Entrapped in the Vehicle?	<input type="checkbox"/> No <input type="checkbox"/> Yes ___ physically entrapped ___ jammed doors ___ fire, etc.	<input type="checkbox"/> No <input type="checkbox"/> Yes ___ physically entrapped ___ jammed doors ___ fire, etc.	<input type="checkbox"/> No <input type="checkbox"/> Yes ___ physically entrapped ___ jammed doors ___ fire, etc.
	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown	<input type="checkbox"/> Unknown
	Detail any entrapment _____	Detail any entrapment _____	Detail any entrapment _____
	_____	_____	_____

How Did Occupant(s) Exit the Vehicle?	<input type="checkbox"/> Fatal before removed <input type="checkbox"/> Removed while unconscious, or not oriented to time or place <input type="checkbox"/> Removed due to perceived serious injuries <input type="checkbox"/> Exited with some assistance <input type="checkbox"/> Exited under own power <input type="checkbox"/> Fully ejected <input type="checkbox"/> Unknown	<input type="checkbox"/> Fatal before removed <input type="checkbox"/> Removed while unconscious, or not oriented to time or place <input type="checkbox"/> Removed due to perceived serious injuries <input type="checkbox"/> Exited with some assistance <input type="checkbox"/> Exited under own power <input type="checkbox"/> Fully ejected <input type="checkbox"/> Unknown	<input type="checkbox"/> Fatal before removed <input type="checkbox"/> Removed while unconscious, or not oriented to time or place <input type="checkbox"/> Removed due to perceived serious injuries <input type="checkbox"/> Exited with some assistance <input type="checkbox"/> Exited under own power <input type="checkbox"/> Fully ejected <input type="checkbox"/> Unknown
--	--	--	--

Further describe any ejection, entrapment, or mobility information here:

Interview Form—Occupant Data Questions

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

Child Safety Seat Information

Was There a Person in a Child Safety Seat in this Vehicle?

- Yes (If "Yes" complete this section)
- No (If "no" or "unknown" Skip This section)
- Unknown

	Driver	Occupant # _____	Occupant # _____
Type of Seat?		<input type="checkbox"/> No Infant <input type="checkbox"/> Toddler <input type="checkbox"/> Convertible <input type="checkbox"/> Booster <input type="checkbox"/> Integral <input type="checkbox"/> Other (specify): _____ _____	<input type="checkbox"/> No Infant <input type="checkbox"/> Toddler <input type="checkbox"/> Convertible <input type="checkbox"/> Booster <input type="checkbox"/> Integral <input type="checkbox"/> Other (specify): _____ _____
Direction Seat Facing Prior to Crash?		<input type="checkbox"/> Front <input type="checkbox"/> Rear <input type="checkbox"/> Unknown	<input type="checkbox"/> Front <input type="checkbox"/> Rear <input type="checkbox"/> Unknown

Injury Information

	Driver	Occupant # _____	Occupant # _____
Were You Injured? > If "Yes" go to mannequin page and record injuries in detail > If "no" ask next questions	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown
Did You Have Any of the Following? (If any injuries are checked, go to the mannequin page and record location, lesion, and source)	<input type="checkbox"/> Cuts <input type="checkbox"/> Abrasions <input type="checkbox"/> Bruises <input type="checkbox"/> Broken bones <input type="checkbox"/> Head, skull, brain <input type="checkbox"/> Internal injury <input type="checkbox"/> Sprains, strains <input type="checkbox"/> Other—specify on mannequin	<input type="checkbox"/> Cuts <input type="checkbox"/> Abrasions <input type="checkbox"/> Bruises <input type="checkbox"/> Broken bones <input type="checkbox"/> Head, skull, brain <input type="checkbox"/> Internal injury <input type="checkbox"/> Sprains, strains <input type="checkbox"/> Other—specify on mannequin	<input type="checkbox"/> Cuts <input type="checkbox"/> Abrasions <input type="checkbox"/> Bruises <input type="checkbox"/> Broken bones <input type="checkbox"/> Head, skull, brain <input type="checkbox"/> Internal injury <input type="checkbox"/> Sprains, strains <input type="checkbox"/> Other—specify on mannequin
Transported Directly from Accident Scene for Treatment?	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown

Interview Form—Occupant Injuries

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

	Driver	Occupant # _____	Occupant # _____
<p>Receive Any Medical Treatment? (check all that apply)</p>	<input type="checkbox"/> Hospital <input type="checkbox"/> Medical clinic <input type="checkbox"/> Paramedics at scene <input type="checkbox"/> Doctor's office <input type="checkbox"/> Treated by self <input type="checkbox"/> Unknown	<input type="checkbox"/> Hospital <input type="checkbox"/> Medical clinic <input type="checkbox"/> Paramedics at scene <input type="checkbox"/> Doctor's office <input type="checkbox"/> Treated by self <input type="checkbox"/> Unknown	<input type="checkbox"/> Hospital <input type="checkbox"/> Medical clinic <input type="checkbox"/> Paramedics at scene <input type="checkbox"/> Doctor's office <input type="checkbox"/> Treated by self <input type="checkbox"/> Unknown
<p>Hospitalized?</p>	<input type="checkbox"/> No <input type="checkbox"/> Yes—# of days _____ <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes—# of days _____ <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes—# of days _____ <input type="checkbox"/> Unknown
<p>Treated and Released from the Emergency Room?</p>	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown
<p>Name and Location of Medical Treatment Facility?</p>			
<p>Do you still experience physical or psychological symptoms from injuries due to the accident?</p>	<input type="checkbox"/> No <input type="checkbox"/> Yes—describe briefly: _____ _____ _____ _____	<input type="checkbox"/> No <input type="checkbox"/> Yes—describe briefly: _____ _____ _____ _____	<input type="checkbox"/> No <input type="checkbox"/> Yes—describe briefly: _____ _____ _____ _____
<p>Lost any days from work or school (college) due to the crash?</p>	<input type="checkbox"/> No <input type="checkbox"/> Not working prior to crash <input type="checkbox"/> Yes—number of days _____ <input type="checkbox"/> Yes—recovery not complete <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Not working prior to crash <input type="checkbox"/> Yes—number of days _____ <input type="checkbox"/> Yes—recovery not complete <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Not working prior to crash <input type="checkbox"/> Yes—number of days _____ <input type="checkbox"/> Yes—recovery not complete <input type="checkbox"/> Unknown

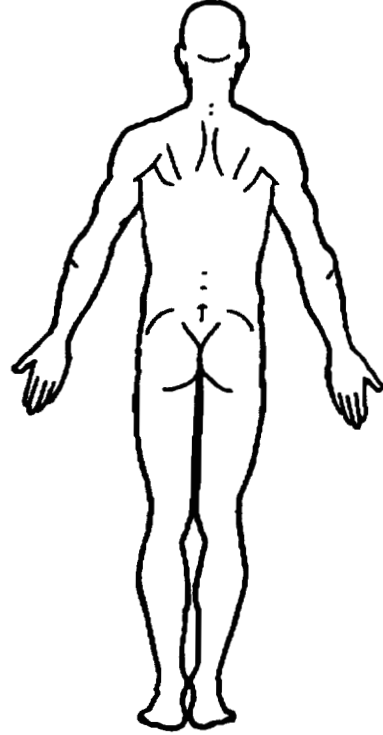
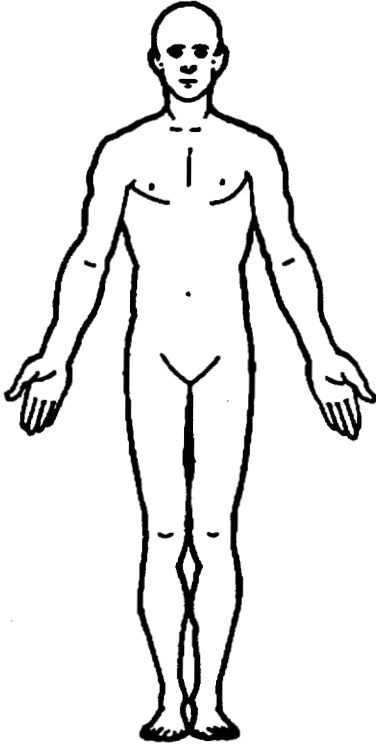
Interview Form—Occupant Injuries

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

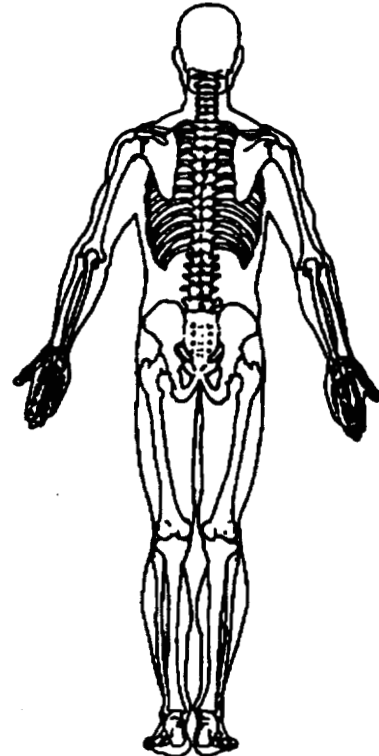
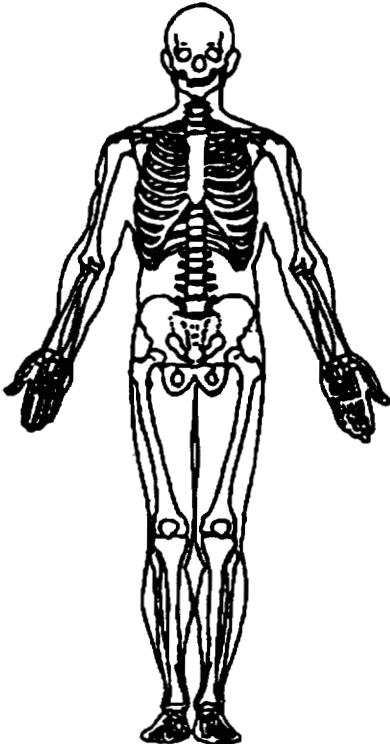
Injury Data from Interviewee(s)

Indicate the *Location, Lesion, and Detail* of all injuries. Occupant No.: _____

SOFT TISSUE/INTERNAL INJURIES



SKELETAL INJURIES



The space provided on the back of this page may be used to further detail injuries noted by the interviewee(s).

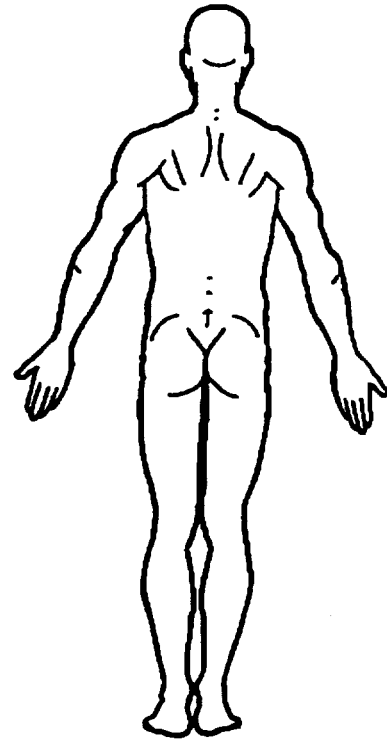
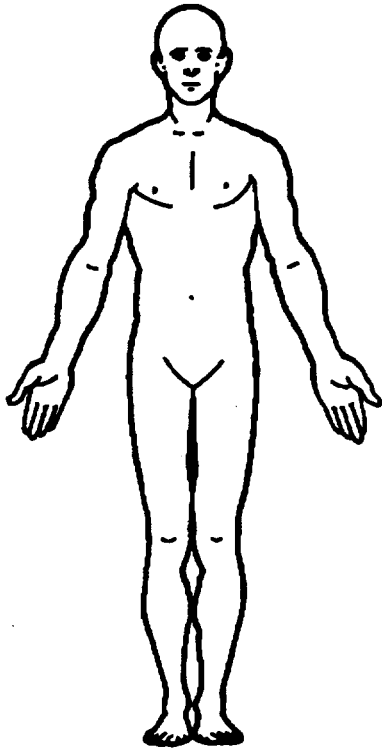
Interview Form—Occupant Injuries

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

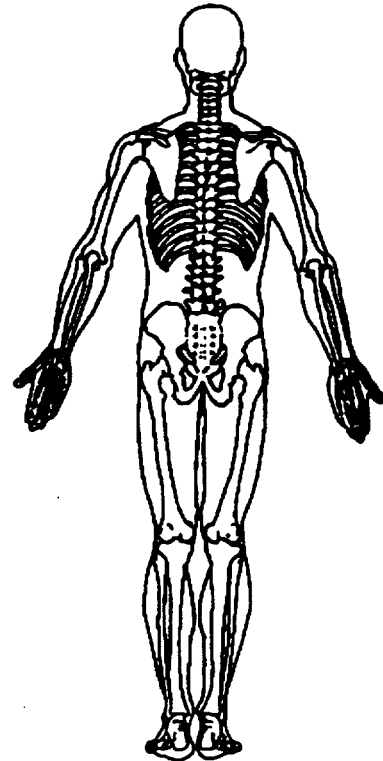
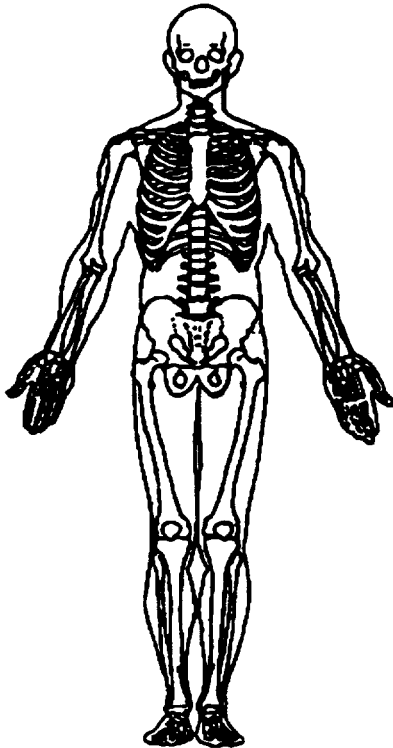
Injury Data from Interviewee(s)

Indicate the *Location*, *Lesion*, and *Detail* of all injuries. Occupant No.: _____

SOFT TISSUE/INTERNAL INJURIES



SKELETAL INJURIES



The space provided on the back of this page may be used to further detail injuries noted by the interviewee(s).

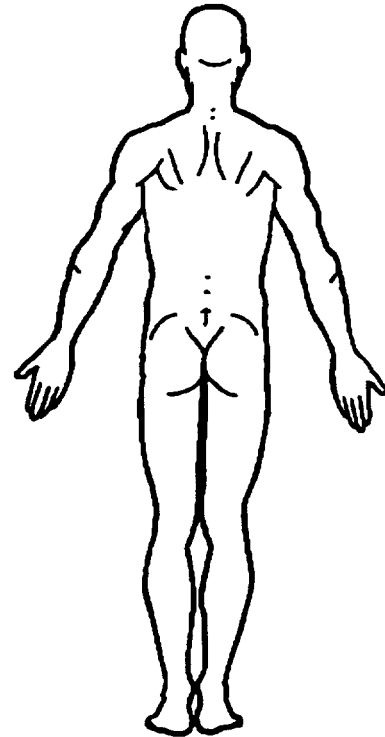
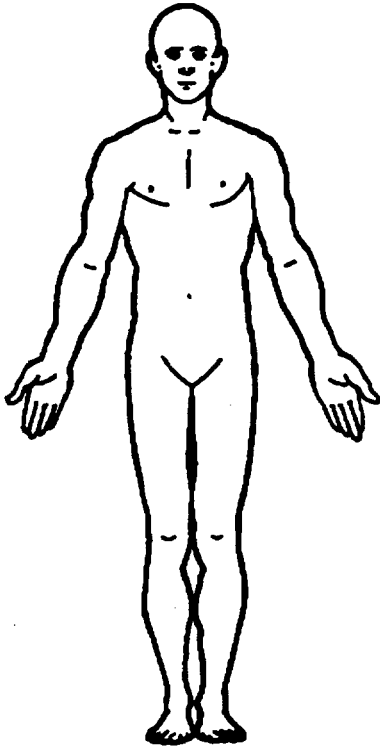
Interview Form—Occupant Injuries

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____

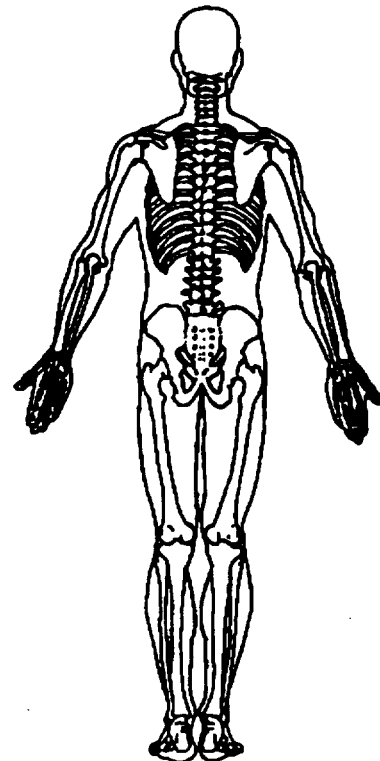
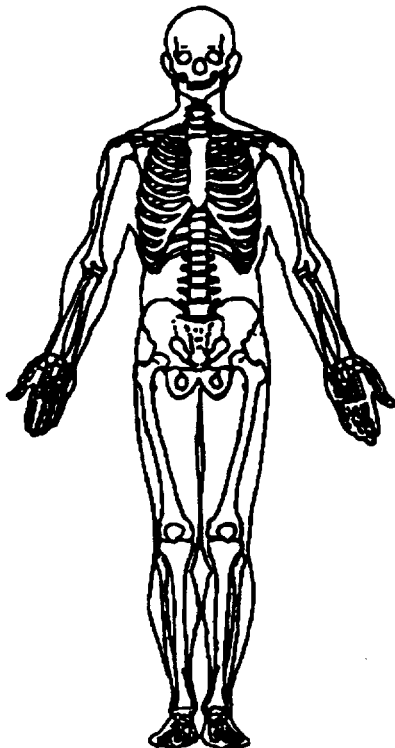
Injury Data from Interviewee(s)

Indicate the *Location, Lesion, and Detail* of all injuries. Occupant No.: _____

SOFT TISSUE/INTERNAL INJURIES



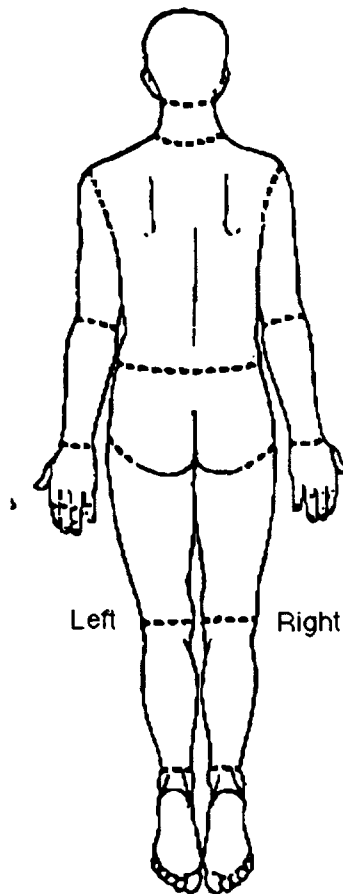
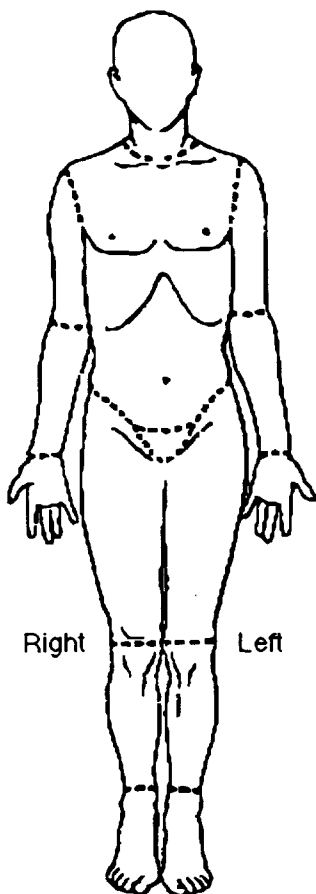
SKELETAL INJURIES



The space provided on the back of this page may be used to further detail injuries noted by the interviewee(s).

Interview Form—Burn Chart

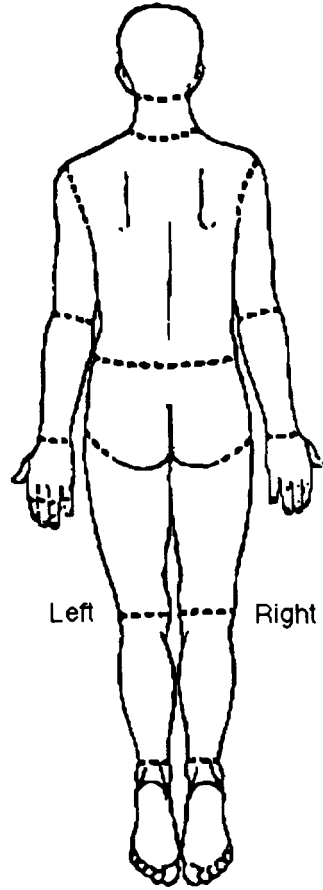
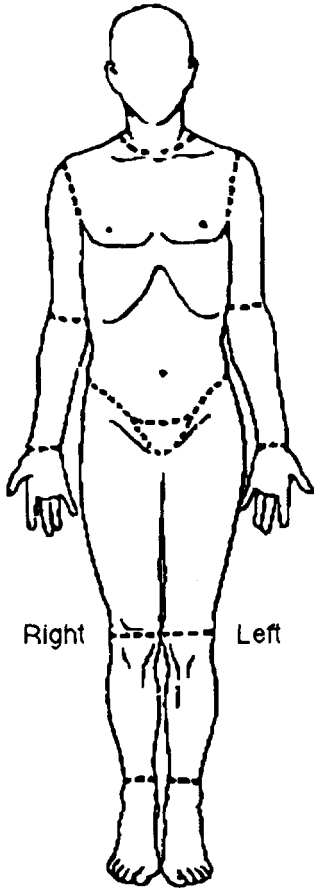
Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____
 Occupant No.: _____



Area	Yes/ No	Skin Graft Needed Yes/No/Unknown
Head		
Neck		
Ant. Trunk		
Post. Trunk		
R. Buttock		
L. Buttock		
Genitalia		
R. U. Arm		
L. U. Arm		
R. L. Arm		
L. L. Arm		
R. Hand		
L. Hand		
R. Thigh		
L. Thigh		
R. Leg		
L. Leg		
R. Foot		
L. Foot		
TOTAL		

Interview Form—Burn Chart

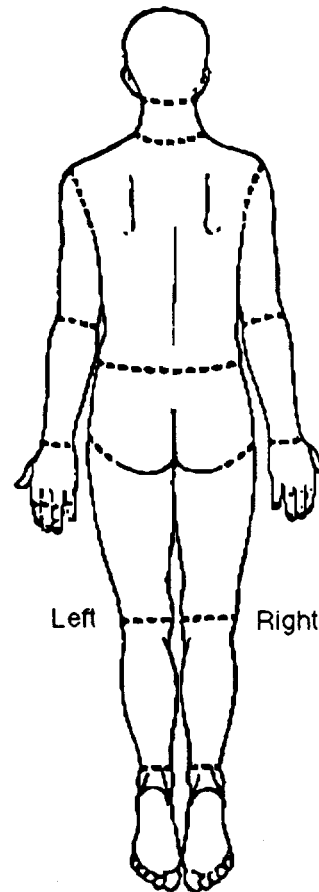
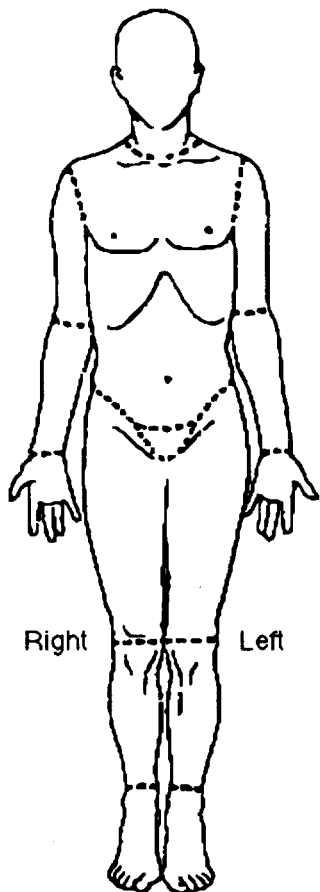
Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____
 Occupant No.: _____



Area	Yes/ No	Skin Graft Needed Yes/No/Unknown
Head		
Neck		
Ant. Trunk		
Post. Trunk		
R. Buttock		
L. Buttock		
Genitalia		
R. U. Arm		
L. U. Arm		
R. L. Arm		
L. L. Arm		
R. Hand		
L. Hand		
R. Thigh		
L. Thigh		
R. Leg		
L. Leg		
R. Foot		
L. Foot		
TOTAL		

Interview Form—Burn Chart

Case Number _____ Vehicle Number _____ Investigator Number _____ Interviewee _____
 Occupant No.: _____



Area	Yes/ No	Skin Graft Needed Yes/No/Unknown
Head		
Neck		
Ant. Trunk		
Post. Trunk		
R. Buttock		
L. Buttock		
Genitalia		
R. U. Arm		
L. U. Arm		
R. L. Arm		
L. L. Arm		
R. Hand		
L. Hand		
R. Thigh		
L. Thigh		
R. Leg		
L. Leg		
R. Foot		
L. Foot		
TOTAL		

Interview Form—Burn Chart

Case Number _____ Vehicle Number _____ Investigator Number _____

	Driver	Occupant # _____	Occupant # _____
<p>If Required:</p> <p>Can firm arrangements be made for signing medical release?</p>	<p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> Undecided</p>	<p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> Undecided</p>	<p><input type="checkbox"/> No</p> <p><input type="checkbox"/> Yes</p> <p><input type="checkbox"/> Undecided</p>
<p>If not, are you willing to sign medical release?</p> <p>If yes, arrange for consent form delivery. Note method, date promised, and log form meeting.</p> <p>Determine logistics of signing form (fax, mail).</p>	<p><input type="checkbox"/> Yes</p>	<p><input type="checkbox"/> Yes</p>	<p><input type="checkbox"/> Yes</p>



Exterior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

Crush Profile in Inches

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.

Impact Sequence Number	Plane of Impact C-Measurements	Direct Damage		L	C ₁	C ₂	C ₃	C ₄	C ₅	C _{ti}	± D
		Width (CDC)	Max Crush								

Original Specifications Worksheet (Undamaged Vehicle Dimensions)

Total Station Checklist:

Method of Crush Measurement

Record:

- Three or more undamaged points on vehicle (not three in one line)
- Wheelbase — center to center of axles
- Sufficient number of points to characterize crush
- Maximum crush
- Sufficient number of points for general characterization of intrusion
- File name

Exterior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

Vehicle Damage Sketch

Tire—Wheel Damage	Original Specifications Worksheet	Drive Wheels			
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; vertical-align: top;"> a. Wheel damage RF ____ LF ____ RR ____ LR ____ </td> <td style="width: 33%; vertical-align: top;"> b. Rotation physically restricted RF ____ LF ____ RR ____ LR ____ </td> <td style="width: 33%; vertical-align: top;"> c. Tire Deflated RF ____ LF ____ RR ____ LR ____ </td> </tr> </table> <p>(1) None (2) Impact damage (3) Heat damage (4) Heat and impact damage (9) Unknown</p>	a. Wheel damage RF ____ LF ____ RR ____ LR ____	b. Rotation physically restricted RF ____ LF ____ RR ____ LR ____	c. Tire Deflated RF ____ LF ____ RR ____ LR ____	Wheelbase _____ in. Overall Length _____ in. Maximum Width in. Curb Weight _____ lb. Average Track _____ in. Front Overhang in. Rear Overhang _____ in. Undeformed End Width _____ in.	<p style="text-align: center;">[] FWD [] RWD [] 4WD</p> <hr/> Transmission <p style="text-align: center;">Auto ____ Manual ____</p> <hr/> Engine Size: # cyl./displ _____ / _____ L (cu n.)
a. Wheel damage RF ____ LF ____ RR ____ LR ____	b. Rotation physically restricted RF ____ LF ____ RR ____ LR ____	c. Tire Deflated RF ____ LF ____ RR ____ LR ____			
<p>End Shift ≥ 4 inches [] Yes [] No</p>	<p>End Shift Direction [] No shift of damaged area [] Vertical up [] Vertical down [] Lateral right [] Lateral left</p>	<p>Approximate Cargo Weight _____ lbs. excluding occupants</p>			

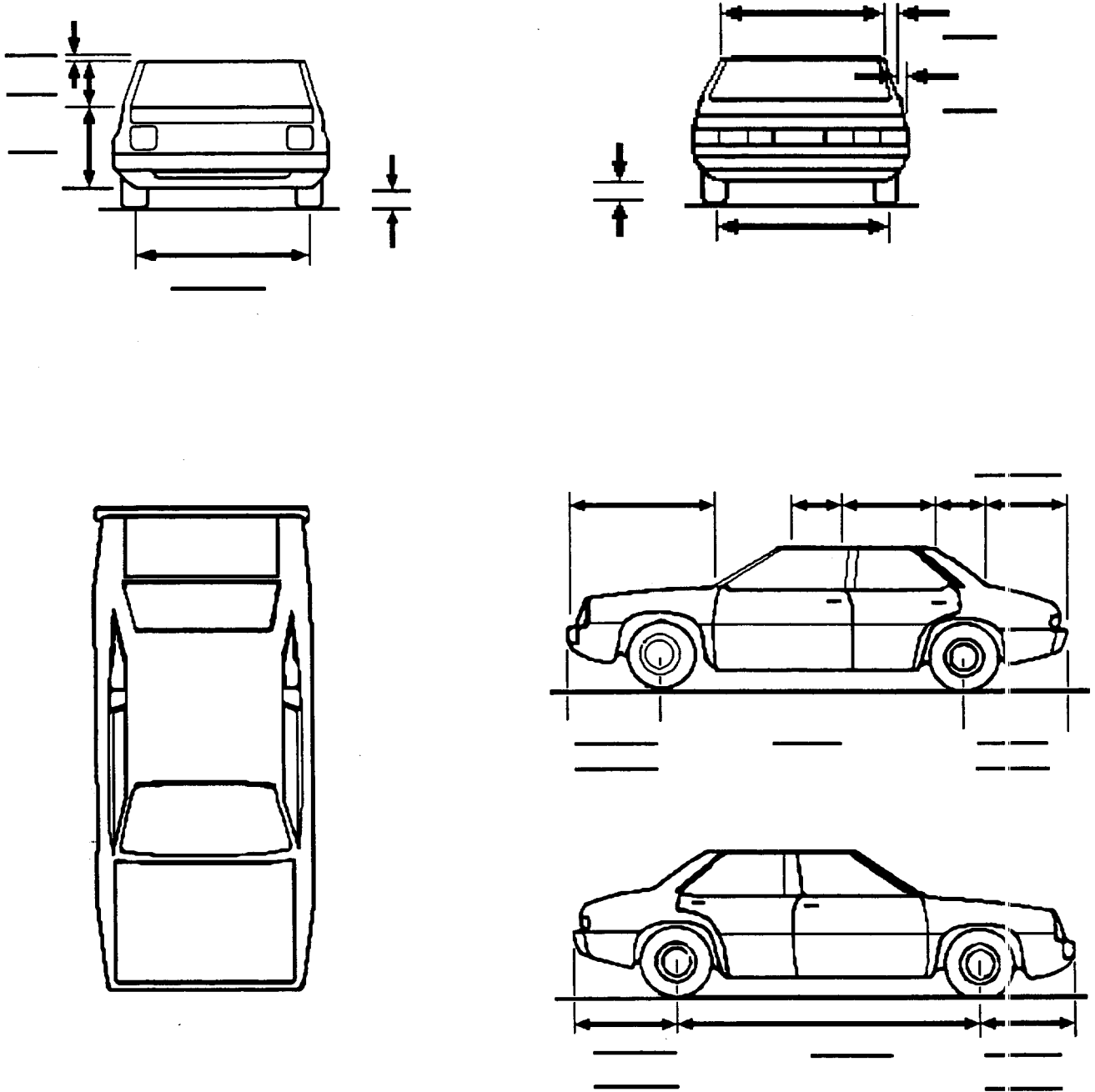
Exterior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

Worksheet—Measurement in inches

(Use to gather data necessary to interpret crush and intrusion measurements)

Indicate collision damage



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.

Interior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

Instrument Panel

1. Odometer Reading _____

- (000) No odometer
- (999) Unknown

Source: _____

Integrity

2. Passenger Compartment Integrity _____

(other than doors or windows)

- (00) No integrity loss
- (01) Integrity loss (e.g., due to bent or torn sheet metal or welds)

Describe nature and location _____

Door, Tailgate or Hatch Opening— Post-impact (sun roof on fire form)

3. LF _____ 4. RF _____ 5. LR _____

6. RR _____ 7. 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
- (4) Other (specify): _____
- (9) Unknown

Door, Tailgate or Hatch Opening—During early stage of fire (may be different from post-impact due to occupant exit paths; code as "open" if propagation allowed by door/gate/hatch)

8. LF _____ 9. RF _____ 10. LR _____

11. RR _____ 12. TG/H _____

- (0) No door/gate/hatch
- (1) Door/gate/hatch closed
- (2) Door/gate/hatch open
- (3) Door/gate/hatch jammed shut
- (4) Other (specify): _____
- (8) Not applicable (N/A) or no fire
- (9) Unknown

Glazing Damage from Occupant Contact

13. WS _____ 14. LF _____ 15. RF _____ 16. LR _____

17. RR _____ 18. BL _____ 19. Roof _____

20. 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

21. Source of information—glazing damage from occupant contact _____

Interior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

Occupant Area Intrusion

Note: If no intrusions, leave variables IV 22 - IV 30 blank.

Location of Impact Intrusion	Intruding Component	Dominant Crush Direction
22. _____	23. _____	24. _____
25. _____	26. _____	27. _____
28. _____	29. _____	30. _____

Location of Intrusion

Front Seat	Second Seat	Third Seat
(11) Left	(21) Left	(31) Left
(12) Middle	(22) Middle	(32) Middle
(13) Right	(23) Right	(33) Right

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

< No intrusion: _____

(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

Dominant Crush Direction

- (1) Vertical
- (2) Longitudinal
- (3) Lateral
- (7) Catastrophic
- (9) Unknown

Interior Vehicle Form

Case Number _____

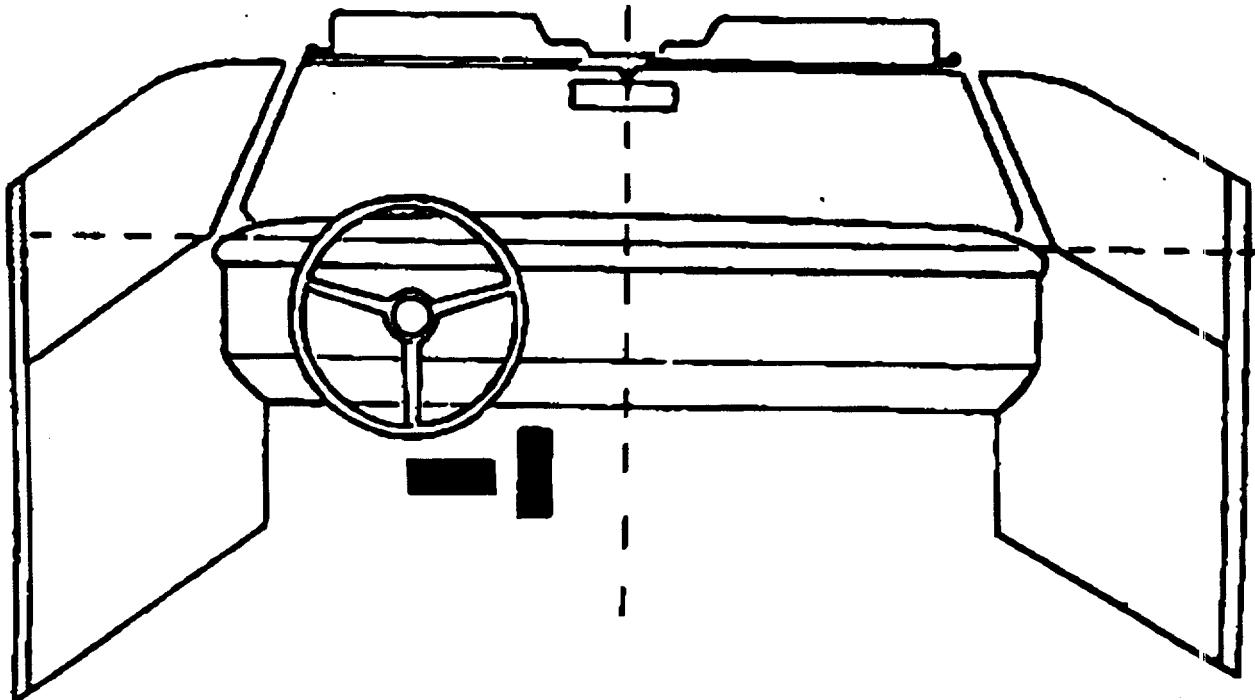
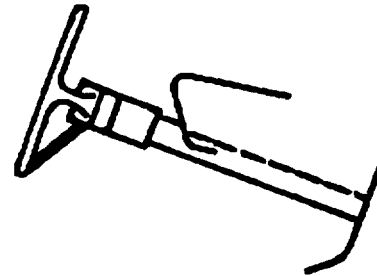
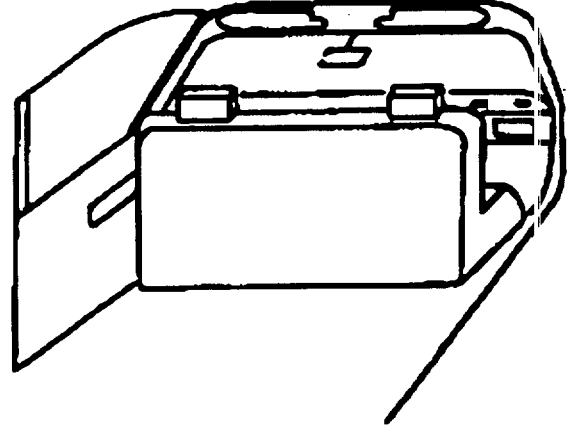
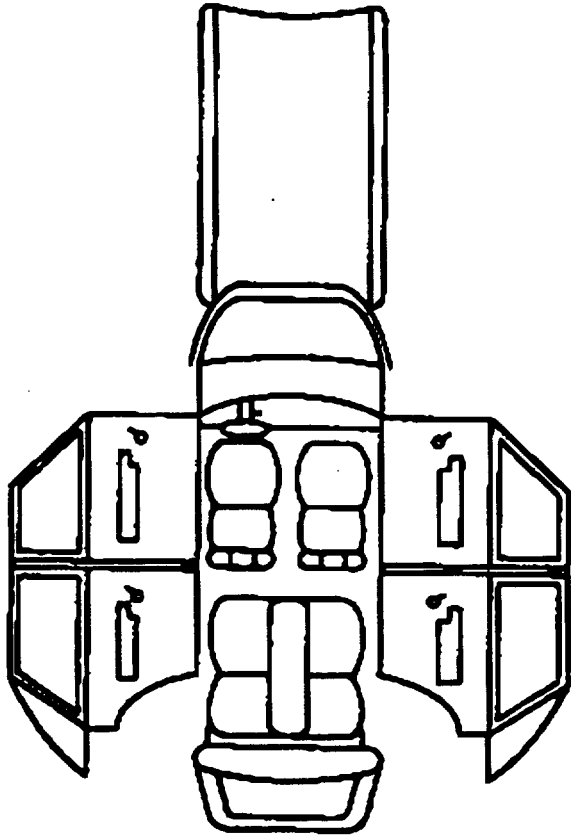
Vehicle Number _____

Investigator Number _____

VEHICLE INTERIOR SKETCHES
(for field use only)

→ No contact _____

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.

Interior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

POINTS OF OCCUPANT CONTACT

→ No 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) Sun visor
- (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
 - (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

Interior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

MANUAL RESTRAINTS WORKSHEET

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

		Left	Center	Right
FIRST SEAT ROW	A—Availability			
	B—Evidence of Usage			
	C—Used in This Crash?			
	D—Proper Use			
	E—Failure Modes			
	F—Anchorage Adjustment			
SECOND SEAT ROW	A—Availability			
	B—Evidence of Usage			
	C—Used in This Crash?			
	D—Proper Use			
	E—Failure Modes			
	F—Anchorage Adjustment			
THIRD SEAT ROW	A—Availability			
	B—Evidence of Usage			
	C—Used in This Crash?			
	D—Proper Use			
	E—Failure Modes			
	F—Anchorage Adjustment			

A—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

B/C—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

D—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

E—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 latch plate
- (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

F—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

Interior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

AUTOMATIC RESTRAINTS WORKSHEET

Note: 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 Injury Assessment Form.

AIR BAGS

FIRST		Frontal Air Bags— Left Front	Frontal Air Bags— Right Front	Other Air Bag
	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

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

Are There Indications of Air Bag System Failure? (This Occupant Position)

- (0) Not equipped/not available
- (1) No
- (2) Yes (specify): _____
- (9) Unknown

AUTOMATIC BELTS

FIRST		Left	Right
	A—Availability/Function		
	B—Use		
	C—Type		
	D—Proper Use		
	E—Failure Modes		

A—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

B—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

C—Automatic (Passive) Belt System Type

- (0) Not equipped/not available
- (1) Non-motorized system
- (2) Motorized system
- (9) Unknown

D—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

E—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 latch plate
- (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

Interior Vehicle Form

Case Number _____ Vehicle Number _____ Investigator Number _____

CHILD SAFETY SEAT FIELD ASSESSMENT WORKSHEET

None present _____

Note: 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						

7. 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)
 - _____
 - _____
 - _____
 - _____

Field Fire Investigation Form

Case Number _____ Vehicle Number _____ Investigator Number _____

GENERAL—EXTERIOR

1. Extent of Fire Damage
% of Vehicle with Fire Damage _____

2. Exterior Impact and Fire Damage

	None	Impact damage	Heat damage	Impact and heat	Consumed	Not applicable	Unknown
(0) Hood							
(1) Roof							
(2) Decklid (Hatch)							
(3) Bed (Pickup)							
Right Side							
(4) Front Fender							
(5) Front Door							
(6) Rear Door							
(7) Rear Fender							
Left Side							
(8) Front Fender							
(9) Front Door							
(10) Rear Door							
(11) Rear Fender							
(12) Front Grille Bumper							
(13) Rear Bumper, Back Plane							

3. Fuel Tank #1 Filler Cap Location _____

- (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
- (Continued ...)

- (7) Over the center of the rear wheels (rear axle) on right side plane
- (8) Other (specify): _____

(9) Unknown

4. Fuel Tank #1 Filler Cap Presence _____

- (0) Not present
- (1) Present, mis-installed
- (2) Present
- (3) Consumed
- (8) Not applicable (N/A)
- (9) Unknown

5. Fuel Tank #2 Filler Cap Location _____

- (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

6. Fuel Tank #2 Filler Cap Presence _____

- (0) Not present
- (1) Present, mis-installed
- (2) Present
- (3) Consumed
- (8) Not applicable (N/A)
- (9) Unknown

Attach additional forms for more than 2 filler caps

7. Miscellaneous Exterior Details

- (0) All OEM Components
- (1) List Non-OEM Components (trailer hitches, running boards, light bars, etc. (specify): _____

Field Fire Investigation Form

Case Number _____ Vehicle Number _____ Investigator Number _____

ENGINE COMPARTMENT

- 8. Fuel Type** _____
- (0) Gasoline
 - (1) Diesel
 - (2) Propane
 - (3) Other (specify): _____

- 9. Engine Direction** _____
- (0) Longitudinal
 - (1) Transverse

- 10. Exhaust Manifold Position in Engine Compartment (with respect to vehicle)**
(check all that apply)
- Right _____
 - Left _____
 - Front _____
 - Rear _____
 - Other _____

- 11. Engine Compartment Fire Damage** _____
- (0) No heat
 - (1) Minor heat (some consumables)
 - (2) Moderate heat
 - (3) Major heat (little or no consumables remaining)

- 12. Fuel Pump Type** _____
- (0) Mechanical
 - (1) Electric (in tank)
 - (2) Electric (outside tank)
 - (3) Other (specify): _____
 - (9) Unknown

Cooling System

- 13. Radiator Cap** _____
- (0) Cap missing
 - (1) Cap present
 - (2) No cap by design
 - (9) Unknown

- 14. Radiator Fluid** _____
- (0) No fluid
 - (1) Fluid present in radiator
 - (9) Unknown

- 15. Radiator Impact Damage** _____
- (0) No damage—Not displaced
 - (1) No damage—Displaced due to impact
 - (2) Minor damage—Displaced into cooling fan
 - (3) Direct damage moderate—Fins
 - (4) Direct damage severe—Tubes broken or tank breached
 - (9) Unknown

- 16. Radiator Fire Damage** _____
- (0) No evidence of fire at radiator
 - (1) Heat damage minor—Rusted but intact
 - (2) Heat damage moderate
 - (3) Heat damage major—Little or no consumables remaining

- 17. Radiator Coolant Hose—Upper Connection to Radiator**
(check all that apply)
- (0) Undamaged upper hose
 - (1) Undamaged—one or more hose clamps missing
 - (2) Present with heat damage
 - (3) Consumed hose except under hose clamp
 - (4) Consumed hose clamp present
 - (5) Consumed hose clamp missing
 - (6) Impact damage
 - (9) Unknown

- 18. Radiator Coolant Hose—Lower Connection to Radiator**
(check all that apply)
- (0) Undamaged lower hose
 - (1) Undamaged—one or more hose clamps missing
 - (2) Present with heat damage
 - (3) Consumed hose except under hose clamp
 - (4) Consumed hose clamp present
 - (5) Consumed hose clamp missing
 - (6) Impact damage
 - (9) Unknown

- 19. Heater Hoses (check all that apply)**
- (0) Undamaged hoses
 - (1) Undamaged—one or more clamps missing
 - (2) Present with heat damage
 - (3) Consumed hose except under hose clamp
 - (4) Consumed hose clamp present
 - (5) Consumed hose clamp missing
 - (6) Impact damage
 - (9) Unknown

- 20. Auxiliary Connections to Radiator**
(check all that apply)
- (0) None
 - (1) Transmission oil cooler
 - (2) Engine oil cooler
 - (3) Power steering fluid
 - (9) Unknown

- 21. Damage to Auxiliary Radiator Connections**
- (0) No auxiliary connection
 - (1) No Damage
 - (2) Damaged—Breached / Broken (specify) _____

(9) Unknown

- 22. Coolant Reservoir Cap** _____
- (0) Cap Not Present
 - (1) Cap Not Damaged
 - (2) Damaged—Breached / Broken
 - (3) Consumed
 - (4) Consumed with unknown impact damage
 - (5) Consumed with impact damage
 - (9) Unknown

Field Fire Investigation Form

Case Number _____ Vehicle Number _____ Investigator Number _____

23. Coolant Reservoir Material _____

- (0) Non-Metallic
- (1) Metallic
- (9) Unknown

24. Coolant Reservoir _____

- (0) Reservoir consumed
- (1) No fluid present
- (2) Fluid present

25. Coolant Reservoir Damage _____

- (0) Coolant fluid reservoir undamaged
- (1) Coolant reservoir impact damaged only (no heat)
- (2) Coolant reservoir heat damaged only
- (3) Coolant reservoir impact and heat damaged
- (9) Unknown

26. Summary—evidence of coolant leaks prior to fire or due to impact: _____

Engine Electrical

27. Battery Location in Engine Compartment _____

- (0) Battery not in Engine Compartment
- (1) Left Front
- (2) Right Front
- (3) Left Rear
- (4) Right Rear
- (9) Unknown

28. Battery Condition _____

- (0) No damage
- (1) Impact damaged (broken)—No heat
- (2) Heat damage only
- (3) Heat and impact damage
- (9) Unknown

29. High Current Electrical Cables

(Enter applicable code for each)

Battery Positive _____

Battery Ground _____

Starter _____

Alternator _____

- (0) No damage
- (1) Broken, damaged, or disconnected (no heat damage)
- (2) Heat damaged only
- (3) Broken / Disconnected from impact— with heat damage
- (9) Unknown

30. Engine Ignition Wires _____

- (0) No damage
- (1) Broken, damaged, or disconnected (no heat damage)
- (2) Heat damage only
- (3) Broken / damaged—with heat damage
- (9) Unknown

31. Fuses and Fusible Links _____

- (0) No damage
- (1) Burn damage
- (2) Damaged, Describe _____
- (9) Unknown

32. Battery Voltage (volts) _____

99.9 Unknown

33. Resistance of battery lead to ground (ohms) _____

34. Summary—evidence of ignition and fuel sources from engine electrical systems: _____

Power Steering

35. Power Steering Reservoir _____

- (0) Reservoir consumed
- (1) No fluid present
- (2) Fluid present
- (8) No power steering
- (9) Unknown

36. Power Steering Reservoir Material _____

- (0) Non-Metallic
- (1) Metallic
- (8) Not applicable (N/A)

37. Power Steering Damage _____

- (0) Power steering reservoir undamaged
- (1) Power steering reservoir impact damaged— no heat
- (2) Power steering reservoir heat damaged only
- (3) Power steering reservoir impact and heat damaged
- (8) Not applicable (N/A)
- (9) Unknown

38. Power Steering Lines and Connection to Gear _____

- (0) No damage
- (1) Impact damage—broken / severed— no heat damage
- (2) Heat damage only
- (3) Impact and heat damage
- (8) Not applicable (N/A)
- (9) Unknown

Brake System

39. Brake Fluid _____

- (0) Reservoir consumed
- (1) No fluid present
- (2) Fluid present

40. Brake Reservoir Material _____

- (0) Non-Metallic
- (1) Metallic
- (9) Unknown

Field Fire Investigation Form

Case Number _____ Vehicle Number _____ Investigator Number _____

41. Brake System Damage

- (0) Brake fluid reservoir undamaged
- (1) Brake reservoir impact damaged only (no heat)
- (2) Brake reservoir heat damaged only
- (3) Brake reservoir impact and heat damaged
- (9) Unknown

42. Brake Master Cylinder, Lines and Connections

- (0) No damage
- (1) Impact damage—damaged / severed—no heat damage
- (2) Heat damage only
- (3) Impact and heat damage

Air Intake System

43. Air Intake System Material

- (0) Non-Metallic
- (1) Metallic
- (2) Combination
- (9) Unknown

44. Air Intake System Damage

- (0) No damage
- (1) Impact damage—damaged / severed—no heat damage
- (2) Heat damage only
- (3) Impact and heat damage

Fuel Delivery System

45. Mechanical Fuel Pump Location

- (0) No mechanical pump
- (1) Left front engine compartment
- (2) Right front engine compartment
- (3) Left rear engine compartment
- (4) Right rear engine compartment

46. Mechanical Pump Damage

- (0) No mechanical pump damage
- (1) Impact damage—no heat
- (2) Heat damage only (melted)
- (3) Impact and heat damage

47. Engine Compartment Metallic Fuel Lines

- (0) No damage; lines intact
- (1) Fuel line impact damage (broken / severed)

48. Engine Compartment Flexible Fuel Hoses

- (0) No hose damage—clamps are present
- (1) Heat damage—one or more clamps not present
- (2) Heat damage—clamps present
- (3) Hoses consumed—clamps present with evidence of hose under clamp
- (4) Hoses consumed—clamps present—no evidence of hose under clamp
- (5) Hoses consumed—clamps not present
- (6) Hoses consumed—clamp presence unknown
- (9) Unknown

49. Engine Compartment

Fuel System Impact Damage

- (0) No impact damage
- (1) Impact damage—not breached / broken
- (2) Impact damage—breached / broken
- (3) Impact damage—unknown breach / break

50. Summary—evidence of hydraulic or fuel leak prior to fire or due to impact

Miscellaneous Engine Compartment

51. Washer Fluid Bottle

- (0) No damage
- (1) Impact damage only
- (2) Heat damage only
- (3) Heat and impact damage
- (4) Full Consumed

52. Bulkhead

- (0) No visible entry to passenger compartment
- (1) Visible entry to passenger compartment

53. Location of Entry to Passenger Compartment (select all that apply)

- (0) Steering Column or Steering Pinion Gear
- (1) Heat and A/C system
- (2) Wire Harness to Fuse Block
- (3) Other wire harness entries
- (4) Windshield
- (5) Other (specify): _____
- (8) No entry of fire to passenger compartment

54. Oil Filter

- (0) No damage to filter
- (1) Impact damage—no heat
- (2) Heat damage only
- (3) Impact and heat damage
- (4) Consumed by fire

55. Exhaust Manifold Material

- (0) Cast Iron
- (1) Formed Steel
- (2) Other (specify): _____

56. Engine Impact Damage

- (0) No visible damage to engine
- (1) Engine damage—no release of fluids
- (2) Engine damage—release of fluids
- (3) Engine damage—unknown if release of fluids

Field Fire Investigation Form

Case Number _____ Vehicle Number _____ Investigator Number _____

57. Summary—describe engine damage and location of oil release: _____

60. Interior Contents _____

- (0) No unusual contents noted
- (1) Flammable contents noted—specify: _____

61. Trunk / Cargo Area / Pick Up Bed _____

- (0) No heat damage
- (1) Minor heat damage
- (2) Moderate heat damage
- (3) Major heat damage

62. Trunk / Cargo Area / Pick Up Bed Contents _____

- (0) No unusual contents noted
- (1) Flammable contents noted—specify: _____

Window/Glass Inspection—Fixed Glass
 (Damage defined as hole in glass)

63. Windshield _____

- (0) No damage
- (1) Impact damage—hole
- (2) Heat damage
- (3) Impact and heat damage
- (4) Impact or heat damage

64. Back Lite _____

- (0) No damage
- (1) Impact damage—hole
- (2) Heat damage
- (3) Impact and heat damage
- (4) Impact or heat damage
- (5) Removed prior to impact

65. Fixed Side Glass Left Side _____

- (0) No damage
- (1) Impact damage
- (2) Heat damage
- (3) Impact and heat damage
- (4) Impact or heat damage
- (5) Removed prior to impact
- (6) Not applicable (N/A)

66. Fixed Side Glass Right Side _____

- (0) No damage
- (1) Impact damage
- (2) Heat damage
- (3) Impact and heat damage
- (4) Impact or heat damage
- (5) Removed prior to impact
- (6) Not applicable (N/A)

Window/Glass Inspection—Non-Fixed Glass

67. Left Front Window Condition _____

- (0) No damage
- (1) Impact damage
- (2) Heat damage—broken
- (3) Impact and heat damage
- (4) Impact or heat damage
- (5) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

Interior Fire Examination

58. Interior Fire Damage _____

- (0) No interior damage
- (1) Minor heat damage (some components consumed)
- (2) Moderate heat damage
- (3) Major heat damage (few or no components remain)

59. Interior Fire Damage Areas

	None	Impact damage	Heat damage	Impact and heat	Consumed	Not applicable	Unknown
(0) No heat damage (entire interior)							
Instrument panel							
(1) Left							
(2) Right							
(3) Underside							
(4) Steering column & wheel							
(5) Left front seat							
(6) Right front seat							
(7) Left rear seat							
(8) Right rear seat							
(9) Rear deck/hatch							
Carpeting— Floor coverings							
(10) Left front							
(11) Right front							
(12) Left rear							
(13) Right rear							

Field Fire Investigation Form

Case Number _____ Vehicle Number _____ Investigator Number _____

68. Left Front Window Position (Prefire)

- (0) Full down
- (1) Full up
- (2) Partial open
- (3) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

69. Right Front Window Condition

- (0) No damage
- (1) Impact damage
- (2) Heat damage—broken
- (3) Impact and heat damage
- (4) Impact or heat damage
- (5) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

70. Right Front Window Position (Prefire)

- (0) Full down
- (1) Full up
- (2) Partial open
- (3) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

71. Left Rear Window Condition

- (0) No damage
- (1) Impact damage
- (2) Heat damage—broken
- (3) Impact and heat damage
- (4) Impact or heat damage
- (5) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

72. Left Rear Window Position (Prefire)

- (0) Full down
- (1) Full up
- (2) Partial open
- (3) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

73. Right Rear Window Condition

- (0) No damage
- (1) Impact damage
- (2) Heat damage—broken
- (3) Impact and heat damage
- (4) Impact or heat damage
- (5) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

74. Right Rear Window Position (Prefire)

- (0) Full down
- (1) Full up
- (2) Partial open
- (3) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

75. Sun Roof Condition

- (0) No integrity loss
- (1) Integrity loss—impact
- (2) Integrity loss—heat
- (3) Impact and heat
- (4) Impact or heat
- (5) Removed prior to impact
- (8) Not applicable (N/A)
- (9) Unknown

76. Sun Roof Position (Prefire)

- (0) Full open
- (1) Full closed
- (2) Partially open
- (8) Not applicable (N/A)
- (9) Unknown

77. Summary—evidence of open window prior to fire:

Electrical Controls—Interior

78. Position of Fuel Selector Valve Switch

- (0) No selector valve switch
- (1) Tank #1 Position
- (2) Tank #2 Position
- (3) Unidentified position
- (9) Unknown

79. Heater Controls

- (0) Heater Off
- (1) Heater On
- (2) A/C On
- (3) A/C Off
- (4) Unidentified position
- (9) Unknown

80. Fan Control

- (0) Fan Off
- (1) Fan On
- (2) Unidentified position
- (9) Unknown

81. Wiper Controls

- (0) Wiper Off
- (1) Wiper On
- (2) Wiper Intermittent
- (3) Unidentified position
- (9) Unknown

82. Headlight Controls

- (0) Off
- (1) Parking
- (2) On
- (3) Unidentified
- (9) Unknown

Field Fire Investigation Form

Case Number _____ Vehicle Number _____ Investigator Number _____

Filler Neck and Hose Damage

11. Filler Hose Tank #1 Material

- (0) Non Metallic
- (1) Metallic

112. Tank #1 Filler Neck and Vent

(check all that apply)

	No impact damage	Impact damage—breach	Impact damage—no breach	No heat damage	Heat damaged—no breach	Heat damaged—breached	Clamps present	Clamps—one or more missing	Not applicable (N/A)
Filler hose									
Vent hose									
Filler neck									
Tank to filler									
Tank to vent									

113. Filler Hose Tank #2 Material

- (0) Non Metallic
- (1) Metallic

114. Tank #2 Filler Neck and Vent

(check all that apply)

	No impact damage	Impact damage—breach	Impact damage—no breach	No heat damage	Heat damaged—no breach	Heat damaged—breached	Clamps present	Clamps—one or more missing	Not applicable (N/A)
Filler hose									
Vent hose									
Filler neck									
Tank to filler									
Tank to vent									

Fuel Lines

115. Number of Fuel System Lines—Tank to Engine

116. Fuel Line Materials

- (0) Non-metallic
- (1) Metallic
- (2) Both Metallic and non-metallic

117. Fuel Line Routing

Structure refers to frame, rail, or equivalent unibody structure

- (0) Exposed, outboard of structure
- (1) Exposed, inboard of structure
- (2) Exposed, inboard of structure; Partial enclosed
- (3) Enclosed within structure or other protection
- (4) Exposed, inboard and outboard of structure
- (5) Other

118. Fuel Line Plane

- (0) All below structure
- (1) All above structure
- (2) Portions above and below structure
- (3) In plane of unibody floor pan
- (4) Other

119. Fuel Line and Hose Damage

- (0) Fuel lines intact—no damage
- (1) Fuel line impact damage
- (2) Fuel line impact damage with separated or open lines
- (3) Fuel line heat damage with open lines
- (4) Open line and damage from both impact and heat

120. Fuel Line Connection Type—

(select all that apply)

- (0) Screw type hose clamps
- (1) Spring clamps
- (2) Crimped connections
- (3) Non-metallic fittings
- (4) Threaded fittings

121. Summary—describe evidence of damage to filler neck(s), hose(s), and fuel lines:

Field Fire Investigation Form

Case Number _____ Vehicle Number _____ Investigator Number _____

Exhaust System

122. Exhaust System Components—

(select all that apply)

- (0) No catalytic converter _____
- (1) Single catalytic converter _____
- (2) Double catalytic converter _____
- (3) Triple catalytic converter _____
- (4) Single muffler _____
- (5) Dual muffler exhaust system _____
- (6) Single resonator _____
- (7) Dual resonator _____
- (8) Non-OEM system _____
- (10) Other (specify): _____

123. Exhaust System Damage—

(select all that apply)

- (0) Complete exhaust system intact and undamaged _____
- (1) Exhaust sys. missing or separated components aft of muffler _____
- (2) Exhaust sys. missing or separated muffler _____
- (3) Exhaust sys. missing or separated component forward of muffler _____
- (4) Exhaust sys. deteriorated with evidence of extensive corrosion _____
- (5) Other _____

124. Automatic Transmission—

(select all that apply)

- (0) Transmission pan and case undamaged _____
- (1) Transmission pan and case impact damage—no fluid released _____
- (2) Transmission pan and case impact damaged releasing fluid _____
- (3) Transmission pan and case heat damage _____
- (4) Transmission pan and case impact and heat damage _____
- (8) Not applicable (N/A) _____

125. Brake Lines (Undercarriage) and Brakes

- (0) No damage _____
- (1) Impact damage—damaged / severed—no heat damage _____
- (2) Heat damage only _____
- (3) Impact and heat damage _____
- (9) Unknown _____

126. Summary—Describe evidence of undercarriage hydraulic leaks:

127. Rubber Mountings—Identify Heat Damage

(select all that apply)

	Consumed	Partial
Suspension		
front left upper		
front left lower		
front right upper		
front right lower		
Engine mount		
left		
right		
Body mount		
front left		
front right		
rear left		
rear right		
Transmission mount—crossmember		
Suspension		
rear left upper		
rear left lower		
rear right upper		
rear right lower		

Drive Shaft

128. Drive Shaft/Half Shaft Joints

Number of Drive Shaft Joints _____

Half shaft boot conditions _____

129. Drive Shaft Condition

- (0) Drive Shaft Intact _____
- (1) Drive Shaft Detached at Forward (Transmission) Joint _____
- (2) Drive Shaft Detached at Mid Bearing Joint _____
- (3) Drive Shaft Detached at Rear Axle Pinion Joint _____
- (8) Not applicable (N/A) _____

130. Half Shaft Condition

- (0) Half Shafts Intact _____
- (2) One or More Half Shaft Joints Detached Describe _____

Incident Site Form

Case Number _____ Investigator Number _____

Incident Location

City _____ State _____ County (Township) _____

Road _____ Milepost _____

Incident Collision Diagram

Document the physical plant:

- * all road/roadway delineation (e.g., curbs/edge lines, lane markings, median markings, pavement markings, parked vehicles, poles, signs, etc.)
- * all landmarks
- * all traffic controls (e.g., signs/signals, etc.)
- * north arrow placed on diagram
- * roadway surface type and condition of applicable roadways
- * grade measurements for all applicable roadways and at location of rollover initiation
- * roadway curvature (include measurement of precrash superelevation for each vehicle if applicable)
- * relevant roadway features, including illumination, drainage, and visibility
- * Describe Coefficient of Friction measurement and surface conditions at that time

Document vehicle dynamics, including:

- * reference point and reference line relative to physical features present at the scene
- * scaled documentation of all incident induced physical evidence
- * scaled documentation of all roadside objects contacted
- * scaled representations of the vehicle(s) at pre-impact, impact, and final rest based upon either:
 - a) physical evidence, or
 - b) reconstructed incident dynamics
- * Tire marks
- * Burn patterns

Crash Data

Veh. #1 Veh. #2 Veh. #3

Legal Speed Limit (mph) _____

Travel Direction
(N, S, E, W, NE, NW, SE, SW) _____

Surface Type
(0) Concrete
(1) Asphalt
(2) Gravel
(3) Dirt
(4) Other _____

Coefficient of Friction _____

Surface Condition at time of measurement
(wet, dry, etc.) _____

Grade (v/h) Measurement

- **Between impact and final rest** _____
- **At location of rollover initiation** _____
- **At pre-crash location** _____

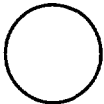
Site Measurements

- For total station measurements:**
- print out list of points, coordinates, any descriptions
 - print site drawing with annotations
 - include file name, disk with file, disk marked with case number

Incident Site Form

Case Number _____
Incident Diagram

Investigator Number _____



Use this diagram to sketch incident site data.

North

Incident Reconstruction Form

Case Number _____ Investigator Number _____ QA# _____ Non-collision _____

CDC and Crush Measurements

Vehicle Number: _____ Impact Sequence Number: _____ PDOF (degrees): _____

Object Contacted (see list)	Direction of Force (clock)	Shift Classif. (SAEJ224.)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Direction of Force (with shift)	Deformation Location	Specific Longitudinal or Lateral Location	Specific Vertical or Lateral Location	Type of Damage Distribution	Deformation Extent	
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

(numbers in parentheses above are 7 digits specified in SAE J224)

Crush Profile in Inches

The crush profile for the damage described in the CDC(s) above should be documented in the appropriate space below. (All measurements are in inches.)

L	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	± D L midpoint offset
Direct+Induced Width							
_____	_____	_____	_____	_____	_____	_____	+ -

Maximum Crush _____

('C' measurements taken left to right, rear to front. 'D' positive right of center, and forward of center)

Vehicle Number: _____ Impact Sequence Number: _____ PDOF (degrees): _____

Object Contacted (see list)	Direction of Force (clock)	Shift Classif. (SAEJ224.)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Direction of Force (with shift)	Deformation Location	Specific Longitudinal or Lateral Location	Specific Vertical or Lateral Location	Type of Damage Distribution	Deformation Extent	
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

(numbers in parentheses above are 7 digits specified in SAE J224)

Crush Profile in Inches

The crush profile for the damage described in the CDC(s) above should be documented in the appropriate space below. (All measurements are in inches.)

L	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	± D L midpoint offset
Direct+Induced Width							
_____	_____	_____	_____	_____	_____	_____	+ -

Maximum Crush _____

Attach another sheet if there are more than two damage- or injury-producing impacts.

Incident Reconstruction Form

Case Number _____ Investigator Number _____ QA# _____

Codes for Object Contacted (01-30)—Vehicle Number

Noncollision

- (31) 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
- (65) 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) Not applicable or not occupied
- (99) Unknown event or object

Incident Reconstruction Form

Case Number _____ Investigator Number _____ QA# _____

For each impact with probability of injury or damage to result in fire:

Vehicle Number _____

Vehicle Number _____

Impact Number _____

Impact Number _____

Travel speed _____ mph

Travel speed _____ mph

Basis _____

Basis _____

Travel speed probable range _____ to _____ mph
(If not calculated, put 999 in range, explain in comment.)

Travel speed probable range _____ to _____ mph
(If not calculated, put 999 in range, explain in comment.)

Comment _____

Comment _____

Impact speed _____ mph

Impact speed _____ mph

Basis _____
(If not calculated, put 999 in range, explain in comment.)

Basis _____
(If not calculated, put 999 in range, explain in comment.)

Impact speed probable range _____ to _____ mph

Impact speed probable range _____ to _____ mph

Delta V _____ mph

Delta V _____ mph

Basis _____

Basis _____

Delta V probable range _____ to _____ mph

Delta V probable range _____ to _____ mph

Comment _____

Comment _____

Energy absorption _____ ft-lbs

Energy absorption _____ ft-lbs

Basis _____

Basis _____

Energy absorption probable range _____ to _____

Energy absorption probable range _____ to _____

Comment _____

Comment _____

Incident Reconstruction Form

Case Number _____ Investigator Number _____ QA# _____

Guidelines for Incident Reconstruction

Can use worksheet for reconstruction program, must attach program output.

Techniques for speed

- Witness (travel speed only)
- Critical speed scuff (travel speed)
- Scuff and skid (impact speed)
- Skid (with travel speed source for impact speed)
- Momentum (impact speed, Delta V)
- Computer model (Impact speed, Delta V, energy from crash, trajectory)

Concise narrative; description of incident:

(note – one narrative per incident)

Techniques for energy

- Computer model, conservation of energy (undeformable object collision)

Stiffness sources:

Crash test data

Calculate A, B values

Look for closest approximation in test data, angle, delta V, offset, surface

Modifications for narrow object:

- research
- range of variance in literature

Modifications for angled:

- range of variance in literature

Comments include how close test approximates incident

Modifications for override (underride), similar for override/underride

Document all for QA

Approach

Use the best sources available; explain. For instance, if reliable stiffness data are available, but you have good witness travel speed, skid mark, and coefficient of friction data, calculations based on Newton's laws.

Summarize incident reconstruction; Document for QA

- Note sources of all input data
- Attach references, vehicle specifications
- Formulae used—source of formulae if appropriate
- Source(s) of coefficient of friction (and any modifications used for wet measurements and dry road incident, etc.)
- Document and justify all judgements made

Occupant Injury Assessment Form—Engineers

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____

Occupant's Characteristics

1. Occupant's Age _____

Code actual age at time of accident.

(00) Less than one year old (specify by month): _____

(97) 97 years or older

(99) Unknown

2. Occupant's Gender _____

(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

3. Occupant's Height _____

Code actual height to the nearest inch

(999) Unknown

4. Occupant's Weight _____

Code actual weight to the nearest pound

(999) Unknown

5. Occupant's Role _____

(1) Driver

(2) Passenger

(3) Unknown

Occupant's Seating

6. 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

7. 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

8. Ejection _____

(0) No ejection

(1) Complete ejection

(2) Partial ejection

(3) Ejection, unknown degree

(9) Unknown

9. Ejection Path _____

(0) No ejection

(1) Windshield

(2) Left front

(3) Right front

(4) Left rear

(5) Right rear

(6) Rear

(7) Roof

(8) Other path (e.g., back of pickup, etc.) (specify): _____

(9) Unknown

10. 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

11. Medium Status (immediately prior to impact) _____

(0) No ejection

(1) Open

(2) Closed

(3) Integral structure

(9) Unknown

12. 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

Occupant Injury Assessment Form—Engineers

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____

13. 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

14. 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

15. 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

16. 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

17. 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 latch plate
- (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

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

19. 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

Nonfunctional

- (4) Automatic belt destroyed or rendered inoperative
- (9) Unknown

Occupant Injury Assessment Form—Engineers

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____

20. Automatic (Passive) Belt System Use/Function _____

- (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

21. Automatic (Passive) Belt System Type _____

- (0) Not equipped/not available
- (1) Nonmotorized system
- (2) Motorized system
- (9) Unknown

22. 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

23. 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 latch plate
- (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

24. 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"

25. 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
- (5) Police indicated "unknown"
- (9) Unknown

26. Check the Primary Source Used in Determining Belt Use

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

27. Frontal Air Bag System Availability/Function _____

- (This Occupant Position)
- (0) Not equipped/not available
 - (1) Air bag

Nonfunctional

- (8) Air bag disconnected (specify): _____
- (3) Air bag not reinstalled
- (9) Unknown

28. 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
 - (6) Nondeployed
 - (9) Unknown

Occupant Injury Assessment Form—Engineers

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____

29. Other Than First Seat Frontal Air Bag Availability/Function _____

- (0) Not equipped/not available
- (1) Air bag

Nonfunctional

(2) Air bag disconnected (specify): _____

(3) Air bag not reinstalled

(9) Unknown

Specify type of "other" air bag present: _____

30. Air Bag Deployment, Other Than First Seat Front (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
- (6) Nondeployed
- (9) Unknown

31. 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

32. Type of Child Safety Seat _____

- (0) No child safety seat this position
- (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

33. Child Safety Seat Orientation _____

(00) No child safety seat this position

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) Unknown orientation (specify): _____

(29) Unknown orientation

(99) Unknown if child safety seat used

34. Child Safety Seat Harness, Shield, and Tether Usage _____

(00) No child safety seat this position

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

Occupant Injury Assessment Form—Engineers

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____

Injury Consequences

35. 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

36. 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

37. 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

38. Hospital Stay _____

- (00) Not Hospitalized
- _____ Code the number of days (up through 60) that the occupant stayed in the hospital
- (61) 61 days or more
- (99) Unknown

39. Intensive Care Unit Stay _____

- (00) Not Admitted to Intensive Care Unit
- _____ Code the number of days (up through 60) that the occupant remained in the Intensive Care Unit
- (61) 61 days or more
- (99) Unknown

40. 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
- (98) Days lost, recovery not complete
- (99) Unknown

Occupant Injury Assessment Form—Medical

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____

Medical History

1. Describe pre-existing medical conditions _____

42. Medications prescribed prior to injury _____

43. Smoke tobacco?
 No Yes
 Number of years _____

44. History of alcohol or drug abuse?
 No Yes

45. Comments on medical history _____

51. Description (cause of death): _____

Trauma Data

52. 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

53. Was the Occupant Given Blood? _____
 (1) No—blood not given
 (2) Yes—up to and including 5 units
 (3) Yes—greater than 5 units
 (9) Unknown if blood given

54. Carbonaceous Sputum? _____
 (1) Yes
 (2) No

Burn Injuries

Injury Consequences

Time to Death

46. Hours (if less than 24 hours) _____
 If more than 24, enter 88
 If unknown enter 99
 Round to nearest hour
 00 not fatal

47. Days (if more than 24 hours, enter days) _____
 If unknown enter 999
 000 not fatal

48. 1st Medically Reported Cause of Death _____

49. 2nd Medically Reported Cause of Death _____

50. 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

55. Skin Grafts _____
 (1) Yes
 (2) No

56. Amputations _____
 (code number of amputations in each column)

digit	limb
_____	_____ yes—burn related only
_____	_____ yes—non-burn only
_____	_____ yes—burn and non-burn injury
_____	_____ no

Occupant Injury Assessment Form—Medical

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____

Injury Data

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					Aspect	Injury Source	Injury Source Confidence Level
		Body Region	Type of Anatomic Structure	Specific Anatomic Structure	Level of Injury	A.I.S. Code Severity			
1st									
2nd									
3rd									
4th									
5th									
6th									
7th									
8th									
9th									
10th									
11th									
12th									
13th									
14th									
15th									
16th									
17th									
18th									
19th									
20th									
21th									
22th									
23rd									
25th									

Occupant Injury Assessment Form—Medical

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____

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 injuries indicated by official sources (or from PAR or other unofficial sources if medical records and interviewee data are unavailable).

Blood Alcohol level
(mg/dl)

BAL = . . .

Arterial Blood Gasses

pH = . . .

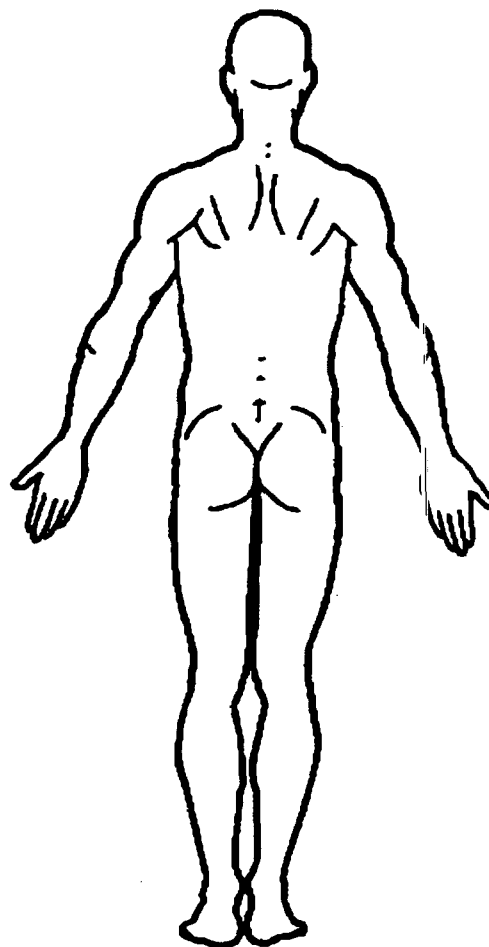
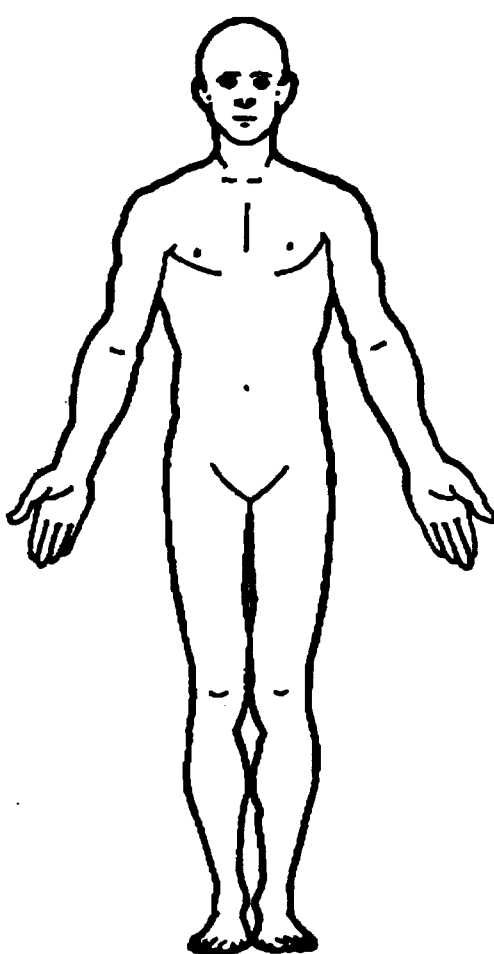
PO₂ = _____

PCO₂ = _____

HCO₂ = _____

COH_b = _____

Comment (time blood drawn, oxygen therapy given): _____



Occupant Injury Assessment Form—Medical

Case Number _____

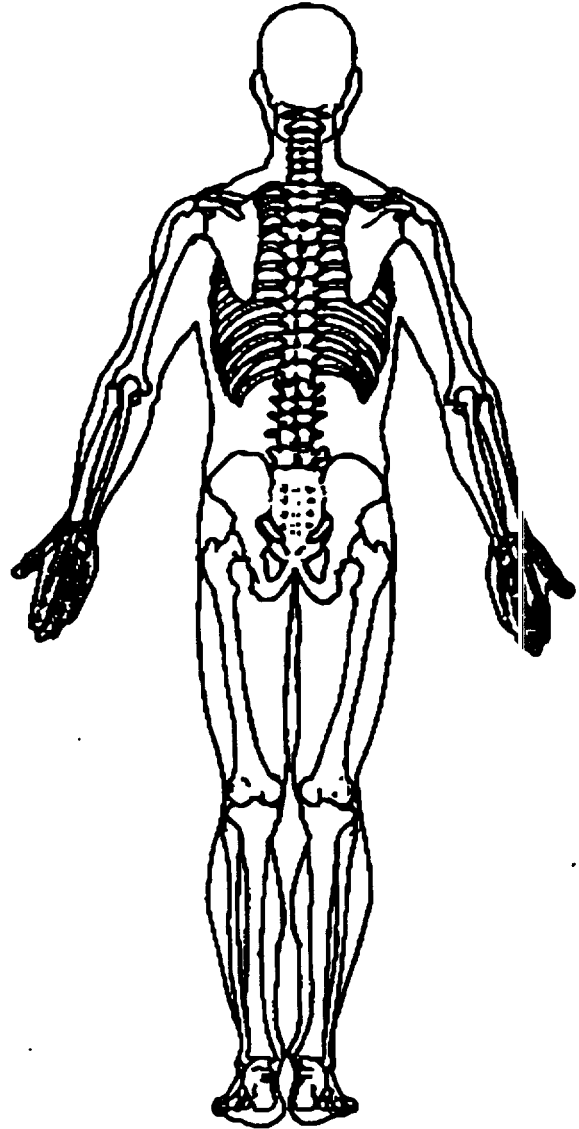
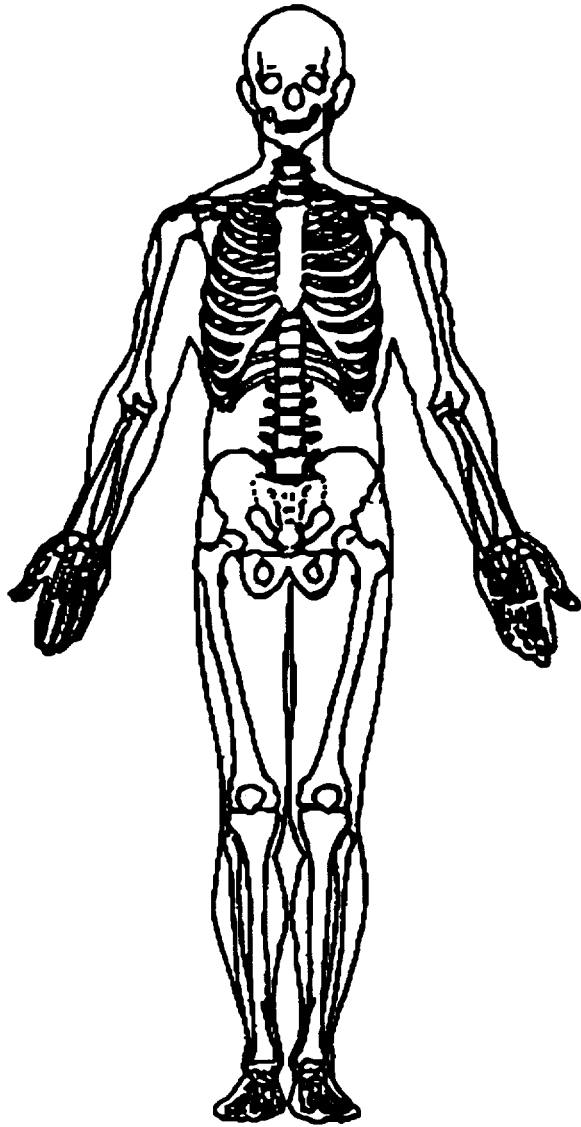
Vehicle Number _____

Investigator Number _____

Occupant Number (Position) _____

Official Injury Data—Skeletal 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).



Occupant Injury Assessment Form—Medical

Case Number _____

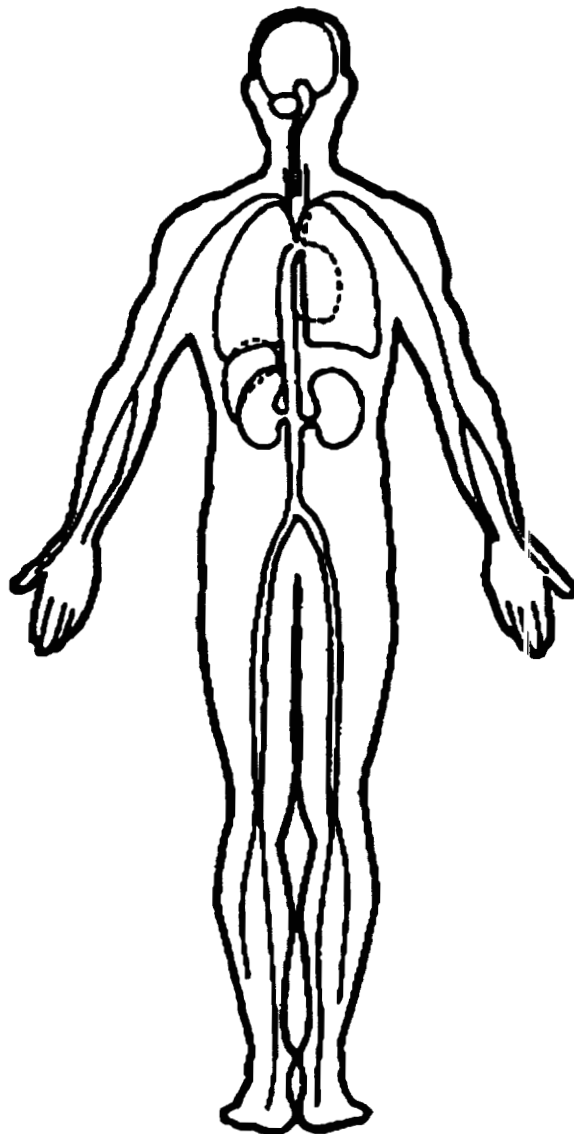
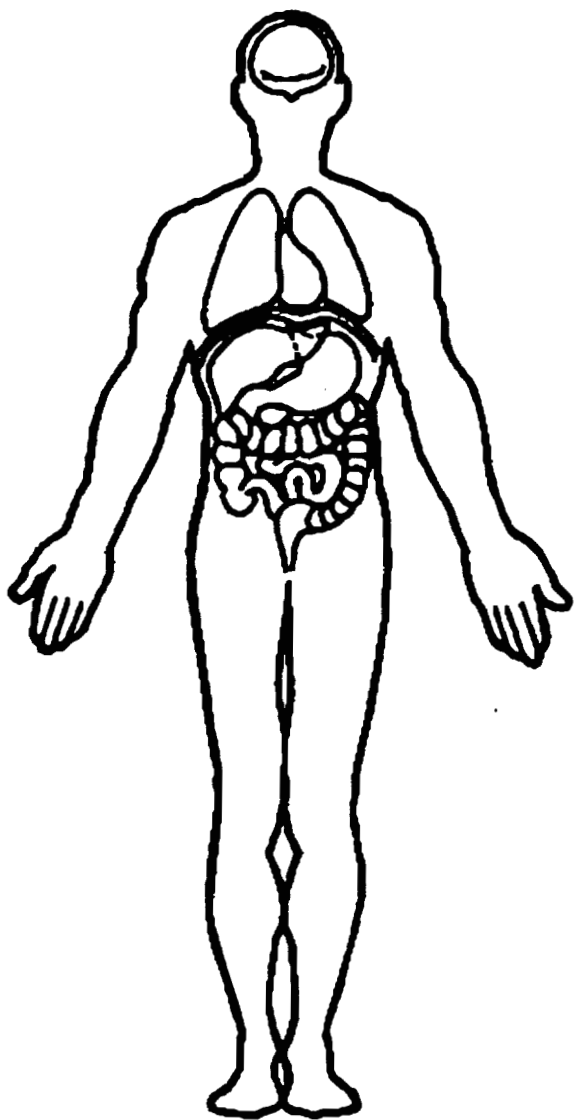
Vehicle Number _____

Investigator Number _____

Occupant Number (Position) _____

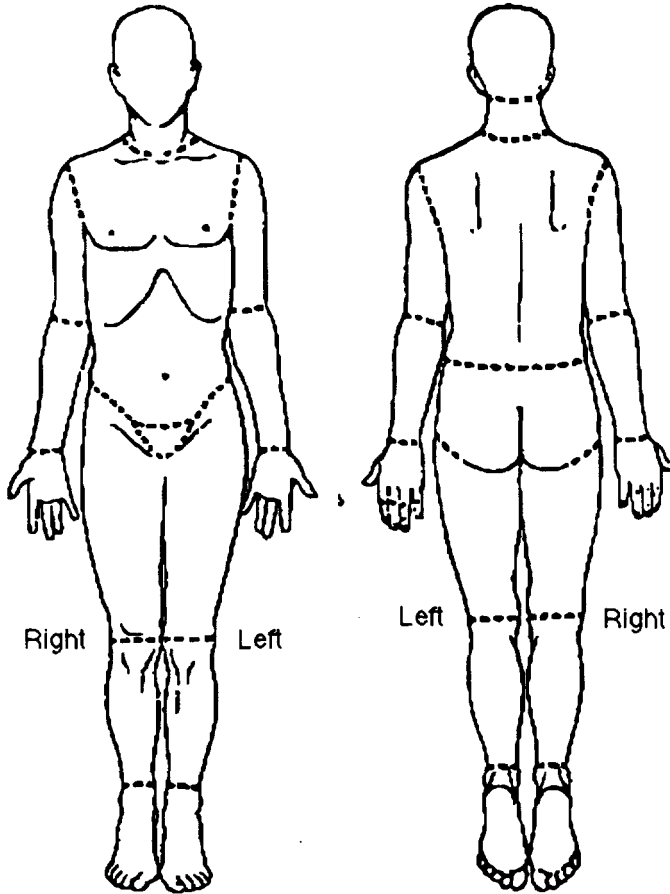
Official Injury Data—Internal Injuries

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).



Occupant Injury Assessment Form—Medical (Burn Chart)

Case Number _____ Vehicle Number _____ Investigator Number _____ Occupant Number (Position) _____



Date _____

Completed by _____

- _____ Shallow
- + _____ Indeterminate or Deep
- = _____ %



Shallow (pink, painful, moist)



Indeterminate or deep (dry, less sensation, white, mottled, dark red, brown or black, leathery)

Percent Surface Area Burned (Berkow Formula)

AREA	1 Year	1-4 Years	5-9 Years	10-14 Years	Y 15 Years	Adult	Shallow	Indeterminate or Deep
Head	19	17	13	11	9	7		
Neck	2	2	2	2	2	2		
Ant. Trunk	13	13	13	13	13	13		
Post. Trunk	13	13	13	13	13	13		
R. Buttock	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2		
L. Buttock	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2		
Genitalia	1	1	1	1	1	1		
R. U. Arm	4	4	4	4	4	4		
L. U. Arm	4	4	4	4	4	4		
R. L. Arm	3	3	3	3	3	3		
L. L. Arm	3	3	3	3	3	3		
R. Hand	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2		
L. Hand	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2		
R. Thigh	5-1/2	6-1/2	8	8-1/2	9	9-1/2		
L. Thigh	5-1/2	6-1/2	8	8-1/2	9	9-1/2		
R. Leg	5	5	5-1/2	6	6-1/2	7		
L. Leg	5	5	5-1/2	6	6-1/2	7		
R. Foot	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2		
L. Foot	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2		
TOTAL								

Appendix B: Data collection instructions

INSTRUCTIONS FOR DATA COLLECTION FORMS

Case Studies of Motor Vehicle Fires

By

Washington State Transportation Center
University of Washington
1107 NE 45th Street, Suite 535
Seattle, WA 98105-4631

Leland E. Shields
Leland E. Shields, Inc.

Robert R. Scheibe
GT Engineering

Timothy E. Angelos
Design Research Engineering, LLC

August 31, 1999



INSTRUCTIONS FOR DATA COLLECTION FORMS

Case Studies of Motor Vehicle Fires

Nine forms have been developed for collection of data related to each of the collision-fire incidents under investigation. The forms will be filled out by investigating engineers, medical personnel, or others trained in their use. A number of the forms and procedures are based on the National Automotive Sampling System (NASS) developed by the National Highway Traffic Safety Administration (NHTSA). The 1996 NASS forms and *Data Collection, Coding, and Editing Manual* were used as a framework for this work, and as such, the NASS instructions are often used or referred to.

The forms for the Investigation of Motor Vehicle Incidents Involving Fire are listed below:

- Case Summary Worksheet
- General Vehicle Form
- Interview Form
- Exterior Vehicle Form
- Interior Vehicle Form
- Field Fire Investigation Form
- Incident Site Form
- Incident Reconstruction Form
- Occupant Injury Assessment Form (Engineers and Medical)

A subset of collected information will be coded in a PC-based relational database that will be publicly available. The coding procedures and a description of the database can be found in a separate document (which is not yet available at the time of this writing).

Though the forms were developed to be self-explanatory and used only by a small number of trained individuals, supplemental instructions were written to assist in the consistency of form completion, especially for questions where there may be some ambiguity. Bring any questions that do arise to the attention of the program managers for future clarification in these instructions. Notice will be sent out to all appropriate investigators when questions regarding form completion are raised and resolved.

The top of each page of each of the forms has a variety of "header" information that includes:

- Case Number - Three digit number to be assigned to a specific incident by project coordinators in Seattle
- Investigator Number - Two digit number assigned to each investigator by project coordinators in Seattle
- Vehicle Number - Two digit number assigned to each vehicle involved in an incident; the number 01 is to be assigned to the fire-damaged vehicle and other numbers arbitrarily assigned by investigator thereafter. In the case of two fire-involved vehicles, consult project team leader
- QA Number - Single digit number assigned to Quality Assurance team member by project coordinators in Seattle

- Occupant Number (Position) - Two digit number corresponding to protocol on page one of Occupant Injury Assessment Form

General Note: Any form that is titled "Worksheet" is provided for the convenience of the investigators and will not be coded. Such forms contain information that may be helpful in summarizing various details of the incident, vehicles or occupants.

CASE SUMMARY WORKSHEET INSTRUCTIONS

The **Case Summary Worksheet** is used for the convenience of the investigators to reduce data from other forms and sources to a manageable summary that will be useful for quick reference.

A. DESCRIPTION OF THE INCIDENT SEQUENCE AND INCIDENT PECULIARITIES

This section should provide a brief synopsis of the incident sequence as reconstructed by the researcher. Do not identify vehicle/driver culpability. For example, suppose vehicle #1 ran a stop sign and struck vehicle #2 in its left side. This situation should be described as follows:

Vehicle #1 was traveling north and vehicle #2 was traveling east on an intersecting roadway. The front of vehicle #1 impacted the left side of vehicle #2.

Thus, the impact configuration is emphasized rather than who was at fault. Any particulars concerning vehicle crashworthiness should be highlighted. Include any abnormal incident occurrences that may be of interest to quality control or the data user.

B. IMPACT SEQUENCE FOR VEHICLE 1

The Impact Sequence for Vehicle 1 is a summary of the Impact Sequence Numbers that were assigned in the Exterior Vehicle Form for Vehicle 1 (the fire-involved vehicle). It is meant only for reference.

C. VEHICLE PROFILES

Vehicle Profiles identify the vehicles by number, make, and model and contain a description the severity of the incident impact which caused the most severe damage to the vehicle.

- **Damage Plane** - The plane first crossed in the impact (i.e., Front, left, right, rear, top, or undercarriage).
- **Severity Description** - A gross indication of collision damage severity. The terms light, moderate, or severe are adequate.
- **Component Failure** - Any vehicular component that failed during the incident sequence should be noted. The components of special interest to the user may be noted by reviewing the components in the Exterior Vehicle, Interior Vehicle, or Field Fire Investigation Forms. Examples could include restraints, glazing, etc.

D. PERSON PROFILES

All persons involved in the incident for whom an Occupant Assessment form was submitted should be noted in this section. This section contains the following variables.

Vehicle No: Same as header.

Person Role: Indicate if the person was the *driver* or a *passenger* in the vehicle. Write "driver" or "passenger"; do not use their coded values.

Seat Position: Same as header for Occupant Number (Position).

Restraint Use: Indicate the type of restraint "used" by the person (e.g., combinations of manual belts, automatic belts, air bags, and/or child seats).

Most Severe Injury: The most severe (*i.e.*, highest AIS) injury to the person should be documented by noting the injury's **Body Region, Injury Type, AIS, and Injury Source** — according to the coding on the bottom of the page. Use the coded value only for AIS. If more than one injury has the highest AIS, choose one with the highest order source of data (*i.e.*, autopsy over post-ER, post-ER over ER, etc.). If the person did not sustain an injury, write "*not injured*". If engineering investigators do not have access to AIS values at the time of completion this entry can be left for medical reviewers.

GENERAL VEHICLE FORM INSTRUCTIONS

Form Pages GV-1 to GV-5

The **General Vehicle Form** is designed to be a repository for vehicle data that is collected in the office, often prior to field inspection. It does not rely upon field-collected data. The first page is required for each vehicle involved; the remaining pages are required for each impact of Vehicle No. 1.

VEHICLE IDENTIFICATION

Incident time and date, vehicle make, model special use and trailer towing status are all self-explanatory. Data for this section may be gathered from any of several sources, including PAR, interview data, or field inspection if available. It is the investigator's responsibility to assure consistency amongst the forms for any data that may appear elsewhere (e.g., VIN). If there is a discrepancy, field observations should always be relied upon.

Document Log should list all reports, (including PAR), incident records (medical, vehicle, fire), and photos that are "in hand" during the investigation.

Documents Available should list any reports, records, or photos that the investigator may be aware of, but which are not "in hand." This is often the case with police photographs or certain medical records.

OFFICIAL RECORDS

Police Reported Vehicle Disposition, Police Reported Travel Speed, Speed Limit, and Driver and Other Contributing Factors should be entered based on official records, most commonly the PAR or medical records.

For Driver and Other Contributing Factors, either "Driver" or "Other contributing factor" must be checked, and then the vehicle number and impact sequence number information must be filled in. Impact sequence number can be found on the Case Summary Worksheet, and confirmed in the Exterior Vehicle Form. A verbal description of each contributing factor should be included. There is room for four such entries; if more are found, attach extra sheets.

PRECRASH ENVIRONMENTAL AND DRIVER-RELATED DATA

For each impact (Impact Sequence Number) of Vehicle 1, data on the roadway, environment, and driver's actions are recorded. These entries are self-explanatory. If more detail is required, see the NASS Manual.

Relation to Interchange or Junction:

An interchange is the area around a grade separation (ANSI D16.1-1989, section 2.5.14) which involves at least two trafficways. Included within its boundaries are: (1) all ramps which connect the roadways, and (2) each roadway entering or leaving the interchange to a point 30 meters (100 feet) beyond the gore or curb return at the outermost ramp connection for the roadway. One may find included within an interchange area intersections, driveway accesses, and, of course, roadway sections which are non-junction.

'Intersection related' is coded when the vehicle's environment just prior to the critical precrash event: (1) is in an intersection or is in an approach to or exit from an intersection; and (2) results from an activity, behavior, or control related to the movement of traffic units through the intersection (for "traffic unit" see ANSI D16.1-1989, sections 2.2.37, 2.2.6, 2.1.7, and 2.1.4).

Trafficway Flow

If the collision occurred other than in a junction, code the value on the basis of the most representative description of the characteristics of the vehicle's roadway environment just prior to the critical precrash event. If this is off the roadway, code the value on the basis of the most representative description of the roadway leading to the point of departure.

If the characteristics of the vehicle's roadway environment just prior to the critical precrash event is represented by the junction of two or more roadways, code the trafficway flow on the basis of the most representative description of the approach leg to the junction for this vehicle.

A roadway is that part of a trafficway where vehicles travel. A divided trafficway is composed of two or more roadways.

- Code "0" [Not physically divided (two way traffic)] can only be used whenever there is no median. Generally, medians are not designed to legally carry traffic. NOTE: Although gores separate roadways and traffic islands (associated with channels) separate travel lanes, neither is involved in the determination of trafficway division. Two-way left turn lanes do not constitute a divided trafficway.
- Code "1" (Divided trafficway-median strip without positive barrier) is used whenever the trafficway is physically divided, however, the division is unprotected [e.g., vegetation, gravel, paved medians, trees, water, embankments and ravines that separate a trafficway (i.e., all non-manufactured barriers)]. NOTE: Raised curbed medians DO NOT constitute a positive barrier in and by themselves. Painted paved flush areas must be 1.2 m in width to constitute a median strip.
- Code "2" (Divided trafficway — median strip with positive barrier) is used whenever the traffic is physically divided and the division is protected by any concrete, metal, or other type of longitudinal barrier (i.e., all manufactured barriers). Also bridges or underpass support structures and bridge rails take this code.
- Code "3" (One way trafficway) is used primarily whenever the trafficway is undivided and traffic flows in one direction (e.g., one-way streets). However, this code can also be used where a median is present so long as all the traffic on the trafficway goes in the same direction. An example occurs where the opposing roadway of the same named trafficway had to be split by such a distance that the right-of-way divides to accommodate other property. If (rare) one of the trafficways is further divided into multiple roadways by a median, then in this instance code "3" (One way trafficway) should be used. Included in this code are entrance and exit ramps.

Number of Travel Lanes:

If traffic flows in both directions and is undivided, code the number of lanes in both directions. If the trafficway is divided into two or more roadways, code only the number of lanes for the roadway on which the vehicle under consideration was traveling.

Incident Type:

This variable is taken from the 1996 NASS coding manual, as is the coding description that follows. Note that in contrast to the NASS coding, the fire investigation project will code this field only for the vehicle subject to collision-fire.

Element Values:

Range: 00-16, 20-93, 98, 99

00 No impact

Code the number of the diagram that best describes the incident circumstance.

98 Other incident type (specify)

99 Unknown

Diagrams: See next page.

Source: Researcher determined — inputs include police report, scene inspection, vehicle inspection, and interview.

Remarks:

This variable is used for categorizing the collisions of drivers involved in incidents. A collision is defined here as the first harmful event in an incident between a vehicle and some object, accompanied by property damage or human injury. The object may be another vehicle, a person, an animal, a fixed object, the road surface, or the ground. If the first collision is a rollover, the impact is with the ground or road surface. The collision may also involve plowing into soft ground, if severe vehicle deceleration results in damage or injury. A road departure without damage or injury is not defined as a collision.

To determine the proper incident type, refer to Figure 1 and follow the three-step decision process outlined below:

Step 1 - Determine the appropriate category.

Step 2 - Determine the appropriate configuration.

Step 3 - Determine the specific incident type (two digit codes).

The categories are divided into six sections and are described as follows:

Category 1. Single Driver — The first harmful event involves a collision between an in-transport vehicle and an object. A harmful event involving two in-transport vehicles is excluded from this category. Note, the impact location on the vehicle is not a consideration for incident types in this category.

Variable Name: Incident Type (cont'd.)

Category II. Same Trafficway, Same Direction — The first harmful event occurred while both vehicles were traveling in the same direction on the same trafficway.

Category III. Same Trafficway, Opposite Direction — The first harmful event occurred while both vehicles were traveling in opposite directions on the same trafficway.

Category IV. Change Trafficway, Vehicle Turning — The first harmful event occurred when the vehicle is either turning or merging while attempting to change from one trafficway to another trafficway. Trafficway for this variable is loosely defined to include driveways, alleys and parking lots when a vehicle is either entering or exiting a trafficway.

Category V. Intersecting Paths (Vehicle Damage) — The first harmful event involves situations where vehicle trajectories intersect. It is important to note the location of damage to each vehicle for incident typing.

Category VI. Miscellaneous — The first harmful event involves an incident type that cannot be described in Categories I-V and thus is included in this category.

Each category is further defined by an Incident Configuration(s). Configurations A through M are discussed below.

Category I. Single Driver

Configurations A and B ... Roadside Departure - The vehicle departed either the right or left side of road with the first harmful event occurring off the road. Right versus left is based on the side of the road departed immediately prior to the first harmful event.

Configuration C. Forward Impact - The vehicle struck an object on the road or off the end of a trafficway while moving forward.

Category II. Same Trafficway, Same Direction

Configuration D. Rear-End — The front of the overtaking vehicle impacted the rear of the other vehicle.

Note, even if the rear-impacted vehicle had started to make a turn, code here (not in Category IV).

Configuration E. Forward Impact — The front of the overtaking vehicle impacted the rear of the other vehicle, following a steering maneuver around a noninvolved vehicle or object.

Configuration F. Sideswipe/Angle — The two vehicles are involved in a shallow, glancing impact involving the side of one or both vehicles.

Note, CDC guidelines for sideswipes are not considered when assessing this configuration.

Variable Name: Incident Type (cont'd.)

Category III. Same Trafficway, Opposite Direction

Configuration G. Head-On — The frontal area of one vehicle impacted the frontal area of another.

Configuration H. Forward Impact — The frontal area of one vehicle impacted the frontal area of another following a steering maneuver around a noninvolved vehicle or an object.

Configuration I. Sideswipe/Angle — The two vehicles are involved in a shallow, glancing impact involving the side of one or both vehicles.

Category IV. Changing Trafficway, Vehicle Turning

Configuration J. Turn Across Path — The two vehicles were initially on the same trafficway when one vehicle tried to turn onto another trafficway and pulled *in front of* the other vehicle. Vehicles making a "U" turn are identified in **Category VI. Miscellaneous**.

Configuration K. Turn Into Path — The two vehicles were initially on different trafficways when one attempted to turn into the same trafficway as the other vehicle.

Note, the focus of this configuration is on the turning maneuver from one trafficway to another and not on the vehicles' plane of contact.

Category V. Intersecting Paths (Vehicle Damage)

Configuration L. Straight Paths — The two vehicles were proceeding (or attempting to proceed) straight ahead.

Category VI. Miscellaneous

Configuration M. Backing, Etc. — One of the two vehicles involved was a backing vehicle, regardless of its location on the trafficway or the damage location on the vehicles.

Any incident configuration which cannot be described in **Category I. through V.** is included here.

The **configurations** are delineated into specific incident types. These types can be identified by referring to the incident type diagram in Figure 1.

Variable Name: Incident Type (cont'd.)

The incident types in **Category I. (Single Driver)** involve an impact between a vehicle and an object. **Categories II. through VI.** identify specific collision combinations which must be coded in specified pairs (*i.e.*, the pair code defines the Incident Type). As an example, the combination "20" (Rear-end, stopped) and "32" (Rear-end, specifics other) or "20" (Rear-end, stopped) and "25" (Slower, straight ahead) are not valid since "20" (Rear-end, stopped) only has meaning when linked to codes "21"- "23" (Stopped,).

An incident involving a vehicle impacting a "driverless in-transport vehicle" is coded "..., **specifics other**" in the appropriate configuration-category. For example, a vehicle which impacts the rear of a driverless in-transport vehicle is encoded "32" (Rear-end, specifics other) and "32".

In incidents involving more than two vehicles or in collision sequences involving a combination of vehicle-to-object-to-vehicle impacts, code the Incident Type for the vehicle(s) involved in the first harmful event. All other vehicles are coded "98" (Other incident type).

Keep in mind that **intended actions** play an important role in the coding scheme. For example, incident type "26" (Slower, turning left) is selected over type "25" (Slower, straight ahead) if the subject vehicle was traveling slower with the **intention** of turning left. Note, the turning action need not have occurred prior to the collision. The driver's **intent** to turn is the key.

The following incident types require clarification.

Code "00" (No impact) identifies noncollision events (fire, immersion, etc.). Rollovers or the road should be coded "98" (Other incident type).

Codes "01" (Right roadside departure, drive off road) and "06" (Left roadside departure, drive off road) are used when the vehicle departed the road under a controlled situation (*i.e.*, the driver was distracted, fell asleep, intentionally departed, etc.).

Codes "02" (Right roadside departure, control/traction loss) and "07" (Left roadside departure, control/traction loss) are used if there is some evidence that the vehicle lost traction or in some other manner "got away" from the driver (*i.e.*, the vehicle spun off the road as a result of surface conditions, oversteer phenomena, locked brakes or mechanical malfunctions). If doubt exists, code "01" (Flight roadside departure, drive off road) or "06" (Left roadside departure, drive off road) respectively.

Codes "03" (Right roadside departure; avoid collision with vehicle, pedestrian, animal) and "08" (Left roadside departure; avoid collision with vehicle, pedestrian, animal) are used when the vehicle departed the road as a result of avoiding something in the road. "Phantom" situations are included here.

Variable Name: Incident Type (cont'd.)

- Codes "03"** (Right roadside departure; avoid collision with vehicle, pedestrian, animal), "08" (Left roadside departure; avoid collision with vehicle, pedestrian, animal) **and** "13" (Forward impact, pedestrian/animal) include pedestrians, bicyclists, other cyclists and other nonmotorists.
- Codes "04"** (Right roadside departure, specifics other) and "09" (Left roadside departure, specifics other) are used for any other stationary or nonstationary objects if the avoidance characteristics of codes "03" or "08" are present.
- Codes "11"** (Forward impact, parked vehicle), "12" (Forward impact, stationary object), **and** "13" (Forward impact, pedestrian/animal) involve an impact with an object which can be located on either side of the road.
- Code "12"** (Forward impact, stationary object) includes a hole in the road, an overhead object (e.g., overpass) or an object projecting over the road edge (e.g., support column of elevated railway).
- Code "13"** (Forward impact, pedestrian/animal) is used when a pedestrian, nonmotorist, or animal is involved with the first harmful event. Vehicle plane of contact is not a consideration.
- Code "15"** (Forward impact, specifics other) is used for impacted (striking or struck) trains and nonstationary objects on the road.
- Codes "44"** (Sideswipe/Angle, straight ahead on left), "45" (Sideswipe/Angle, straight ahead on left/right), "46" (Sideswipe/Angle, changing lanes to the right), **and** "47" (Sideswipe/Angle, changing lanes to the left) identify relative vehicle positions (left versus right) **and** lane of travel intentions (straight ahead versus changing lanes).

From these four codes, four combinations are permitted. They are: (1) "44" and "45", (2) "46" and "45", (3) "45" and "47", and (4) "46" and "47". When used as a combination these codes refer to a sideswipe or angle collision which involved a vehicle to the left of a vehicle to the right where:

- (1) neither vehicle (codes "44" and "45") intended to change its lane;
- (2) the vehicle on the left (code "46") was changing lanes to the right, and the vehicle on the right (code "45") was not intending to change its lane;
- (3) the vehicle on the left (code "45") was not intending to change its lane, and the vehicle on the right (code "47") was changing lanes to the left; and
- (4) the vehicle on the left (code "46") was changing lanes to the right, and the vehicle on the right (code "47") was changing lanes to the left.

Variable Name: Incident Type (cont'd.)

In addition, when: (1) the right sides of the two vehicles impact following a 180 degree rotation of the vehicle on the right, or (2) the left sides of the two vehicles impact following a 180 degree rotation of the vehicle on the left; select the appropriate combination ("44"-45", "46"-45", "45"-47", or "46"-47") depending upon: (3) their positions (*i.e.*, left versus right) **and** (4) the intended lane of travel (straight ahead versus changing lanes) of their drivers.

Code "48" (Sideswipe/Angle, specifics other) is used if one vehicle was behind the other prior to their **Category II, Configuration F** collision. For example, use this code when two vehicles are on the same trafficway and going the same direction, and one loses control and is struck in the side by the front of the other vehicle. However, if one vehicle rotates such that the impact is front to front, then use code "98" (Other incident type).

Code "64" (Sideswipe/Angle, lateral move — infringing vehicle) identifies the vehicle which infringed upon the other (code "65") in a **Category III, Configuration I** collision.

Codes "68" through "85" (Turn Across Path and Turn Into Path) are used in Configurations J and K where the vehicle's action is the controlling factor, and the plane of contact is irrelevant.

Code "82" (Left turn into opposite direction) is used when the driver's vehicle was in the act of making a left turn (*e.g.*, from a driveway, parking lot or intersection). Do not confuse this situation with **Configuration L, Straight Paths**. The driver's intended path is the prime concern.

Codes "86" through "89" (Straight Paths) must not be confused with incident types in **Configuration K, Turn Into Path**. For these codes the vehicles are proceeding (or attempting to proceed) straight ahead, usually at a junction.

Code "98" (Other incident type) is used for those events and collisions which do not reasonably fit any of the specified types. This code includes:

- ☛ rollovers on the road;
- ☛ third or subsequent vehicles involved in an incident; or
- ☛ the second involved vehicle when the first harmful event involved a vehicle-to-object collision, or a noncollision.

INTERVIEW FORM INSTRUCTIONS

Before completing the Interview Form make sure that the interviewee(s) have been clearly identified, including their role in the incident. Such roles include driver, passenger, police officer, witness, vehicle registered owner, person most knowledgeable about vehicle service history, etc. If interviewee is a vehicle occupant other than the driver, be sure to clarify seating position of the occupant. Check the boxes at the top of page 1 to indicate that you have introduced yourself and the project, you have received the interviewee's consent for the interview, and if applicable, agreement (and arrangements) have been made for release of medical information. If consent for medical release is obtained, explain that you will be sending out a cover letter with a packet of information containing a letter of introduction from NHTSA and a form to sign which will enable the release of medical records.

The interviewer should introduce him/herself in roughly the following manner. If the party of interest is not available, ask when that person might be available, and if possible, make an appointment to speak with them.

General Introduction:

Hello Mr./Ms. _____,

My name is _____. I am a researcher for a national study of automobile collision events that involve fire. Our work, which is funded by General Motors with the participation of the National Highway Traffic Safety Administration in Washington D.C., is being conducted to help fire safety researchers better understand and prevent collision-fire events.

I understand that you were involved in such an incident (as driver, witness, etc.), and that you may have some information that would be helpful to our research. I have a questionnaire in front of me that will help me guide our discussions and jog your recollections of the (event, vehicle, etc.). Would you be willing to discuss this with me? (Offer to make an appointment to call back at a later time if that is more convenient for the interviewee.)

If they agree:

Good. What I'm going to do is ask you to recall the events of the collision and fire, as best you know them, including details about the vehicle(s) involved, the roadway and incident site, the fire itself, and any injuries that were sustained. The interview may take twenty or thirty minutes. Any personal data, such as medical information, will be kept strictly confidential and will be used only by the research team. If I ask you anything that makes you uncomfortable, please let me know. Are you ready to begin?

If they don't agree:

I'm sorry. Is there anyone else you could refer me to who may be able to help us? (Get their name(s) and number(s).)

General Comments

Remember that the interviewee is doing us a favor. It is important to be sensitive to them and not to intrude on their privacy or desire for distance. In the event of severe injuries or fatalities,

be gentle and understanding; it may be appropriate to express your concern or condolences for those that were hurt. Elicit their cooperation by being orderly, polite, and somewhat clinical, and by listening carefully to their responses.

The Interview Form is designed to obtain incident, vehicle, and occupant data in an efficient and organized manner. The interviewer is encouraged to use this form as a guide for conducting the interview. It is understood that this interview structure may not meet the style of every interviewer or attempt to meet all contingencies presented by interviewees. The interviewer will have the option of asking questions in a different order to successfully complete the requirements of the interview. However, this form should be followed in the order presented when possible to avoid overlooking data items.

The Interview form has space to record injury information for three occupants. If additional occupants are present, use additional sheets.

Driver's Description of Incident Events

Let the Driver (or interviewee) tell you what happened. Refrain from interrupting the interviewee's train of thought. Let the interviewee finish, then return with follow-up questions to areas of the incident sequence that are unclear.

Write legibly. Record faithfully the interviewee's response even when it disagrees with information and/or evidence that you have already acquired (e.g., from the vehicle and/or scene inspection).

Query the interviewee on all crashworthiness and fire issues. If this interviewee's vehicle was involved in the incident sequence in a manner which makes it applicable to the trajectory algorithm of a PC-based incident reconstruction program, then interview so that particular attention is paid to incident details which would help you identify both its impact and final rest locations. Ask about the details of the fire, including when/how it was first noticed, where it was first located, how quickly it spread, etc.

Immediately following the interview, summarize on the Interview Form interviewee comments obtained over the course of the interview which were not provided during the initial uninterrupted statement and were not part of the itemized questions. Sufficient space has been provided under the Driver's Description of Incident Events section to accommodate additional writing. If additional space is required, then copy and use as many Interview Form face sheets as required.

Occupant's Description of Incident Events

Space is provided to record statements obtained from the occupant or other interviewee(s). As noted by the layout of the Interview Form face sheet, more emphasis is placed upon statements obtained from the driver. The researcher should record as much information from the occupant as possible when the driver is not readily available. However, an appointment should be made to contact the driver for a follow-up interview.

Specific Questions to Ask Interviewee

Space has been left here for the researcher to record questions that are specific to the interviewee or incident circumstances. Such questions would likely come from prior knowledge of peculiar circumstances that may be important, but may not be adequately captured in the Interview Form.

Incident Diagram

Although the use of this diagram is optional and will be used as a worksheet, it can be of particular help during an interview to keep concise record of the visual description given by the interviewee. Sometimes the researcher has visited the scene prior to conducting the interview. Using your knowledge of the scene, you can pre-sketch the scene on this page. During the interview, you may confirm the accuracy of your sketch with the story received from the interviewee. Have the interviewee describe or show you how the vehicle(s) moved during the incident. This technique may sometimes reveal new insights into the incident dynamics. In addition, you may be able to obtain a good locational fix regarding the vehicle's final rest position.

INTERVIEW FORM Specific Questions

The Interview Form is divided into the following major and subordinate sections:

General Information

- Description of Events
- Incident Site Sketch

Crash Information

- Crash Data Information
- Rollover Data
- Fire Data
- Vehicle Information (including service history)

Occupant Data Questions

- General Information
- Restraint Information
- Ejection, Entrapment, Mobility Information
- Child Safety Seat Information

Occupant Injuries

- Injury Information
- Injury Sketches
- Burn Chart

Each subsection contains structured questions with check boxes provided. The intent of this design is to reduce time required to write out responses and to establish a method for obtaining a large volume of data.

The interviewer should be knowledgeable of incident circumstances and review the Interview Form prior to conducting the interview to ensure documentation of all pertinent data. As a suggestion, the interviewer should mention the subsections listed above to help focus the interview and provide some insight to the interviewee as to the nature of interview.

The interviewer need not ask questions where information is already known prior to the interview attempt. This is especially true for vehicle related questions where information has

already been collected during the vehicle inspection. Where uncertainty exists, default by asking the appropriate questions.

For convenience, please review and use the following list of abbreviation codes to clarify when information was either obtained from the vehicle inspection, scene inspection, or not obtained. These codes should be written next to the specific question.

- VI** = **Vehicle Inspection** [Indicates that a question (or series of questions) is/are not asked because the answer is known prior to the interview from the vehicle inspection.]
- SI** = **Scene Inspection** [Indicates that a question (or series of questions) is/are not asked because the answer is known prior to the interview from the scene inspection.]
- R** = **Refused** (Use this abbreviation if the interviewee refuses to answer this specific question.)
- UNK** = **Unknown** (Use this abbreviation when the interviewee does not know the answer and a check off box was not provided as a choice.)
- NA** = **Not applicable** (Use this abbreviation if a specific question is not pertinent to the interview and no preceding question directs the interviewer around the question by means of a "Go to..." directive. Use with caution.)
- T** = **Terminated** (Use this abbreviation at the point where an interviewee abruptly ends the interview. Also annotate the remaining unanswered subsections with this code to indicate the interview had not progressed to these areas.)

CRASH INFORMATION

Crash Data Information

The questions under this subsection attempt to define this vehicle's pre-impact trajectory to final rest position (*i.e.*, travel direction, speeds, control, avoidance, and impacted objects). Information concerning environmental conditions is also included.

Rollover and Fire Data

Also included in the Crash Information section are subsections that are specific to vehicle rollovers and fires. Rollover questions describing the location, cause, direction of roll, and quarter turns are presented in a basic checkoff format. Fire questions describing the origin of the fire, how/where fire or smoke were first seen, information about fluid leakage and fuel tank level, and narratives related to fire sequence and timing are included. Some portions are presented in a basic checkoff format; some are in short narrative format.

Vehicle Information

The questions in this subsection pertain to vehicle identification, pre- and post-crash conditions, vehicle modifications, and data about the vehicle's service history. Questions concerning doors, glazing condition before the crash, glazing damage from impact, cargo weight, and specific notations of modifications to the vehicle are included.

The service data subsection should be directed toward the person most knowledgeable about the service history of the vehicle. This is usually, though not always, the owner. Ask who would be the best person to provide this information (if it is not the interviewee), and ask for a phone number or means by which they can be contacted. Questions in this section are short answer or narrative format, meant for later reduction by the investigator.

Narrative Summary

At the end of the Crash Information section, write a concise summary of the pertinent information obtained from the interviewee. This section should contain the most important details of the crash and fire.

OCCUPANT DATA QUESTIONS

General Information

The main questions under this section are directed toward gaining an understanding the number of occupants, their seating positions, occupant characteristics, and any potentially distracting activities being undertaken at the time of the incident (such as smoking or cellular phone use). Define the occupant number by seating position as listed on Interview Form page 9. Note that '19' can be used for row 1, unknown position, '99' can be used for unknown position, row also unknown, and xxA and xxB can be used for two occupants sharing position xx.

Restraint Information

Questions in this subsection are specific for both manual and automatic seat belt systems. The information is designed to capture usage along with "proper" usage of the belt system. The information is presented in a basic checkoff format with space provided for supplemental discussion.

Ejection, Entrapment, Mobility Information

Questions under this section focus on the degree of ejection or entrapment of the occupant during the collision. The mobility information describes the extent of help (if any) needed by the occupant in exiting the vehicle. Though most of the questions are in checkoff format, room is provided at the end for a narrative description.

Child Safety Seat Information

Questions in this subsection are specific to vehicles that had an occupant in a child safety seat. The information captures the type of seat and the direction it was facing at the time of the crash. Questions are presented in a checkoff format.

OCCUPANT INJURIES

Injury Information and Sketches

The main questions under this subsection relate to injuries and medical treatment. The injury questions are designed to probe for specific types of injuries. It is imperative the interviewer probe extensively using these questions to obtain the best injury description possible.

Variable: Were you injured?

Remarks: Specify that this includes even minor scrapes and bruises

Variable: Did you have any of the following?

Remarks: Definitions:

Cuts:	Broken skin
Abrasions:	Scrapes, including "road rash"
Bruises:	Skin discoloration
Broken Bones:	Diagnosed by x-ray
Head, Skull, Brain:	Any injury, including "concussion"
Internal Injury :	Any traumatic injury to internal organ; not "heart attack"
Sprains, Strains:	Any muscular soreness lasting more than a few days
Other:	Other injuries or events, e.g. heart attack or stroke; separate diagram

burns on

Additionally, extra care should be exercised in recording specific injury detail on the mannequin sketches. This includes thoroughly labeling body parts with the respective lesion and linking this information via arrow lines to the specific area on the mannequin (e.g., abrasion of the left index finger, etc.).

Soft tissue injuries (not including burns) include scrapes, and abrasions. Skeletal injuries include injuries to bones, joints, sprains, fractures, and dislocations.

Burn Chart

Similar to the injury information section above, have interviewee identify the body portions burned by using the table below the mannequin sketch (check yes/no for affected areas), and ask whether skin grafts were needed for those regions. Indicate on the mannequin sketches the area and extent of the burn injuries. If the information is available, include the source of the burn (e.g. hot fluid, flame).

Medical Release

At the conclusion of the interview (if not already asked and agreed at the beginning of the interview), ask the interviewee if they would be willing to sign a medical release form such that records of the injuries sustained during the collision-fire incident could be made available to the researchers. Record information on how and when this can be arranged, the date it has been promised, and any other details necessary for obtaining medical records.

The question concerning a signed patient release form is designed to remind the interviewer to mail (or present) this form in the following situations:

- ☛ Medical facility treating the occupant requires a release in order to obtain "any" medical records
- ☛ Medical facility treating occupant will only provide partial medical records (e.g., emergency room record only) without a signed patient release form.
- ☛ Treated by a private physician
- ☛ Uncertainty exists whether the person was treated at the stated medical facility

This question does not have to be asked if it is clear the only treatment received was provided by a medical facility which does not require a signed patient release form (*i.e.*, write NA).

EXTERIOR VEHICLE FORM INSTRUCTIONS

Form Page EV-1

The **Exterior Vehicle Form** is designed to be a comprehensive data collection tool arranged in a format to allow sufficient space for documenting vehicle damage profiles and associated relevant measurements. The procedures and definitions for recording that data in a format that will maintain system-wide consistency are included in the remarks on the following pages. All dimensions should be entered in inches.

Initial information about vehicle make, model, body type, inspection location and date should be entered as text (Model year is numeric).

Variable Name: Vehicle Identification Number

Element Values:

Code the entire VIN, left justify	
00000000000000000000	No VIN
??????????????????	Unknown

Source: Vehicle inspection

Remarks:

This VIN entry is obtained from the vehicle inspection. The entry in the General Vehicle Form is from other records, including the PAR or other records such as registration.

The VIN should be left justified, zeros and "Zs" should be slashed. Code "?" for any digits that are unknown or missing.

Variable Name: Is This a Multi-Stage Manufactured Vehicle And/Or A Certified Altered Vehicle?

Element Values:

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

Source: Vehicle Inspection.

Remarks:

Under the "Code of Federal Regulations, Title 49 - Transportation" Chapter V Part 567, Sections 567.5 and 567.7, a label certifying compliance with all Federal Motor Vehicle Safety Standards must be affixed to a multi-stage manufactured vehicle or altered (post manufactured) vehicle.

A multi-stage manufactured vehicle will generally begin as a chassis-cab (incomplete vehicle) and subsequently end up in final-stage as a pickup based utility truck (dump truck, flat bed, stake body, tow truck, etc.) or a van derivative (*i.e.*, van conversion, Hi-cube, motor home, etc.).

Form Page EV-1

Variable Name: Is This a Multi-Stage Manufactured Vehicle And/Or A Certified Altered Vehicle? (cont'd.)

Altered vehicles will generally involve a major modification of basic components such as suspension, frame, power plants, etc., with work generally performed by a recognized auto body shop. The lengthening of a standard automobile chassis to create a limousine would be one example of the type of alteration that would qualify for certification.

To determine if the vehicle qualifies, locate the certification label that should include one of the following statements:

Multi-stage vehicle

- ☞ Incomplete manufactured vehicle (chassis-cab) certification label should include the statement: "**CHASSIS-CAB MANUFACTURED BY**" or "**CHASSIS-CAB MFD BY**".
- ☞ Intermediate manufactured vehicle certification label should have the following statement: "**INTERMEDIATE MANUFACTURED BY**" or "**INTERMEDIATE MFD BY**".
- ☞ Final manufactured vehicle certification label should have the following statements: "**MANUFACTURED BY**" or "**MFD BY**" and "**INCOMPLETE VEHICLE MANUFACTURED BY**" or "**INC VEH MFD BY**".

Altered vehicle

- ☞ An altered vehicle certification label should include the statement: "**This vehicle was altered by (individual or corporate name) in (month and year in which alterations were completed) and as altered it conforms to all applicable Federal Motor Vehicle Safety Standards affected by the alteration and in effect in (month, year).**"

These labels are generally affixed in one of the following areas on the driver's side of the vehicle:

- ☞ hinge pillar
- ☞ door-latch post
- ☞ door edge that meets the door-latch post
- ☞ left side of the instrument panel
- ☞ inward-facing surface of driver's door

Code "0" (No post manufacturer modifications) is used when this vehicle was a full-line manufactured vehicle. Full-line is interpreted as a vehicle that is completely assembled at the end of a plant assembly line of its original manufacturer. This would include vehicles that only require cosmetic additions such as additional paint, mirrors, wheels, etc., to be customer ready!

Code "1" (Yes — post manufacturer modifications) is used for multi-stage vehicles and/or altered certified vehicles. This includes vehicles that were in various stages of completion (*i.e.*, incomplete, intermediate, final).

Variable Name: Is This a Multi-Stage Manufactured Vehicle And/Or A Certified Altered Vehicle? (cont'd.)

Vehicles that are altered via "backyard modification (*i.e.*, addition of air shocks, spring spacers, cosmetic alteration including sheet metal and paint, etc.) are not identified as altered certified vehicles. Only those businesses which specialize in vehicle alterations (*i.e.*, limo body shops, etc.) where a label of alteration is required by federal regulations and is present on the vehicle are identified in this element.

Code "9" (Unknown) is used in the following situations.

- ☞ The vehicle fits the description of a multi-stage or altered vehicle, but the researcher was not able to view the label(s) for positive identification.
- ☞ The label(s) was removed/destroyed so a clear determination of whether the vehicle was a certified multi-stage or altered vehicle could not be made.

Form Pages EV-1 and EV-2

Definitions for Damage Location and Crush Profile

Side or End Damage

Undeformed end width is measured and recorded whenever an end plane is involved.

End shift at frame (CDC) is assessed to determine whether sufficient end shift or bowing exists to necessitate incrementing the direction of force. Remember, end shift of 4 inches or more must be present on: both frame rails to allow for incrementation to the left or right, or at least one frame rail for vertical incrementation. If neither frame rail has end shift, this should be annotated on the form.

Locations

Locate end of damage with respect to the post crash centerline of the end plane or, for side impacts, to an undamaged axle. Spaces are provided to record the "Location of Direct Damage", "Location of Direct and Induced Damage", and "Location of Maximum Crush" measurements with respect to the vehicle post crash center or bumper corner for end impacts and an undamaged axle for side impacts. These required measurements are used to assist with CDC assignments (direct) and to determine the "D" dimension if not directly measured. The following examples include the data that are required.

Direct Damage Examples

- ☞ begins 4 inches right of post crash center of the end plane, or
- ☞ begins 12 inches rearward of the rear axle (side plane)

Definitions (cont'd).**L (Direct and Induced Damage Length) Examples**

- ☞ Entire end plane involved, or
- ☞ C₁ is 24 inches forward of the rear axle

Maximum Crush Examples

- ☞ located 5 inches left of post crash center of the end plane, or
- ☞ located at C₃, 25 inches forward of the rear axle
- ☞ located 2 inches forward of the rear axle

These data are required for each impact. A space is provided to indicate the "Impact Sequence Number".

Crush Profile

Several data elements are required to properly complete the crush profile data portion of the Exterior Vehicle Form. These data are grouped together as they are generally obtained during the vehicle inspection. Each column (or associated group of columns) is explained as below.

Impact Sequence Number contains the impact sequence number specific to this vehicle for which the data are being obtained.

Plane of C-Measurements contains the annotation of the plane at which the crush profile is documented (*i.e.*, bumper, grille, sill, mid-door). This column is annotated "**average**" when used to indicate the resultant profile from an underride-type impact.

Direct Damage: Width contains the indication of the length of direct damage as measured on the vehicle.

Direct Damage: Max Crush contains the measured maximum crush for the profile being documented. For measurements taken strictly by NASS technique, recall that maximum crush is determined after free space is subtracted. Indicate the free space at Max Crush in the space below the measurement. Use a third line to indicate the resultant maximum crush. Resultant crush by any technique is intended to measure linear distance between an undamaged vehicle profile and the post-incident profile of the subject vehicle.

L (direct and induced damage length) contains the recorded L as obtained during the vehicle inspection. Recall that L represents both direct and induced damage as measured along the reference line. This measurement is used to locate the position of the C-measurements.

C1-C6 contains the recorded two, four, or six C-measurements (as appropriate) on the line for the crush profile being documented. On the line beneath, annotate the free space to be subtracted. A third line is used to record the resultant crush profile. Resultant crush by any technique is intended to measure linear distance between an undamaged vehicle profile and the post-incident profile of the subject vehicle.

Definitions (cont'd).

$\pm D$ contains the recorded position of the center of direct damage. For end impacts distances are measured from the center of the vehicle with positive values toward the passenger side. For side impacts distances are measured from the centerpoint between axles with positive forward. The data obtained for the direct damage width is used to calculate "D"; indicate whether "D" is a positive or negative value.

If the spaces provided are not sufficient for the number of impacts that require documentation, include the additional data on the back of the first page of the Exterior Vehicle Form.

Form Page EV-3 Vehicle Damage Sketch

Exterior Vehicle Form **Page 3** enables researchers to report data that are not encoded and might otherwise be omitted from the case. Pertinent data such as scrapes, scratches, buckling, paint transfers, and other indications of engagement or relative motion are reported on this page. In addition, sketch the vehicle damage profile on the outlines provided, using the established protocol as below.

- ☞ End shift determination is necessary for coding CDC. See SAE J224, PDOF coding in columns 1 and 2 for more information. Reference information can also be found in NASS Vehicle Measurement Techniques, July 1989.
- ☞ Outline the damage profile produced by the impact.
- ☞ Use cross hatches to indicate direct damage.
- ☞ Highlight induced damage and/or remote buckling with diagonal lines.

Although researchers are reporting a vehicle's incident related damage, other damage may be observed which existed prior to the incident. These damaged areas, in addition to any towing related damage, are indicated and annotated accordingly.

INTERIOR VEHICLE FORM INSTRUCTIONS

The **Interior Vehicle Form** is intended for field data collection during an inspection of the incident vehicle(s), though some information may be considered from other sources. One form is used for each vehicle involved in the incident; the vehicle number is recorded in the header. Data are collected primarily to document occupant compartment intrusion and integrity, for purposes of understanding both the nature and extent of injuries, and the use (and functionality) of passenger restraints.

Form Page IV-1

Variable Name: Passenger Compartment Integrity (other than doors and windows)

Element Values: (00) No integrity loss
(01) Integrity loss (Describe in short narrative format)

Source: Vehicle inspection

Remarks:

Integrity loss is defined as a hole or opening that was caused by impact (other than an open door or damaged window, which are covered elsewhere). The intent is to document any possible path for fuel or fire to enter the passenger compartment, or for passengers to be ejected, that can be attributed to impact. Examples may include torn, bent, or broken sheet metal (including torn welds or seams) in the floor, firewall, or luggage compartment area (for fire path), or broken out sunroof panels (for ejection).

Form Page IV-2

OCCUPANT AREA INTRUSION OVERVIEW

Intrusion results whenever the internal boundary surface of the passenger compartment is moved inward due to direct or indirect damage resulting from the application of a crushing force to the exterior surface of a vehicle. A passenger compartment is defined as that interior occupant space which is normally available for occupant seating, based upon both the vehicle design and seat configuration at the time of the incident. Adjacent cargo areas and other enclosed areas are included for consideration in the following situations.

- ☛ The area behind the last row of seats designed by the manufacturer for cargo is integral with the passenger compartment.
- ☛ An area where a seat row was either removed or folded down to accommodate cargo.

Intrusion can occur from the vertical, longitudinal, or lateral direction. Intrusion can also occur from the displacement of interior seatbacks and/or seat cushions.

Measurement of Passenger Compartment Intrusion

On the Intrusion Worksheet, record interior overall length, width, and height on the upper diagram. Overall measurements are intended to provide a general reflection of intrusion severity when later compared to dimensions of an undamaged vehicle. Record information of measurement locations to facilitate such comparisons. Record the ten most severe intrusions in descending order, beginning with the most severe, then the second most severe component, etc. If there are less than ten intruding components, the lines following the last encoded intrusion should be left "blank". This worksheet is intended to be used for the Occupant Area Intrusion variables in the following section. Displacement of less than one inch is not considered an intrusion.

Form Page IV-3

Occupant Area Intrusion

Variables entitled Location of Impact Intrusion and Intruding Component are relatively self-explanatory. The coding for these variables are described on the form in this section.

Variable Name: Dominant Crush Direction

Element Values:

- | | |
|---|--------------|
| 1 | Vertical |
| 2 | Longitudinal |
| 3 | Lateral |
| 7 | Catastrophic |
| 9 | Unknown |

Source: Vehicle inspection.

Remarks:

This variable assesses the direction of displacement for the identified Intruding Component. The direction of movement is determined independently from the PDOF applied to the vehicle.

Code "1" (Vertical) refers to components which intrude into the passenger compartment from either an upward or downward direction.

Code "2" (Longitudinal) refers to components which move forward or rearward into the passenger compartment.

Code "3" (Lateral) refers to components which are displaced either left or right within the passenger compartment.

Code "7" (Catastrophic) is coded when the intrusion damage to the occupant compartment is so devastating that the researcher is not able to discern any of the following: specific occupant locations, intruding components, magnitude of intrusions, and dominant crush.

Code "9" (Unknown) is used for the following situations.

- ☞ The researcher cannot determine if there was any intrusion.
- ☞ The vehicle was under repair at the time of inspection.

Variable Name: Odometer Reading

Range: 000, 001 through 999, 999

Miles — Code to the nearest mile

000 No odometer

999 Unknown

Source: Primary source is the vehicle inspection, but describe source in any case. If the odometer is damaged or obscured interview or service records can be used.

Remarks:

This variable measures the distance the vehicle has traveled as indicated on the odometer. However, in cases where it is known that the odometer was working but had turned over (i.e., recycled) the coded value represents the total distance traveled by the vehicle rather than the reading on the odometer. Annotate the source of information when it is determined that the odometer had turned over.

Code "999" (Unknown) is used when:

- ☞ it is known that the odometer was disconnected or broken before the collision;
- ☞ the vehicle is equipped with an electronic instrument cluster and an analog "back-up" odometer is not present; or

- ☞ the vehicle's odometer reading is unknown.

Form Page IV-4 and IV-5

INSTRUCTIONS FOR COMPLETION OF VEHICLE INTERIOR SKETCHES AND POINTS OF OCCUPANT CONTACT PAGES

The VEHICLE INTERIOR SKETCHES page and corresponding POINTS OF OCCUPANT CONTACT page provide a valuable link between vehicle interior documentation and occupant injury data. Properly completed, these records identify evidence of occupant contact points and relate the contact points to the part of the occupant's body that produced the evidence.

In completing the Vehicle Interior Sketches, assess the occupant trajectory in conjunction with the impact configuration, direction of force, and use of restraints. As contact points are identified, they should be documented as follows.

- ☞ Sketch the damaged area on the instrument panel outline (e.g., radio, glove compartment, and damage to instrument panel structure).
- ☞ Annotate the contacted area with a letter (begin with A) and list on the Points of Occupant Contact page.
- ☞ In the column adjacent to the respective letter, identify the interior component contacted. Specify the number of the contacting occupant if it can be determined.
- ☞ Identify the type of evidence present (i.e., scuff, tissue transfer, tooth, etc.) in the "Supporting Physical Evidence" column.
- ☞ Specify the level of confidence which you feel best represents your conclusion using the scale of: 1 (Certain), 2 (Probable), 3 (Possible), or 4 (Unknown).
- ☞ Within the vehicle, highlight the contact with yellow (or similar) tape for photographic purposes.
- ☞ Annotate the area through which the occupant was ejected or the area in which the occupant was entrapped.

Form Page IV-6

MANUAL RESTRAINTS WORKSHEET

Restraint usage data, recorded on the noncoded section of the Interior Vehicle Form under the title "MANUAL RESTRAINTS", is based solely on the evidence obtained during the vehicle inspection.

An indication of restraint usage is determined for only those seating positions believed or possibly occupied during the subject incident. The "indication of usage" represents "recent usage" rather than "usage ever", whenever possible. The following evidence is sought when assessing restraint usage:

- ☞ **belts/fittings damaged by occupant loading:** deformed anchor components, stretched webbing, latch metal peening (loading impression on metal);
- ☞ **placement of belts:** on, behind, or under seatbacks or cushions; and,
- ☞ **condition of belts:** dirty, dust covered, mechanically unusable, knotted, size adjustment on fixed length belts, cut for convenience or comfort (out of the way, near housings), or cut for occupant extraction by emergency personnel (usually at an easily accessible position).

Restraint "usage in this incident" is not generally determined solely from field inspection data. Vehicle evidence along with police report information, interviews, relationship of contact points to seat position given the PDOF applied to the vehicle, presence of belt-caused occupant injuries, and presence or absence of ejection are considered before encoding restraint usage on the Occupant Injury Assessment Form.

Form Page IV-8

AUTOMATIC RESTRAINT USAGE

Automatic belts should be coded in an analogous manner to the manual restraints above.

Air bag evaluations are coded as described on the form.

CHILD SAFETY SEAT FIELD ASSESSMENT WORKSHEET

For each child safety seat present in the vehicle, assign (unless you have knowledge regarding what the occupant's number is) the seat a temporary occupant number. Determine the correct answer for each of the six row variables present on Page IV-8. Due to the transient nature of child safety seats, annotate questions regarding its position for use during the interview. From this data, the actual position of the child safety seat at the time of the incident and the occupant's correct number can be determined for the inclusion on the Occupant Injury Assessment Form.

FIELD FIRE INVESTIGATION FORM INSTRUCTIONS

The **Field Fire Investigation Form** is designed to be a comprehensive field data collection tool for documenting information about fire damage to the vehicle and the type, presence, and condition of various vehicle systems and components. The purpose for this form is to gather data that provide insight into the cause, origin, and propagation of the fire in the context of the maintenance and design state of the vehicle.

The form is broken into the following sections:

- General - Exterior
- Engine Compartment
- Interior Fire Examination
- Under Carriage Fire Inspection
- Fire Inspection Summary

The Field Fire Investigation Form is largely self-explanatory. The majority of questions are of the checkoff variety, with occasional blanks for one-word clarifications or short descriptions. It is intended that these sections are worksheets that will give all investigators a consistent framework for conducting field inspections. Eight narrative summaries placed throughout the first four sections should capture all information of significance to the fire event, including that which was contained in the checkoff questions. It is intended that a large number of the checkoff questions will not be coded, so it is important that the narratives contain the essence of what was important to fire investigations.

Form Page FFI-1

General - Exterior

This section includes questions related to fire extent (percent of vehicle with fire damage and identification of specific areas burned), fuel filler cap presence and location(s), and a description of any non-OEM components on the vehicle.

If it can be concluded that the fuel filler cap was not likely to have been present at the time of impact, code fuel filler cap presence as "missing." If the fuel filler cap is not present but may have been consumed in the fire, code filler cap presence unknown.

The purpose of specifying non-OEM components is for documenting any changes to the vehicle that may have altered its mechanical, structural, or electrical make-up, especially in the context of fire initiation or propagation.

Form Pages FFI1-FFI4

Engine Compartment

Questions pertain to the presence or condition of components or systems found in the engine compartment, including the engine itself (size, orientation,), cooling system (radiator, reservoir, fluid level, cap(s), hose(s), etc.), engine electrical (battery, cables, wires, fuses, etc.), power steering system, brake system, air intake system, fuel delivery system (fuel type, fuel pump type, fuel lines and hoses), oil filter, and exhaust manifold.

Note that shorting of a fusible link may not be evident visually; with the battery disconnected, test for continuity across the link.

Variable: Battery Voltage

Remarks: Measure the voltage drop across battery positive and negative terminals.

Variable: Resistance of battery lead to ground

Remarks: Disconnect the positive battery lead. Measure resistance from the positive battery lead to chassis ground.

Form Pages FFI4-FFI6

Interior Fire Examination

Questions pertain to the extent of damage to the interior and cargo area, the flammability of any cargo, the condition of windows or glazing, and positions of electrical controls on the dash or steering column. The glass inspection questions distinguish between heat and impact damage and allow specification of window position (open, closed, partially open). The intent is to identify any paths for fire propagation through open, missing, or impact-damaged glass and general burn pattern as evident on glass.

Form Pages FFI6-FFI9

Under Carriage Fire Inspection

Questions pertain to general damage characterization, fuel tank damage characterization, filler neck damage, fuel line routing, connections, and damage, exhaust system component identification and damage, and damage to the automatic transmission, brake lines, rubber body mounts and drive shaft.

If there are more than two tanks on the vehicle, attach additional pages.

Fire Inspection Summary

The final four questions are all narrative summaries. The first three are intended to be distilled from the previous eight summaries to identify fuel sources, ignition sources, and the fire origin. The final narrative is a Fire Inspection Summary, which is the final reduction of all fire inspection data to summarize the overall findings of the inspection. All four narratives will be coded.

INCIDENT SITE FORM INSTRUCTIONS

Form Page AS-1

The **Incident Site Form** is intended as a repository for information collected at the incident site. In addition to a sketch of important site features, including roadway dimensions and characteristics, traffic controls, landmarks, skidmarks, burn patterns, and debris, specific data are collected to document coefficient of friction, grade, and surface type and condition. In general, dimensions (distance and direction) are to be taken from a known reference point and a reference line, the latter of which usually corresponds to a curb or pavement line in proximity to the zone of interest. Measurements should include reference locations expected to remain constant for a reasonable period of time (i.e. fire hydrants, sewer grates, and bridge abutments).

Variable Names: Incident Location (City, State, County, Road, Milepost)
Entries: Text, self-explanatory
Remarks: If no milepost, use distance from named intersection or landmark

Variable Name: Posted Speed Limit
Entries: 00-99 mph
Source: Posted on roadway or documentable legal limit

Variable Name: Travel Direction
Entries: N, S, E, W, NE, NW, SE, SW.

Variable Name: Surface Type
Entries: (1) concrete, (2) asphalt, (3) gravel, (4) dirt, or (5) other

Variable Name: Coefficient of Friction
Entries: 0.00 to 1.00
Source: Measured with instrumentation or provided by state
Remarks: COF to be measured with G-analyst or equivalent on roadway surface near incident site.

INCIDENT RECONSTRUCTION FORM INSTRUCTIONS

The **Incident Reconstruction Form** is designed to be a comprehensive data collection tool for documenting Collision Damage Classifications are assigned to all vehicles, and incident reconstruction analyses are performed on the vehicle subject to collision-fire (vehicle 1). CDC is included in the database to provide a concise and universal description of impact damage to vehicles. The Incident Reconstruction Form may be completed in the office after all relevant material has been gathered.

AF: 1-2

CDC RELATED REMARKS

CDC Worksheet

CDCs and incident reconstructions are completed for all damaging (with potential for fire) and injurious collisions. The CDC worksheet will not be coded in the electronic database. It is presented for investigator notes in preparation of the coded CDC fields available on the following page - which will be contained in the electronic database. Columns with notations '1-7' above the headings are described in SAE J224, as is the column titled 'Incremental Value of Shift.'

CDCs should be completed based on inspection data, or adequate photographs of the post-incident damage to the vehicles, but should not be completed reliant upon witness or interview data alone unless the damage is insignificant. Relevant inspection data may be found on the **Exterior Vehicle Form**, page EV-1-3.

The 'Object Contacted' column entries are enumerated on the bottom of the same page of the form. For further descriptions of the 'Object Contacted' coding, see the NASS manual.

Direct Damage

The CDC generated for a particular impact is based upon damage resulting from **direct** contact only; it does not include **induced** damage. All CDCs are based entirely upon the procedures in SAE J224 MAR80. Partial CDCs may be entered, using ? for any unknown character.

Add-on Components

Add-on components (e.g., snow plow blade, pickup cap, etc.) are considered cargo, and a CDC is not generated for direct damage sustained by the add-on component.

Overlapping Damage

During some incident sequences, a vehicle will sustain "overlapping damage" (*i.e.*, multiple impacts in the same area of the vehicle). If the direct damage caused by each object contacted cannot be separated and described with individual CDCs, then one CDC is generated to describe all of the damage.

CDC RELATED REMARKS (Continued)

Single Impact/Event

If the vehicle sustained only one impact/event, the corresponding CDC (*i.e.*, documented or unknown) is entered. The CDC and crush data for the second impact sequence number may be left blank. Put a line through any field not used for any reason to clarify that the variable was intentionally missed.

Multiple Impacts/Events

If the vehicle is involved in multiple impacts/events, the corresponding CDCs are entered in chronological order of occurrence.

Variable Name: C.D.C. — Direction of Force

Element Values:

Range: Blank, 00-12, 20-32, 40-52, 60-72, 80-92, 99

Blank No C.D.C.

00	Nonhorizontal force	07	7 o'clock
01	1 o'clock	08	8 o'clock
02	2 o'clock	09	9 o'clock
03	3 o'clock	10	10 o'clock
04	4 o'clock	11	11 o'clock
05	5 o'clock	12	12 o'clock
06	6 o'clock	99	Unknown

Incremental Values for Above Force Directions

00	No shift
20	End shift vertical--up; top shift--forward
40	End shift vertical--down; top shift--rearward
60	End or top shift lateral--right
80	End or top shift lateral--left

Source: Restricted to vehicle inspection or photographs unless damage was reported to be insignificant.

Remarks:

Code the principal direction of force incremented to indicate: (1) vertical or lateral shifting of vehicle basic end structures which occurred during horizontal force application, or (2) longitudinal or lateral shifting to the top structure resulting from nonhorizontal force application

CDC RELATED REMARKS (Continued)

to the top. In other words, the combined value (Direction of Force + Incremental Value of Shift) is coded under this variable.

Code "00" (Nonhorizontal Force) (plus any Incremental Value of Shift for a top structure impact) any time a vehicle becomes inverted and impacts any object or vehicle while inverted. In addition, use this code in any other circumstance that is consistent with the directions contained in SAE J224 MAR80.

When occasional differences which seem to be inconsistent (e.g., PDOF = 010° and clock position = 01) are encountered, they actually reflect the investigative method; therefore, reconcile the differences by reviewing the entire case and any CRASH output to determine if the difference is reasonable. It is not necessary to amend the PDOF on page AR-1. This procedure allows the QA reviewer to appreciate what the researcher thought the PDOF was, to the closest 10 degrees, based upon examination of that vehicle alone, while the clock position representing the force on page AR-2 reflects the final determination after examining all sources (vehicles, objects contacted, scene evidence, CRASH program, etc.). In other words, it is not necessary for the force directions on page AR-1 and the PDOFs on page AR-2 to be compatible. However, any force direction on the final CRASH output must be compatible with the force direction coded on page AR-2.

Code "Blank" (No event or not CDC applicable) is used when there is not an event or when an event exists but is not CDC applicable.

Variable Name: C.D.C. — Deformation Location

Element Values:

Blank	No C.D.C.
F	Front
R	Right side
L	Left side
B	Back (rear)
T	Top
U	Undercarriage
9	Unknown

Source: Restricted to vehicle inspection or photographs.

Variable Name: C.D.C. — Specific Longitudinal or Lateral Location

CDC RELATED REMARKS (Continued)

Element Values:

Blank No C.D.C.

Horizontal Impacts

D Distributed- — side or end
 L Left — front or rear
 C Center — front or rear
 R Right- — front or rear
 F Side front — left or right
 P Side center section — L or R
 B Side rear — left or right
 Y Side (F + P) or end (L + C)
 Z Side (P + B) or end (C + R)
 9 Unknown

Top or Undercarriage

D Distributed (F+P+B)
 F Front Section
 P Center Section
 B Rear Section
 Y F+P
 Z P+B
 9 Unknown

Source: Restricted to vehicle inspection or photographs.

Remarks:

Element values "F", "P", "B", "Y", "Z", and "D" must be used for vehicles with top or undercarriage deformation ("T" or "U" in variable EV07 and/or EV15).

Variable Name: C.D.C. — Specific Vertical or Lateral Location

Element Values:

Blank No C.D.C.

CDC (Vertical - Front, Rear, or Side Impacts)

A All
 H Top of frame to top
 E Everything below belt line
 G Belt line and above
 M Middle — top of frame to belt line or hood
 L Frame — top of frame, frame, bottom of frame (including undercarriage)
 W Below undercarriage level (wheels and tires only)
 9 Unknown

CDC (Lateral - Top and Undercarriage Impacts)

D Distributed
 L Left
 C Center
 R Right
 Y Left and Center (L + C)

CDC RELATED REMARKS (Continued)

Z Right and Center (R + C)
 9 Unknown

Source: Restricted to vehicle inspection or photographs.

Variable Name: C.D.C. — Type of Damage Distribution

Element Values:

Blank No C.D.C.
 W Wide impact area
 N Narrow impact area
 S Sideswipe
 O Rollover (includes side)
 A Overhanging structure
 E Corner
 K Conversion in impact type
 U No residual deformation
 9 Unknown

Source: Restricted to vehicle inspection or photographs.

Note: When recording a "K" conversion impact type on, page AR-2 code the first half of the "K" conversion in one CDC row entry, and code the second half of the "K" conversion in the next CDC row entry.

Variable Name: C.D.C. — Deformation Extent Guide

Element Values:

Blank No C.D.C.
 01 One
 02 Two
 03 Three
 04 Four
 05 Five
 06 Six
 07 Seven
 08 Eight
 09 Nine
 99 Unknown

Source: Restricted to vehicle inspection or photographs.
Remarks:

CDC RELATED REMARKS (Continued)

Extent zone is coded from direct damage only, even when a body panel is torn loose from the vehicle frame due to impact; consider body panels torn loose from the frame as not representative of residual crush.

When you average two crush profiles, use the largest maximum crush for your extent zone (*i.e.*, do not use the averaged maximum crush).

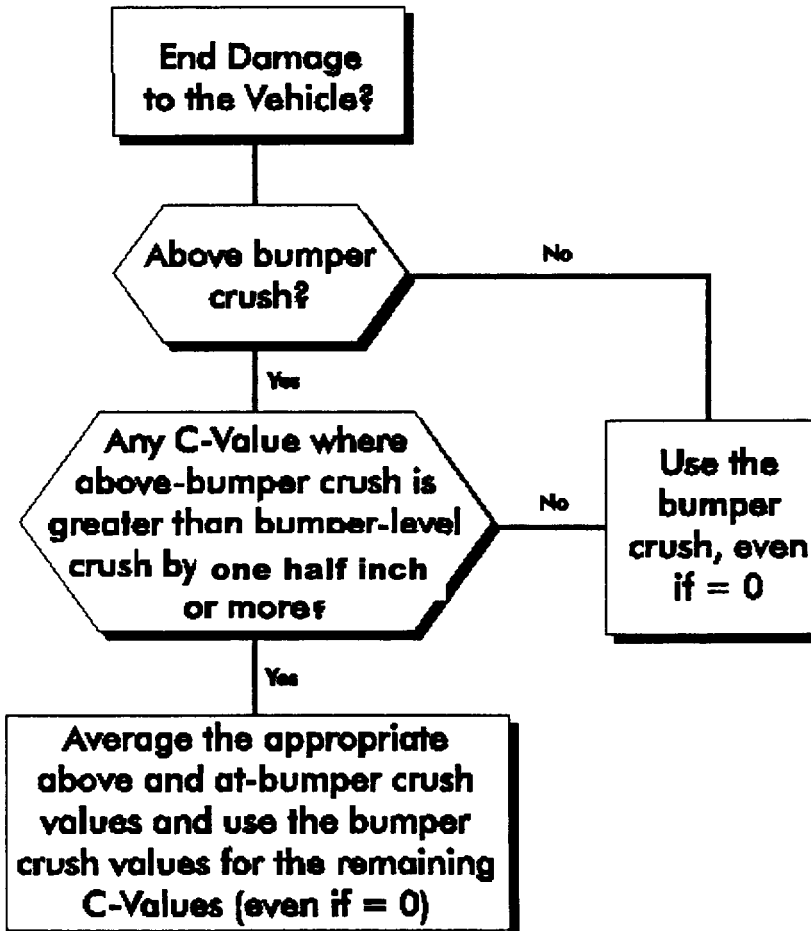
CRUSH PROFILE OVERVIEW

For the section entitled "Crush Profile", code the CDC associated damage dimensions for each impact sequence in chronological order. The encoded "L", "C"s and "D" values must be the actual data set used in the reconstruction program (*i.e.*, CRASH or OLDMIS).

If the damage measurements are known, code the appropriate measurements to the nearest tenth of an inch regardless of whether a reconstruction algorithm was completed. If only two or four C-values are collected (rare occasions), then leave the remaining C-value fields blank.

CRUSH PROFILE REMARKS (Continued)

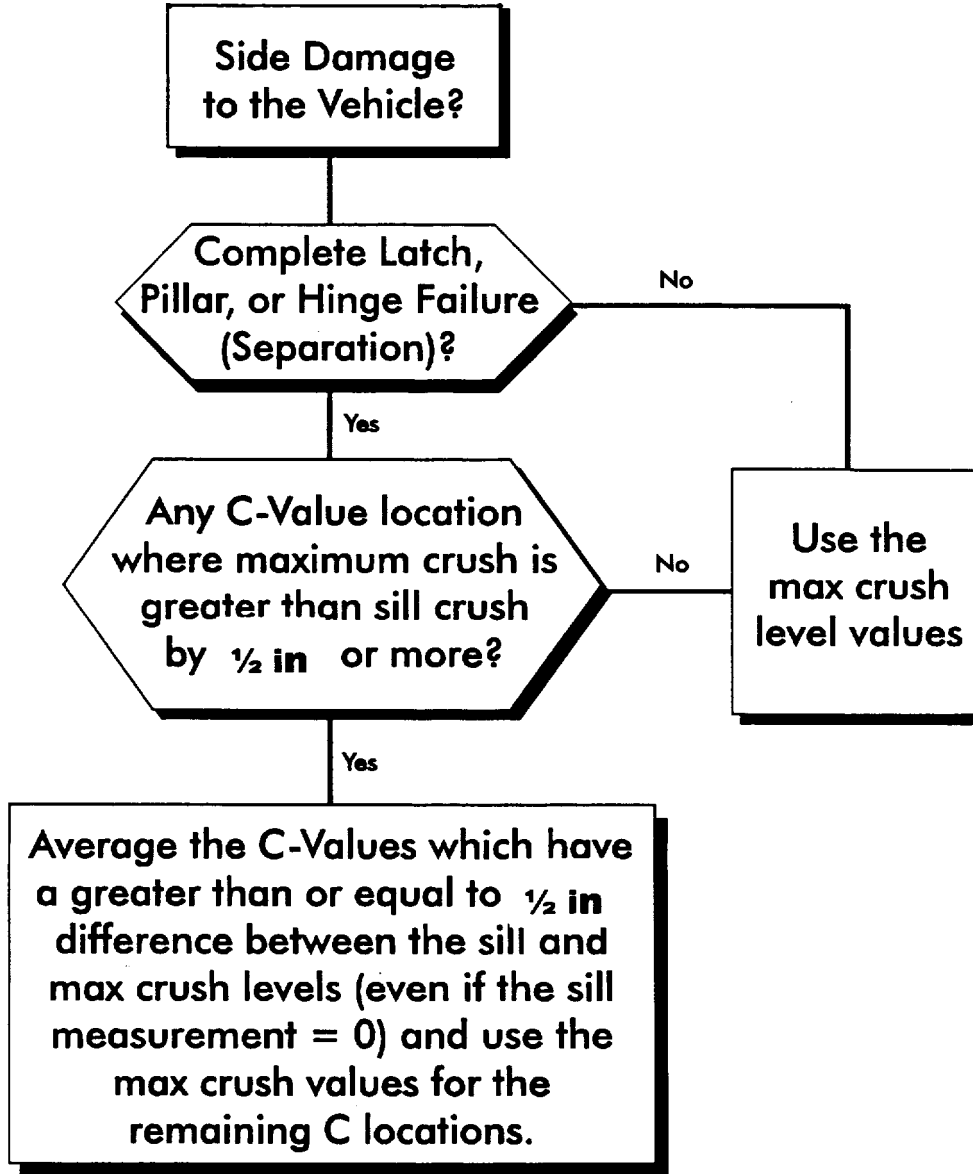
END DAMAGE MEASUREMENT PROTOCOL



CRUSH PROFILE REMARKS (Continued)

CRUSH PROFILE OVERVIEW

SIDE PLANE DAMAGE MEASUREMENT PROTOCOL



CRUSH PROFILE REMARKS (Continued)

Variable Names: L - Deformation Length, C1-C6, and D

Remarks: Taken from the exterior vehicle form.

Source: Vehicle inspection.

INCIDENT RECONSTRUCTION CALCULATED PARAMETERS

Entries are available for results of calculations of travel speed, impact speed, Delta V, and collision energy. Of these Delta V is the most important, and therefore should receive the greatest priority. Other values are important when they are necessary to calculate Delta V. If they are not necessary for accurate Delta V calculations, additional effort need not be expended to obtain them.

Calculate the necessary parameters for each collision with potential for damage that could lead to fire or injury. For each parameter, entries are made for the range of expected values, and for the single value that can be entered to express the part of the range of highest confidence. The minimum and maximum reasonably expected values of a parameter may be entered from the extent of values calculated with various assumptions or input values. If there is no information to expect any value in the range would be more likely, then use the average of the limits of the range as the single value of the parameter. The single value selected for entry should be justified in the Incident Reconstruction summary.

Attach additional pages if there are more than 2 damaging or injurious impacts. Use the guidelines on page AR-4 to direct methodologies and documentation for quality assurance review.

Use the most expedient technique available to calculate Delta V. If crush stiffness values are available from crash tests that reasonably approximate the crash conditions (direction of impact, object orientation and size, collision speeds or delta V, etc.) then collision damage energy may be the best approach. For narrow object impacts or side impacts without representative crash test data, other techniques may be necessary.

Entries for ranges of results are provided to express the uncertainty of various approaches.

Example: The best methodology for existing data is crush damage energy for a narrow impact collision, but no narrow object crash test is available. Use the stiffness values from full barrier crash tests, and increase the stiffness for narrow object impact based on literature values. When making such adjustments, the sources of adjustment factors should always be cited in the documentation.

Example: Coefficient of friction measurements are used to calculate Delta V. The field inspection coefficient of friction measurement obtained was on a wet surface while the subject event occurred on a dry road. Use literature values to adjust the coefficient of friction value in calculations and include citations in the documentation.

Incident Reconstruction Summary and Conclusions

Summarize all methodologies, in a clear and concise fashion so someone can efficiently review all work. Include all input values, vehicle specifications, references to sources, formulae used. Document all judgments made.

NARRATIVE DESCRIPTION OF INCIDENT

After the incident reconstruction is complete, the investigator will have a detailed understanding of all incident events. This is the best time to prepare a narrative description of the incident. The narrative is a story that must stand on its own as a clear account of what happened. Enter a short and concise description of the incident sequence and circumstances. Make the narrative chronological. Stick just to the known facts. Don't use flowery language. Reference the sources of information used to document the incident, especially when including quotations. The check-boxes are there to help you remember items to potentially cover. You may want to check each one off as you cover the topic in your narrative.

Note: It is not necessary to comment on the negative of each listed item. For example, don't include, "There was no indication of alcohol involvement," or, "There were no ejections."

Remember to write in real English and use complete sentences. Also, avoid sensational descriptions of fire or other events.

Potential items to include in the narrative:

- Events of the incident
- Number of vehicles
- Indications of incident severity (speeds, objects collided with, intrusion, crush, Delta V)
- Number of fatalities or injuries
- Description of injuries
- Cause of death and/or injuries (use quotes where possible)
- Number and positions of occupants
- Restraint usage
- Ejection
- Rollover
- Non-OEM modifications
- Alcohol usage (BAC)

FIRE INFORMATION

- Identification of fuel and ignition sources
- Initiation location and propagation paths (evidence of same)
- Time to fire initiation and propagation
- Description of vehicle damage related to fire causation or propagation

OCCUPANT INJURY ASSESSMENT FORM INSTRUCTIONS

The **Occupant Injury Assessment Form** is divided into two major sections -- one to be completed by investigating engineers, the other to be completed by the medical team. The form is intended as a repository for information gathered about each of the occupants; hence one form must be completed for each occupant, and the appropriate **Occupant Number (Position)** must be noted in the header information on each page. For the engineering portion of the form, required information is gathered from a variety of sources, including inspection of the vehicle, interviews, and the police incident report (PAR). In many cases, information to be coded on the **Occupant Injury Assessment Form** will have been collected in worksheet format on another form (particularly the Interior Vehicle Form and Interview Form). For the medical portion of the form, data to complete the form will come largely from medical records and interviews.

Most of the questions on this form are self-explanatory and do not require extensive additional description. Those that are less obvious will be explained in further detail.

Form Page CAE-1

OCCUPANT INJURY ASSESSMENT FORM - ENGINEERS

The form is divided into the following subsections:

- Occupant's Characteristics
- Occupant's Seating
- Belt System Function
- Police Reported Restraint Use
- Air Bag/Seat Performance
- Child Safety Seat

Occupant's Characteristics

This section contains basic information about the occupant's age, gender, height, weight, and role (driver, passenger, etc.) in the incident.

Occupant's Seating

Questions pertain to the occupant's seating position, ejection classification, entrapment, and mobility following the incident. Note that the occupant seat position code (e.g., driver seat = 11) is the **Occupant Number (Position)** required in the header information and used elsewhere in the data collection forms.

One variable requiring further clarification follows:

Form Page OAE-2

Variable Name: Occupant's Mobility

Range: 0 - 5, 8, 9

Element Values:

- | | |
|---|---|
| 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 from vehicle with some assistance
- 4 Exited from vehicle under own power
- 5 Occupant fully ejected
- 8 Removed from vehicle for other reasons (specify):
- 9 Unknown

Source: Investigator determined — inputs include PAR, fire and or EMS personnel/records, medical records, witnesses, and interviewees.

Remarks: This variable is to be coded hierarchically, that is, if codes 1 and 2 both apply then code 1.

Code "0" (Occupant fatal before removed from vehicle) is used when it can be determined that the occupant was deceased prior to removal from the vehicle.

Code "1" (Removed from vehicle while unconscious or not oriented to time or place) is used when it can be determined that the occupant was unconscious or had diminished awareness (not oriented to time and place) when they were removed from the vehicle.

Code "2" (Removed from the vehicle due to perceived serious injuries) is used when it can be determined that the occupant was injured but conscious and oriented and had to be removed from the vehicle due to their serious injuries (e.g. broken femur). A key factor to consider is the perceived seriousness of the injury. Generally this involves removal by EMS personnel.

Code "3" (Exited the vehicle with some assistance) is used when the occupant was able to exit the vehicle partially under their own power but their condition was such that some assistance in exiting was necessary.

Code "4" (Exited the vehicle under own power) is used when the occupant was able to exit the vehicle without assistance from another person.

Code "5" (Occupant fully ejected) is used when the occupant was completely ejected from the vehicle (and coded as such).

Code "8" [Removed from vehicle for other reasons (specify):] includes those people who require assistance in exiting the vehicle and would have required assistance even if there had not been a crash i.e., infants, severely disabled, intoxicated persons.

Code "9" (Unknown) is used when the researcher cannot reasonably determine the manner of exit by the vehicle occupant.

Form Page (DAE-2

Belt System Function

Questions deal with manual (active) and automatic (passive) belt systems. Most are relatively self-explanatory, though the form contains considerable detail for these questions should there

be any difficulty interpreting findings. Two variables have been described here in full detail for clarity:

Variable Name: Automatic (Passive) Belt System Availability/Function

Element Values:

- | | |
|---|--------------------------------|
| 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 |

Source: Researcher determined — primary source is the vehicle inspection; secondary sources include medical records, the interview, and police report. **NOTE:** The use of the police report is limited. If there is no vehicle inspection and the only secondary source is the PAR, then the PAR "narrative" must clearly state that the automatic belt system was used or available. An indication of usage or availability in a "restraint system" block is, by itself, not usable.

Remarks:

Some belt restraint systems are a combination of manual (active) and automatic (passive) occupant protection devices. For this variable, consider only the automatic portion of the system. Select the automatic belt system which was available at the time of the incident for this occupant.

Automatic belts are designed to restrain an occupant and allow an occupant egress (the act of going from an enclosed place) without the requirement of manually activating the belt. Some systems use only a torso belt [code "1" (2 point automatic belts)], while others are designed with a lap and torso belt [code "2" (3 point automatic belts)]. A clue for proper system identification involves the egress issue. If you are sitting in the occupant's position and all belts are attached and you open the door, then determine if you *have to* detach any belt in order to exit the vehicle. Belts which do not require detaching are automatic belts. Note! The ease of egress is not considered because many automatic belt systems may appear cumbersome.

Availability is assessed based on the occupant's seating position. Select the automatic belt system that was available for use, if so desired, by the occupant relative to the occupant's seating position in the vehicle. Availability is also determined by presence, functional status, and use of the automatic belt system. Any occupant who is using a belt restraint system, or portion thereof, must by default have that system available to them. The correctness and/or appropriateness of the use is considered in a later question, Proper Use of Automatic (Passive) Belt System.

Certain occupant seating situations involve abnormal posture. Examples are:

- ☞ occupant on the floor [*i.e.*, in front of a designated seat (*e.g.*, sitting, standing, etc.)];
- ☞ occupant lying across one or more seating positions;

- ☞ occupant sitting side-by-side of another occupant in the same seating position, since only one can be assigned to the seating position — see Occupant's Seat Position;
- ☞ occupant standing or kneeling in a designated seating position); and
- ☞ occupant in or on the lap of another occupant (e.g., sitting, standing, kneeling, etc.).

Occupant on the floor: For this situation use code "0" (Not equipped/not available). These occupants are not in a designated seating position and do not have an automatic belt available.

Occupant lying across one or more seating positions: For an occupant lying across multiple seating positions, (Occupant's Seat Position) must equal code "14", "24", "34", or "44". These occupants can be using an automatic belt: If they are, then code availability based upon the belt used. Do not confuse this situation with occupants lying against a door or side panel or against another occupant. Persons in this latter category are still considered to be occupying a single occupant seating position.

Occupant sitting side-by-side of another occupant in the same seating position: These occupants (*i.e.*, Occupant's Seat Position equals "14", "24", "34", "44") do not have an automatic belt available unless such a person is sharing the use of an automatic belt (*i.e.*, two or more persons sitting side-by-side using the same automatic belt should have the same restraint available for each occupant).

Occupant standing or kneeling in a designated seating position: These occupants have automatic belts available to them for use. Availability is assessed for these occupants based on the occupant's assigned seating position.

Occupant in or on the lap of another occupant: These occupants do not have an automatic belt available unless such a person is sharing the use of an automatic belt (*i.e.*, two or more persons sitting in front of one another or on top of one another using the same automatic belt).

Code "0" (Not equipped/not available) indicates: (1) that at the time of the incident the designated seating position that the occupant was in, was not equipped with a manufacture installed or post manufacture installed automatic belt (2 point or 3 point); (2) the occupant was not in a designated seat position (e.g., on the floor); (3) the occupant was not the person assigned the designated seat position and was not using an automatic belt (e.g., sitting side-by-side); or (4) the seat position that the occupant was in was equipped only with a manual (active) belt system.

Code "1" (2 point automatic belts) is used when a torso belt is anchored along the inboard side of the front seat and anchored either at the upper window frame of the door surface (adjacent to the upper B-pillar) or attached to a motorized track located along the upper A-pillar, roof side rail, and upper B-pillar. A two-point automatic belt system requires the presence of either a manual lap belt or a knee bolster.

Code "2" (3 point automatic belts) is used for an automatic belt system consisting of a lap and torso belt. This system uses a common anchor for both belts located on the inboard side of the front seat and two anchors along the door surface (e.g., commonly used in late model General Motors cars). This system can be detected by sitting in the occupant's position with the latch plate/buckle attached and opening the door. If the belt travels with the door and allows egress without detaching the belt, then use this code—the system is automatic.

Code "3" (Automatic belts — type unknown) is used when (1) no vehicle inspection occurs and the occupant's seating position is known to have automatic belts (e.g., from the VIN) but the type (2 point versus 3 point) is unknown, or (2) a vehicle inspection occurs and the occupant's seating position is known to have automatic belts but the researcher is not able to determine from the vehicle inspection or any secondary sources what type of automatic belts are available.

If the type of automatic belt system is determinable, then the system's mechanization can also be determined because most manufacturers use the same type of system for a given vehicular model. In addition, if the type of automatic belt system is indeterminable, then it is assumed that the system is functional (*i.e.*, code "3" takes precedence over code "4" below).

Code "4" (Automatic belts destroyed or rendered inoperative) is used when the automatic belt, initially installed at this occupant's seating position, was subsequently removed or destroyed (e.g., unbolted, cutout, etc.) or in any way rendered inoperative. In addition, use this code for belts that are extremely deteriorated from aging. Do not use this code for motorized belt tracks that are mechanically or electrically inoperative.

Belts which are knotted, buckled at the rear of the seat (bench or bucket), etc., are available if they were otherwise operative.

Code "9" (Unknown) is used for front outboard seat occupants of uninspected passenger vehicles where it cannot be determined from any secondary source whether or not this occupant's seating position was equipped with an automatic belt system.

Variable Name: Automatic (Passive) Belt System Use

Element Values:

- 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

Source: Researcher determined — primary source is the vehicle inspection; secondary sources include the interview and medical records. **NOTE:** Do not use the police incident report as a source for coding this variable.

Remarks:

Code "0" (Not equipped/not available/destroyed or rendered inoperative) is used when Automatic (Passive) Belt System Availability/Function, is coded "0" (Not equipped/not available) or is coded "4" (Automatic belts destroyed or rendered inoperative).

Code "1" (Automatic belt in use) is used when Automatic (Passive) Belt System Availability/Function, equals "1" (2 point automatic belts), "2" (3 point automatic belts), or "3" (Automatic belts - type unknown) **and** this occupant was using the automatic belt. The correctness of the use is not assessed on this variable [see variable Proper Use of Automatic (Passive) Belt System].

Code "2" [Automatic belt not in use (manually disconnected, motorized track inoperative)] is used when the automatic belt's latch plate/buckle was detached at the time of the incident. For example, this code is used to capture disconnected 3-point, door mounted automatic belts (*i.e.*, 1987 and newer General Motors vehicles) which can be used similar to an active lap and shoulder belt system.

This code is also used for motorized tracks that were ***not in the restrained position*** at the time of the incident. The motorized track may be inoperative because of fuse removal, electric motor failure, or track failure when the malfunction prevents the automatic belt system from moving along its track into the restrained position.

Note! This variable does not assess how this occupant uses the automatic belt when entering or exiting the seating position. For example, this occupant may routinely manually detach/attach the latch plate/buckle (*i.e.*, uses the automatic belt system as if it were a manual belt system). This variable assumes that the nonmotorized automatic belt is available and functioning and assesses whether or not the latch plate/buckle was attached at the time of the incident. If the latch plate/buckle was attached at the time of the incident, then use code "1" (Automatic belt in use). On the other hand, if it was detached, then use code "2" [Automatic belt not in use (manually disconnected, motorized track inoperative)].

For motorized belts, this variable assumes that the motorized belt system is locked in the restrained position with the belt attached at the time of the incident. If the motorized belt system was locked in the restrained position and the belt was attached at the time of the incident, then use code "1" (Automatic belt in use). If the motorized belt system was not locked in the restrained position or the belt was detached, then use code "2" [Automatic belt not in use (manually disconnected, motorized track inoperative)].

Code "3" (Automatic belt use unknown) is used when, Automatic (Passive) Belt System Availability/Function, equals "1" (2 point automatic belts), "2" (3 point automatic belts), or "3" (Automatic belts — type unknown) **and** the researcher is unable to determine if the automatic belt was in use.

Code "9" (Unknown) is used when it cannot be determined from any source whether or not this occupant's seating position was equipped with an automatic belt system [*i.e.*, Automatic (Passive) Belt System Availability/Function equals "9" (Unknown)].

Police Reported Restraint Use

Data is to be determined from PAR or other official police records.

Air Bag/Seat Performance

Questions pertain to air bag availability, function, and deployment, and documentation of seat back performance for each occupant's position. Variables 27 and 28 refer to frontal air bag systems for the current occupant position. Variables 29 and 30 are designed to capture data for occupant positions other than the driver, position 11. If there is an occupant in one or more other positions for which there is an air bag, Variables 29 and 30 may be redundant. See the 1996 NASS Data Collection, Coding and Editing Manual for further details if necessary.

Form Page OAE-4

Child Safety Seat

Questions pertain to the type, orientation, and harness usage for child safety seats. Details for coding these variables are included below

Variable Name: Type of Child Safety Seat

Range: 0-5, 7-9

Element Values:

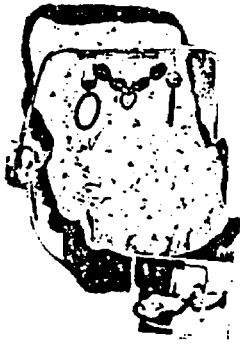
0	No child safety seat
1	Infant seat
2	Toddler seat
3	Convertible seat
4	Booster seat — with shield
5	Booster seat — without shield
7	Other type child safety seat (specify)
8	Unknown child safety seat type
9	Unknown if child safety seat used

Source: Researcher determined — inputs include vehicle inspection, interviewee, and police report.

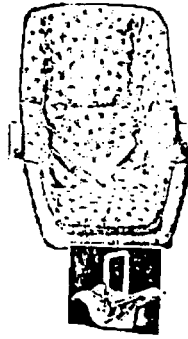
Remarks:

Code "0" (No child safety seat) is used when (1) this person is not an infant or child (*i.e.*, less than 23 kilograms and less than 102 centimeters or less than six years old if height and weight not known), or (2) this person is an infant or child, but was not using an infant or child seat.

Use the person's age (*i.e.*, less than six versus six and older) to determine if this person is an infant or child when height and weight information is absent. Child carriers that are not designed as safety seats are to be classified as "No child safety seat". Examples of these child carriers are shown below.



Kolcraft
"Baby's First Touch"



Century
"Kanga-Rocka-Roo"



Cosco
"Day Cradle/Carrier"

If this person is an infant or child and was an occupant of a hit-and-run vehicle, then code this variable from available information. If age, height, or weight information is unavailable on this hit-and-run occupant, then use code "0" (No child safety seat).

Code "1" (Infant seat) is used when the seat is designed to only face the rear of the vehicle and the maximum capacity is 8-9 kilograms (this information will usually be found on the manufacturer's label). Infant safety seats are equipped with a five-point harness (straps) to secure the infant to the safety seat and use the vehicle's safety belt system (i.e., manual or automatic) to secure the seat to the vehicle. The five-point infant seat system includes a pair of straps that go over the infant's shoulders, a crotch strap, and the vehicle's belts as lap belts to secure the seat to the vehicle. The seat is tub-shaped and cradles the baby in a generally reclined position. Examples are shown below.

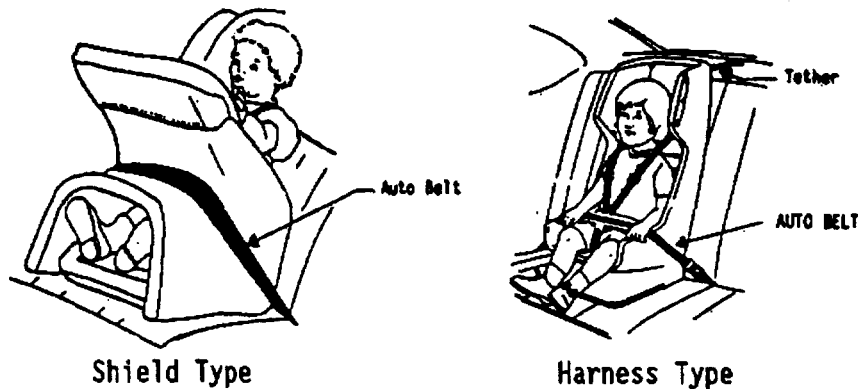


Cosco/Peterson
"First Ride"

Questor
"Dyn-o-mite"

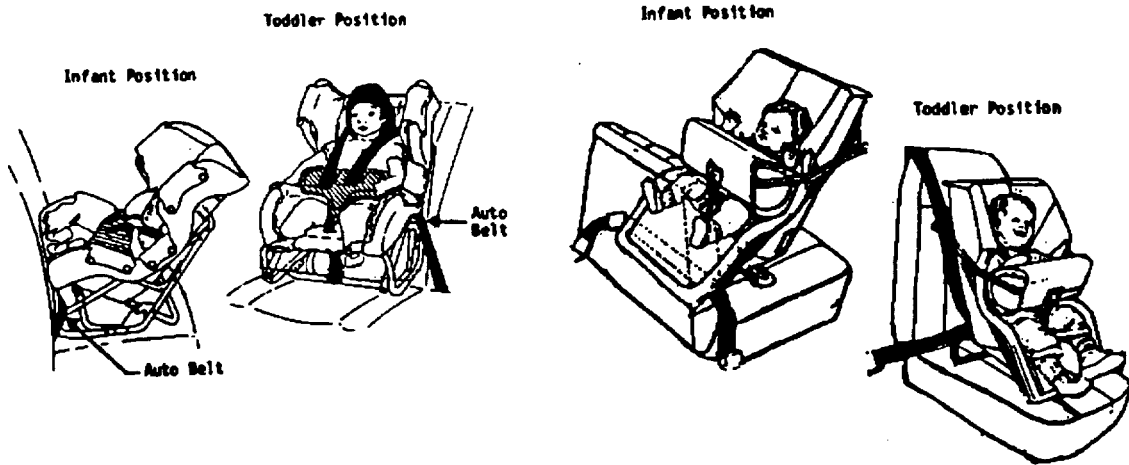
Code "2" (Toddler seat) is used when the seat is designed to *only* face the front of the vehicle and to carry a child weighing approximately 9-23 kilograms (this information will usually be found on the manufacturer's label). The toddler seat

may also be referred to as a "child seat". Most have a five-point harness system (straps) to secure the child to the seat. All models secure the safety seat to the vehicle with the vehicle's safety belts (*i.e.*, manual or automatic) and, in addition, some models have a tether strap which **must** be attached to the rear manual safety belt or deck lid to prevent tipping forward. The child is restrained by a shield, a harness, or a combination of the two in a generally upright sitting position, although some seats have multiple positions. Examples are shown below.



Code "3"

(Convertible seat) is used when the seat is designed to face the **front or rear** of the vehicle and to carry a child ranging from birth to approximately 23 kilograms (this information will usually be found on the manufacturer's label). Most have a harness system (straps) to secure the child to the seat. All models secure the safety seat to the vehicle with the vehicle's safety belts (*i.e.*, manual or automatic) and, in addition, some models have a tether strap which **must** be attached to the rear manual safety belt or deck lid to prevent tipping forward. The child is restrained by a shield, a harness, or a combination of the two in either a generally reclined rearward facing position (for small infants--birth to 9 kilograms) or a generally upright forward sitting position (for larger children--9-23 kilograms). Examples are shown below:

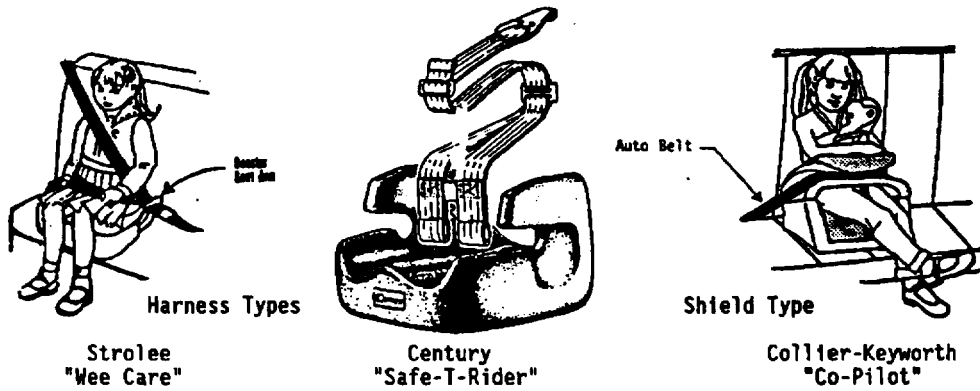


Harness Type
Century "200"

Combination Harness and Shield
Type Cosco/Peterson "SAFE & SNUG"

Code "4"

(Booster seat — with shield) is used when the seat is designed as a forward facing platform without a back (except for one Cosco/Peterson model which has a back) and adjusts to children up to 27 kilograms. This booster seat has a shield. The booster seat restrains the child in a raised upright sitting position with either a harness or shield. Booster seats are designed primarily to fill the gap between when a child outgrows the standard child safety seat and when the child can use the adult belt (i.e., manual or automatic) and still see out the window. Some models can also be used for smaller children, as small as 9 kilograms. Examples of booster seats are shown below.



Used with Lap Belt and Harness



Some of the above infant, child, convertible and booster seats require a tether. When a tether-required seat is placed in the vehicle's front seat, the tether should run over the top of the seat and attach to a rear manual seat belt or possibly to one of the anchors for a front seat belt (*i.e.*, manual or automatic). When a tether-required seat is placed in the vehicle's rear seat, the tether should run over the top of the rear seat and attach to an anchor on the rear window shelf or possibly pass through the rear window shelf and attach to one of the anchors for a rear manual seat belt.

Code "5" (Booster seat — without shield) is used when the seat is designed as a forward facing platform without a back (except for one Cosco/Peterson model which has a back) and adjusts to children up to 27 kilograms. This booster seat does not have a shield.

Code "7" (Other type child safety seat) is used when the infant or child safety seat cannot be described by codes "1" through "5" above. Specify the type.

Code "8" (Unknown child safety seat) is used when a child safety seat is in use but the type of child safety seat is unknown.

Code "9" (Unknown if child safety seat used) is used when it is unknown if the person under consideration is an infant or child, or it is unknown if this person was using a child safety seat.

Variable Name: Child Safety Seat Orientation

Element Values:

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

Source: Researcher determined — inputs include vehicle inspection, interviewee, and police report.

Remarks:

Code "00" (No child safety seat) is used when (1) this person is not an infant or child (*i.e.*, less than 23 kilograms and less than 102 centimeters or less than six years old if height and weight not known), or (2) this person is an infant or child, but was not using an infant or child seat.

If height and weight information is absent, then use age to establish if this person should be classified as an infant or child. Persons six years of age and older are not classified as an infant or child; thus, use code "00" (No child safety seat).

If this person is an infant or child and was an occupant of a hit-and-run vehicle, then code this variable from available information. If age, height, or weight information is unavailable on this hit-and-run occupant, then use code "00" (No child safety seat).

The researcher must determine from the seat, using the Child Safety Seat Identification Guide, the designed orientation for this person's weight or age. Next, the actual orientation of the seat at-impact must be determined to obtain the correct code.

For example, a one and one-half year old child whose weight is 8 kilograms was sitting in a forward facing Century 300 child safety seat. The correct code based upon the Child Safety Seat Identification Guide is "02" (Forward facing). At this age and weight the convertible seat should be rear facing but was forward facing.

Before using any code the researcher must carefully review the subcategories and choose the appropriate code based on designed orientation at the occupant's age and weight.

Code "01", "11", or "21" (Rear facing) or "02", "12", or "22" (Forward facing) if at the time of the incident the seat was facing the rear of the vehicle or the front of the vehicle, respectively. Do not code with respect to the vehicle's direction of travel (*e.g.*, backing vehicle).

Code "08", "18", or "28" (Other orientation) if the seat was facing other than rear or forward at the time of the incident (*e.g.*, on the floor, sideways, on top of or underneath something).

Code "09", "19", or "29" (Unknown orientation) is used when a child safety seat is in use but the orientation at the time of the incident is unknown (*e.g.*, at the time of vehicle inspection the child safety seat is not present or is unattached and there is no information from an interview or the PAR).

Code "99" (Unknown if child safety seat used) is used when it is unknown if the person under consideration is an infant or child, or it is unknown if this person was using a child safety seat.

Variable Name: Child Safety Seat Harness Usage
 Child Safety Seat Shield Usage
 Child Safety Seat Tether Usage

Element Values:

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

Source: Researcher determined — inputs include vehicle inspection, interviewee, and police report.

Remarks:

Code "00" (No child safety seat) is used when (1) this person is not an infant or child (*i.e.*, less than 23 kilograms and less than 102 centimeters or less than six years old if height and weight not known), or (2) this person is an infant or child, but was not using an infant or child seat. If height and weight information is absent, then use age to establish if this person should be classified as an infant or child. Persons six years of age and older are not classified as an infant or child; thus, use code "00" (No child safety seat).

If this person is an infant or child and was an occupant of a hit-and-run vehicle, then code this variable from available information. If age, height, or weight information is unavailable on this hit-and-run occupant, then use code "00" (No child safety seat). The design of each child safety seat must be assessed regarding harness, shield, and tether use.

Refer to the Child Safety Seat Identification Guide to ascertain the design of the seat and the applicability of the harness, shield, and tether to each seat individually.

An "after market" harness/shield/tether is one added by the user to a child safety seat not originally designed to use the device.

Code "99" (Unknown if child safety seat used) is used when it is unknown if the person under consideration is an infant or child, or it is unknown if this person was using a child safety seat.

Form Page OAE-5

Injury Consequences

Questions related to injury consequences are answered through police records, interviews, and medical records.

Form Page OAM-1

OCCUPANT INJURY ASSESSMENT FORM - MEDICAL

The medical team will review medical records and interview forms to gather codable information for this form. It has the following subsections:

- Medical History
- Injury Consequences
- Trauma Data
- Burn Injuries
- Injury Data (table)
- Official Injury Data - Soft Tissue Injuries (diagram)
- Official Injury Data - Skeletal Injuries (diagram)
- Official Injury Data - Internal Injuries (diagram)
- Official Injury Data - Burn Injuries (diagram)
- Summary of Medical Analysis

Medical History

Pre-existing medical conditions (such as chronic illnesses, birth defects, and obesity) are entered here, as well as prescribed medications, and whether the occupant has a history of smoking or drug abuse. Additional comments on medical history are entered in narrative form.

Injury Consequences

Time until death and cause of death are entered in checkoff format. Cause of death is further described:

Variable Name: 1st Medically Reported Cause of Death
 2nd Medically Reported Cause of Death
 3rd Medically Reported Cause of Death

Element Values:

- 00 Not fatal or no additional causes
Code the Occupant Injury from line number(s) for the medically reported injury(s) that reportedly contributed to this occupant's death
- 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

Source: Determined from official records

Remarks:

This variable records the injury(s) which was/were determined by the medical professional completing the report to be the cause of death. A "cause of death" statement may appear at the beginning or end of an official medical record or it may also appear in a "diagnosis" section or body of a medical record. Like the coding rule for injuries, probable or possible causes of death are not coded. If the occupant was not fatally injured, then these variables must all be coded "00" (Not fatal or no additional causes). If the occupant was killed and no official medical data was obtained, or the data obtained inadequately describes injuries which could have an affect on the occupant's death, then code 1st Medically Reported Cause of Death as "99" (Unknown) and 2nd Medically Reported Cause of Death and 3rd Medically Reported Cause of Death as "00" (Not fatal or no additional causes). If the occupant was killed and acquired medical data do not provide a specific official medically reported cause of death, then the medical team will determine if injury data are sufficient to code 1st Medically Reported Cause of Death, and/or 2nd Medically Reported Cause of Death, and/or 3rd Medically Reported Cause of Death with an appropriate coded injury row(s).

Code the row number(s) of the injury(s), from the Occupant Injury Form, which caused the death. If only one injury is reported as, or determined to be, the cause of death, code that injury row's number for 1st Medically Reported Cause of Death and code 2nd Medically Reported Cause of Death and 3rd Medically Reported Cause of Death as "00" (Not fatal or no additional causes). The same logic applies if two injuries are reported.

Code up to three specific injuries detailed in a medically reported "cause of death" statement.

If the "cause of death" statement consist of nonspecific indefinite injuries (e.g., multiple injuries of head, trunk, etc., blunt force injuries of the chest etc., massive injury, and multiple traumatic injuries) and injuries are detailed in the official medical records such that the cause of death can be logically determined, then choose up to three specific injuries using the following guidelines:

- ☛ Proceed by first considering specific AIS-6 injuries, followed by AIS-5, then AIS-4, then AIS-3.

Note: AIS levels do not automatically identify an injury as the selected cause of death. For example, if the occupant has an AIS-6 burn injury but the medical says that the occupant was dead prior to the occupant's vehicle catching on fire, then burn was not the cause of death.

- ☞ Within each AIS level, determine the contribution the specific injury had on the occupant's chance of survival.

Code "96" (Mode of death given but specific injuries are not linked to cause of death) is used when it is determined that the occupant qualifies for code "1" (Fatal) in variable Treatment — Mortality, but specific injuries are not medically reported for the cause of death. The official medical report may give a mode of death such as (1) acute pulmonary embolism, (2) respiratory failure, (3) cardiac arrest, or (4) asphyxiation. This code is also used when the cause of death is reported from complications or consequences of injuries.

Code "97" (Other result) is used when it is determined that the occupant qualifies for code "2" (Fatal-ruled disease) in variable Treatment — Mortality.

If no cause of death is directly from an injury and there is no officially reported mode of death, then encode 1st Medically Reported Cause of Death as "97" (Other result) and 2nd Medically Reported Cause of Death and 3rd Medically Reported Cause of Death as "00" (Not fatal or no additional causes).

Trauma Data

Pertains to information about occupant trauma. For details on Glasgow Coma Scale, see the 1996 NASS Data Collection, Coding and Editing Manual.

Burn Injuries

Code, in checkoff format, whether there were any skin grafts administered to the occupant, and presence and nature of any amputations to digits or limbs.

Form Page OAM-2

Injury Data Table

See 1996 NASS Data Collection, Coding and Editing Manual for coding details

Form Pages OAM-3 to OAM -6

Official Injury Data - Soft Tissue, Skeletal, Internal, and Burn Injuries

These mannequin diagrams are to be filled out as worksheets for the medical team to document the array of injuries sustained by each occupant. Instructions accompany each diagram.

Form Page OAM-7

Summary of Medical Analysis

This narrative summarizes all pertinent medical findings. It should express the nature and extent of injuries, the influence of impact versus burn trauma, and any medical factors that may have caused or contributed to the injuries sustained during the collision-fire incident.

Case Studies of Motor Vehicle Fires Instructions for Use of CDs

Two CDs have been included with this report. One is in Microsoft Access 2000 format, the other is in Adobe's Acrobat Reader format.

Adobe Acrobat Version

The Acrobat Reader version is provided for those who might be interested in learning about the cases without the need to perform database searches, or for those who do not have access to Microsoft Access 2000 or who are not familiar with using the program. Acrobat Reader software is freely available for PC or Mac and can be downloaded from the Web site <<http://www.adobe.com/products/acrobat/readstep.html>>. The Acrobat Reader version of the database may be easier to view because of its zoom feature for photos that is not available using Microsoft Access 2000.

Starting up

Select a case from the index.

Navigating within cases

When the case displays on the screen, use the page function shown at the bottom to move to any page. Use the bookmarks to the left of the screen to move directly to the various forms available within a specific case.

Printing

Using Acrobat Reader's print function lets you print selected pages or all pages related to the case you have selected.

Navigating between cases

Select 'Return to Index' from the bottom of bookmark list on left of screen.

Microsoft Access Version

The MS Access version, in "read only," is mainly intended as a database tool for those interested in selecting cases and sorting by desired criteria. When opened, it will load automatically to a form that may be used to view a selected case. Tables may also be directly viewed, if desired.

Starting Up

To begin, select the desired case number in the field in the upper right.

Navigating within cases

Across the top of the screen (under Access program tool bars) the user will see a list of forms that correspond to the data collection forms. Forms display information for Vehicle 1 first, then any other vehicles that were involved in the incident. At the bottom of the screen is written "Record" followed by a page number for that form. One may increment with the record page number or with "Page Up" and "Page Down" keys. To go to the next form, click the form name at the top. Note that "Page Up" and "Page Down" will not move between forms or cases.

Navigating between cases

To view a different case, a new case number may be entered into the Case Number field in the upper right of the screen at any time.

Running queries and generating reports

Directions for the use of the database features of the software are beyond the scope of these instructions. For further assistance consult the Microsoft Access manuals.