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MULTIDISCIPLINARY ACCIDENT INVESTIGATION REPORT AUTOMATION

Program Review
Volume 1 of 5

HIGHWAY SAFETY RESEARCH INSTITUTE
THE UNIVERSITY OF MICHIGAN
ANN ARBOR, MICHIGAN 48104

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16. Abstract

This is Volume 1 of a 5 volume final report documenting the results of the Multidisciplinary Accident Investigation (MDAI) Report Automation contract. It contains a review and discussion of all contract activities.

Over 4500 clinical accident investigations have been conducted todate (October 1972). These reports, sponsored by the National Highway Traffic Safety Administration and the Motor Vehicle Manufacturers Association are being edited and processed into a common data base. Both NHTSA and MVMA member companies are being provided direct and simultaneous access to the data base through the University of Michigan's time-shared computer system via remote batch terminals and interactive terminals (e.g., teletypes). The file consists of over 800 variables and are derived from the "Collision Performance and Injury Report" Revision 3 plus certain added pre-collision data.

The NHTSA has sponsored the automation of the MDAI reports, the documentation of the MDAI report editing procedures and reference information, and the utilization of the data bank by the NHTSA staff and six of the MDAI field teams.

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Volume 1 of 5

Program Review

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SECTION 1

PROGRAM SUMMARY

BACKGROUND

The National Highway Safety Bureau began sponsorship of in-depth accident investigation programs early in its history, selecting a few interested researchers to cover a small number of accidents and to report on the circumstances, causes, and effects of these collisions from the point of view of several disciplines. Following the Airlie House Conference* the several investigative teams were asked to report their findings both as written descriptions and, where appropriate, using the Collision Performance and Injury Report which has been developed over a period of years by the automotive industry. This report was concerned principally with the vehicle damage severity and both the severity and causative factors of injuries incurred, and did not address itself generally to accident causation nor to the environmental factors of the accident. In subsequent reports furnished by these teams, the vehicle damage and injury data were reported in the detail required by the data processing form, but human factors information and some environmental information were reported only in the text. The consistency of these latter items grew more slowly, but presently--due in large measure to the federally sponsored training programs and the more direct communication from the sponsor to the team personnel--i.e., they are reported with enough completeness to be tabulated from the text.

Up until the time when there were a few hundred case reports in existence there was little value in attempting statistical analyses of the multi-disciplinary data. Further, the number of cases was small enough that a few people who had read them all could recall them well enough to locate cases relevant to some new problem --for example those involving head-on collisions between trucks and cars, or those involving fire. With the advent of new teams, higher production rate of existing teams, and a subsequent greater total number of cases, there was expected to be some value in statistical analysis. Also, the size of the data was such that no single person could recall all of the information well enough to select case reports for further study. It was at this point that HSRI initiated the present effort of editing the case reports, placing as much information as possible into digital form, and making it accessible for retrieval or analysis by computer techniques. This document is a report of the processes involved in this program, the methods of using the data in its present form, and some preliminary analyses of the data.

More than 4500 clinical accident investigations have been conducted to date. These clinical (sometimes called Level III) investigations of collisions provide a level of detail not available elsewhere. A substantial amount of support for these investigations has been provided by the National Highway Traffic Safety Administration (NHTSA) and by the Motor Vehicle Manufacturer's Association (MVMA). Presently this common data base is made available to both sponsors for direct analysis through the use of this institute's Simplified Procedures for Analysis of Data (SPAD) system.

It should be noted that these in-depth investigations, either singly or in combined form, do not constitute an end in themselves.

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* Proceedings of the Collision Investigation Methodology Symposium August 24-28, 1969 in Warrenton, Virginia.

They should be viewed as one kind of information which is of potential value in studying problems in the traffic safety field. Generally this information must be compared with police level (or mass) accident data in order to infer frequencies of certain events, and of course the existing literature should be referred to in any new study. Viewed in the proper perspective, this Multi-disciplinary Accident Investigation data takes its place as a microscopic view of a large number of real world accidents. Although much of the information was collected to permit study of injury mechanisms, it is possible now to gain understanding of many problems by appropriate sorting and analysis of the collected data. Clearly the data handling and sorting techniques perform no magic. Useful conclusions can be drawn only if intelligent questions are asked and appropriate analytical techniques are used. Thus the key to successful use lies in the analyst. The investigations (supplemented by coding and keypunching) have provided the basic information; the computer has provided the tools with which the data can be interrogated; the analyst's problems of data handling have been made much easier-so that he can spend his efforts appropriately in planning and directing a study.

DATA PREPARATION

Data preparation begins with the editing of the full written reports, ordinarily accompanied by a complete set of 35 mm slides. While the quality of MDAI team reports has increased markedly with time, it is still necessary to review the contents of each report manually. The data forms, photographs, and case narratives are reviewed for consistency, correctness, and completeness. After editing, each case is keypunched and key-verified. To aid in the editing process, a computer program performs over 400 checks on each case. Possible internal data inconsistencies and invalid or wild codes are flagged before the information is placed in the data bank. This same program also computes a number of summary variables not provided in the keypunched data, and formats the data for file building.

File building entails adding new cases, correcting old cases on the master file, and generating the three analysis or working files structured by case vehicle, vehicle occupant, and occupant injury. A complete set of one-way frequency distributions is prepared for each file, and this is reviewed for invalid codes and unusual distributions. Comments and errors discovered by the data file user community provide another valuable source of correction. Each case, even though in computer storage, is always subject to updating and change when errors are discovered.

Quality control is an essential element in processing data of any sort, and is particularly important when this amount of detail is available. As mentioned above, all keypunched data is verified, and a computer program checks on the editors. In addition, the data editors are selected with a variety of medical and engineering backgrounds, are trained by editing non-MDAI cases, and are receiving field experience with HSRI accident investigators in the original preparation of data forms. As a final step each case is edited manually by a second editor--essentially equivalent to the verifying operation in keypunching. Editing time varies widely depending upon the case but averages about three man-hours per case vehicle entered into the file.

Errors and unknown values occur in the file due to weaknesses in the original investigations, the case documentation, the basic reference information provided the teams and editors, and the editing process itself. In an effort to assist the teams, individual critiques are prepared for each case as it is edited. Also, a complete collection of reference information (e.g. original seat back angles) available to the editors has been compiled in Volume 5 of this report, along with a full description of how each data element is interpreted by the editors.

DATA FILE CONTENTS

Over 800 different variables (items of information) are recorded in the master file for each case. The majority of these items are taken from the "Collision Performance and Injury Report" (CPIR) Long Form submitted with each case. Because the primary emphasis of this form was to record vehicle crash damage and concurrent injury details a number of additional pre-crash and administrative variables have been coded by the editors onto a second (supplementary) form. Both forms are reproduced in Appendix A of this volume.

Once the master file is created three "working" or "analysis" files are created--centered respectively on the vehicle, the occupant, and the injury. The vehicle file contains one logical record for each case vehicle investigated; thus, if both vehicles in a head-on collision were reported on two CPIR forms, two computer records would be stored. The occupant file contains one record for each case vehicle occupant, whether injured or not. Finally the injury file contains one record for each reported injury sustained by an occupant. A complete set of univariate descriptive statistics for each variable in the working files is provided in Volume 4.

The data file contains all the case vehicle passenger cars and light trucks investigated by both the NHTSA and MVMA sponsored teams. Case reports from the teams sponsored by the Canadian Department of Transport will be included in future versions of these same files.

New variables have been and continue to be added, as well as new case reports. Thus the contents of the data file is growing in width as well as length. In fact the MDAI data file can be considered a library of variables as well as a collection of MDAI case reports. The original master file contained 696 variables compared with 829 variables currently processed. It is anticipated that the number of variables will grow by several hundred in the next year.

The specific addition of variables are now being developed. The first is the development of an accident causal coding scheme. A bibliography of accident causation literature is contained in Appendix C. The second is the development of an injury causation scheme as defined in Appendix D. The third addition will be the processing of the NHTSA Vehicle Condition and Maintenance Report into the computer file.

DATA UTILIZATION

The number of MDAI cases has grown to the point where computer files are vital for two applications: (1) simple searches of the data to locate cases of particular interest (e.g. those cases in which small children were injured by flying objects in the car) and (2) statistical analysis of a number of cases (e.g., analysis-of-variance of mean injury severity level as a function of inches of roof crush in rollover accidents.) Neither of these operations is practical in a manual file, but either is trivial in a properly organized data file and analysis system.

Perhaps the most important feature of the set of multi-disciplinary accident data is its breadth and diversity. While it may not be generally recognized, it is true that there are numerous associations and correlations in accident data which are not necessarily causative relationships. For example, increased frontal crush (in head-on collisions) correlates strongly with increased injury. Intuition or common sense would lead us to believe that the first correlation was a good thing--i.e. that even more frontal crush would probably reduce injury, and that the second is a bad thing (whence the roof crush standard). Using the complete set of MDAI data, however, it is possible to study many facets of this problem. Could it be that increased roof crush is simply associated with more severe impacts, and that a benefit of roof crush is that it inhibits ejection? The CPIR data tells us that 4 out of 6 rollover fatalities are ejectees.

The point is that a major benefit of the multi-disciplinary data is the ability to pursue a problem far beyond the first simple correlation, to search for confounding factors, and to come up with a better and more complete description of any problem.

It should be obvious that there is a great danger, particularly in situations as complex as traffic accidents, in collecting only that data necessary to substantiate one's initial hypothesis. Seat belts save lives, but perhaps people who wear seat belts get into different kinds of accidents than those that don't--and the value of the seat belts may be greater or less than one would judge from the first simple observation. The MDAI data provides the detail to study such problems in enough depth to get closer to the truth.

In order to readily look at such problems the Highway Safety Research Institute has developed a fairly extensive package of statistical analysis tools and accident data files that are made available to a community of users through the University of Michigan time-shared computer system. Volume 5 describes the analysis tools and accident files provided by the Simplified Procedures for Analysis of Data (SPAD) system.

The present MDAI data user community includes the NHTSA staff in Washington, D.C., the four major motor vehicle manufacturers in the United States, six of the Multi-disciplinary Accident Investigation teams and the Canadian Department of Transport. Each of these users has access to the entire accident data bank and set of analysis tools through the privacy of their own computer terminals. Figure 1 indicates with dots and circles the various accident files available to SPAD users. Remote terminal users (outside of Michigan) are indicated by dashed lines. While HSRI cannot determine the specific analysis performed, it has been observed that the NHTSA staff alone, over the last six months, has logged close to 15 terminal hours per month.

SUMMARY

This five volume final report documents the results of editing and automating 1092 case vehicles reported by 20 Multidisciplinary Accident Investigation teams sponsored by the NHTSA Accident Investigation Division; and of providing for the utilization and analysis of all the Level III accident investigation information in the common data base as outlined in Figure 2.

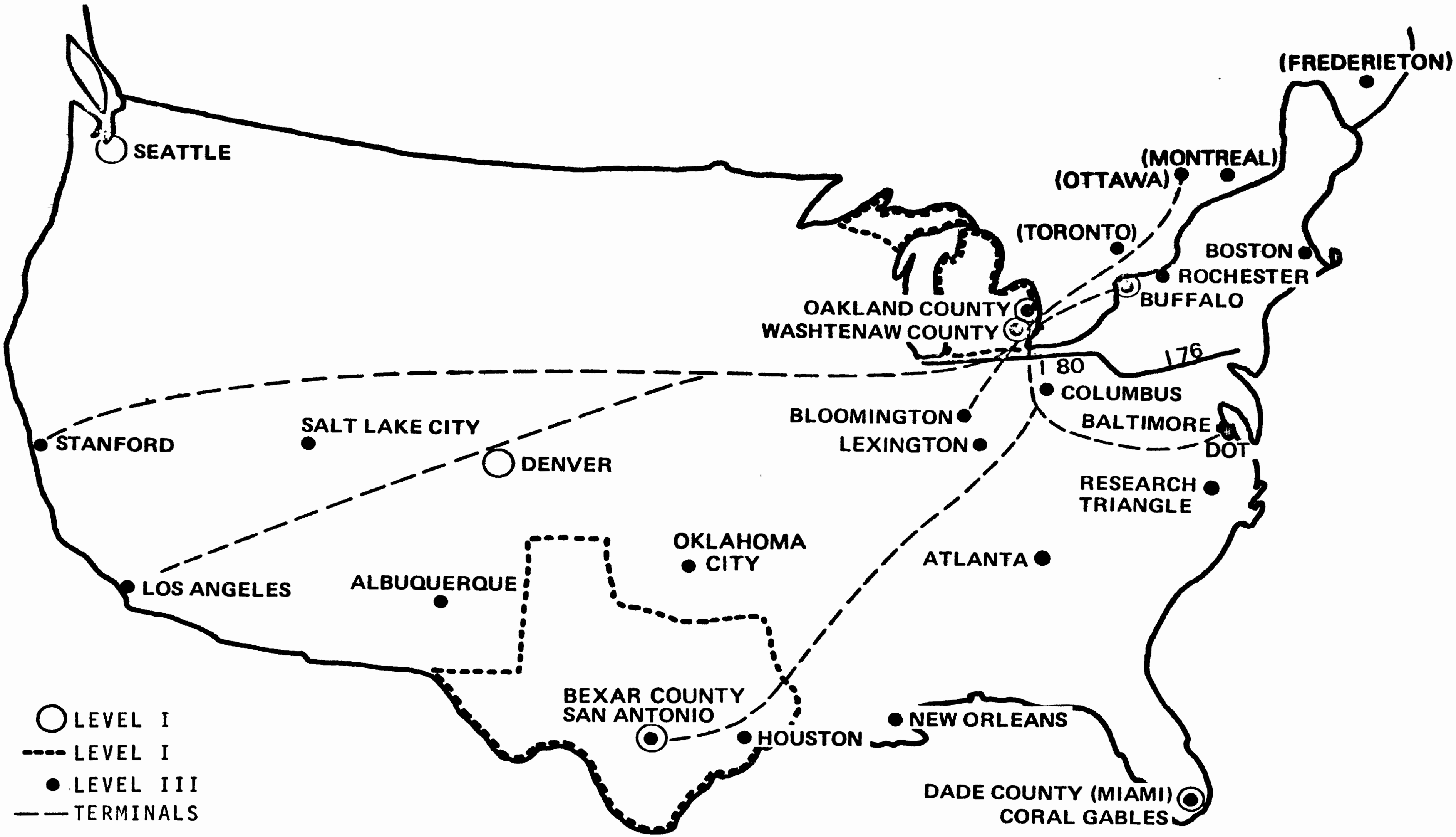
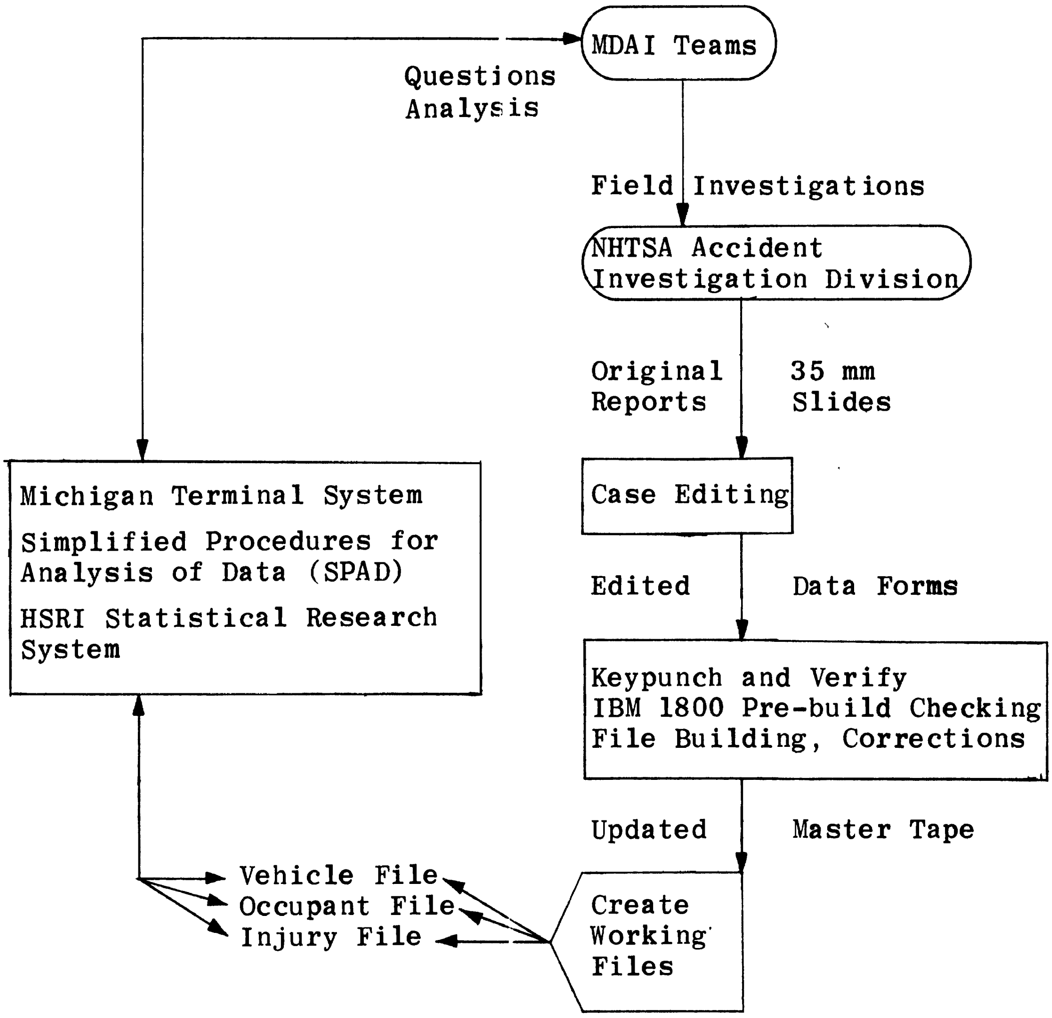

(FREDERIETON)
SEATTLE
(MONTREAL)
(OTTAWA)
(TORONTO)
BOSTON
ROCHESTER
BUFFALO
OAKLAND COUNTY
WASHTENAW COUNTY
76
80
COLUMBUS
BLOOMINGTON
BALTIMORE
LEXINGTON
DOT
SALT LAKE CITY
STANFORD
DENVER
RESEARCH TRIANGLE
OKLAHOMA CITY
ATLANTA
LOS ANGELES
ALBUQUERQUE
BEXAR COUNTY SAN ANTONIO
HOUSTON
NEW ORLEANS
DADE COUNTY (MIAMI)
CORAL GABLES
LEVEL I
LEVEL I
LEVEL III
TERMINALS

FIGURE 1

FIGURE 2

MDAI Report Automation and Utilization Chart



The five volumes are:

Volume 1 Program Review
- Program Summary
- Data Preparation
- File Structure and Content
- Data Utilization
- Data Reporting Forms
- IBM 1800 Pre-build Program
- Accident Causation Bibliography
- Occupant Injury Classification Scheme

Volume 2 MDAI Data Analysis
- Data Analysis Discussion
- Team-by-Team Comparisons
- Team Case Cross-Indexes

Volume 3 Simplified Procedures for Analysis of Data (SPAD)
- Michigan Terminal System
- Statistical Research System
- HSRI Accident Files
- Operating SPAD, Examples

Volume 4 Univariate Frequency Distributions of MDAI Data
- Codebook of Variables
- One-Way Frequency Distributions

Volume 5 Editing Manual and Reference Information used in the Preparation of Data Forms
- Editing Conventions and Procedures
- Interpretations of Questions
- Reference Information

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SECTION 2

DISCUSSION OF DATA PREPARATION

The preparation of data for, and the maintenance of computer files is a fairly straightforward process. The automation of the MDAI reports requires particular care though, because of the broad level of detail in each case and the relatively small number of cases. Thus it becomes essential that each item of information in each case be processed in a consistent, correct and complete form. This objective is made even more difficult to achieve when 20 different accident investigation teams document accidents independently of each other, on data forms that are sometimes ambiguous and without adequate original vehicle reference information.

The steps involved in data preparation are discussed in Volume 4 Section 3 and are outlined below:

1. The original documentation submitted by the MDAI teams is transmitted by NHTSA to HSRI along with the 35 mm slides for processing.
2. New cases are logged upon arrival in a random-access computer file of cases received and returned.
3. The case summary, CPIR form(s) and NHTSA Vehicle Condition and Maintenance Report(s) are xeroxed.
4. The HSRI data editors review each case, make corrections, and code the supplementary questions. Each data question is checked for consistency with the other case documentation and for internal consistency within the data forms themselves. Where possible, responses are checked for correctness and completeness using the team case documentation, 35 mm slides and available reference information. The data forms used are contained in Appendix A.
5. The edited cases are then second edited or re-edited by a second staff member.
6. The data forms are keypunched and 100 percent key verified.
7. An IBM 1800 pre-filebuild program (Appendix B) reads the data cards, performs further edit checks, computes new variables and reformats the data for updating the MDAI master file.
8. Error comments produced by the pre-build program are resolved manually and the case is rechecked by the pre-build program.
9. Any needed corrections to the MDAI master file are performed as they are discovered and resolved.
10. Quarterly the cases compiled by the pre-build program are used to update the MDAI master file. Because of the previous step the newly updated master file also reflects all necessary corrections discovered since the last file update.
11. The three working or analysis files are created from the updated master file. The resulting vehicle, occupant and injury files are made available to users through the SPAD system.
12. Marginals or one-way frequency distributions are computed on one and two digit numeric variables. These distributions are reviewed for wild or invalid codes, and for unusual distributions.

QUALITY CONTROL

Quality control is the by-word for the entire data preparation effort. Besides performing checks at each step of the case automation process, efforts have been made to increase communications with both the teams preparing the documentation and the users accessing the data.

In an effort to aid the MDAI teams in consistently reporting case investigations, the conventions and interpretations used in editing the data forms have been fully documented in Volume 5. Also as an aid to the MDAI teams, Volume 5 contains a complete compilation of all vehicle reference information (e.g., original seat back angles) available to the HSRI editors. Finally, individual case critiques are provided to NHTSA that summarize the results of the editing process for each case.

The automation of the MDAI reports can be looked at as a project to establish a noise free communications channel between the field accident investigator and the data analyst or user. Feedback from all data file users is strongly encouraged. Any case in computer storage is subject to alteration and correction at any time. Certain types of data problems and errors are never discovered until an attempt is made to utilize the file. As these problems are discovered they are corrected and new checks are instigated in order to avoid any reoccurrances. Because of the effectiveness of the file checking by actual utilization, the HSRI analysts are provided access to each newly updated set of MDAI files several weeks before release to sponsoring organizations.

The first or initial editing of an MDAI case is the most important quality control function. It is here that the majority of inconsistencies, errors and incomplete responses are discovered and resolved. While the amount of time varies quite widely from team to team the editor averages about 3 hours per investigated case vehicle (or processed CPIR form). Although exact averages have not been compiled, frequently the editor will be required to fill in 50 responses not completed by the investigator and will often uncover two major "blunders" per case. Examples of such blunders are listed in Table 1.

Table 1
Examples of CPIR Coding Errors Observed in Case Reports

Hardtop coded as Sedans
Used Original Dimensions of Wrong Vehicle (Vega length for a Chevelle)
Night coded as Day
Wrong Occupant Age coded
Vehicle-to-Vehicle Coded as Ran-Off-Roadway
Incorrect Force Vector Angle used for VDI Clock
Passenger Cars coded as having Lower D Pillars
Rear Doors coded on Two Door Cars
Number of Occupants Incorrect
Body and Frame Coded as Unitized
Intrusion not coded yet Side Impact Damaged Seats
Case Vehicle and Other Vehicle Speeds Reversed
Right and Left Side Vehicle Damage Reversed.

The following procedures have been implemented to ensure the quality of the data editing process:

1. All the editing criteria, conventions, and interpretations of questions have been documented into an editing manual. This increases inter-editor consistency, and aids in the training of new data editors. This document has also been made available to existing teams as a part of this report (Volume 5).
2. Occasionally a response has been left blank because the original vehicle reference information was not available to the investigator. Neither the investigator nor the data editor can record the amount of seat back rotation unless the original seat back angle is available. As an aid to the HSRI editors (and to the investigators) all available reference information has been compiled in Section 5 of Volume 5.
3. The data editors are selected with a mix of medical and engineering backgrounds. They are trained on non-MDAI cases, and each is receiving field experience by assisting HSRI team investigators.
4. The IBM 1800 pre-build program performs over 400 checks for invalid code values or internal inconsistencies (see Appendix B) such as rear door damage on two-door cars. This program is augmented frequently as the desirability of new tests is determined.

In summary, the data which is now resident in the computer file has had many opportunities to be in error, and also many opportunities to be corrected. Access to the present digital file is quite easy, and it is likely that occasional inconsistencies will continue to be discovered. The goal of an error-free and consistent set of data is a laudable one, and the methods discussed here are intended to aim toward this goal by improving the information from the field investigation to the final digital form. An occasional error in, say, driver's age seems not to be critical in the police data if one is making a statistical study of drinking in accidents. But in the MDAI data the investigator may be interested in locating an example of an elderly woman driving a car with camper trailer attached--and if there are only two of these in the file it would be disastrous to have one of them coded as a male.

SECTION 3

DISCUSSION OF FILE STRUCTURE AND CONTENTS

This section presents information on the structure and contents of the MDAI master file and the MDAI working or analysis files. A complete dictionary of variables and code value definitions is contained in Volume 4 along with a complete set of univariate or one way frequency distributions for each numeric variable.

FILE STRUCTURE

The Statistical Research System (SRS) is a set of modular computer programs for the file maintenance and analysis of fixed length records. Each variable, or item of information, is defined in terms of its starting location and field width in the fixed length record. Thus, every item of information is stored in each record; if the information is left blank that storage point is filled with the defined missing date code.

For each data file, there is a corresponding dictionary file that defines and describes each variable in terms of the variable number, name, starting location, field width, character type, and missing date code. The dictionary and data files are used together by the SRS programs. The first portion of Volume 4, Section 2 contains a printout of the MDAI analysis file dictionaries.

A data set can be considered as a table with the cases being the rows and the variables being the columns. This structure is illustrated in Figure 3 which shows a four case file containing five descriptive variables. Here, the case vehicle is characterized by the age and sex of the driver, the severity of the damage, the color of the case vehicle, and the vehicle's manufacturer. There is usually one variable for each question on an accident report form.

	V1 DRIVER SEX	V2 DRIVER AGE	V3 DAMAGE SEVERITY	V4 VEHICLE COLOR*	V5 VEHICLE MANUFACTURE
CASE 1	2	18	3	'bbbRED'	3
CASE 2	1	16	2	'bBROWN'	3
CASE 3	2	52	2	'ORANGE'	1
CASE 4	1	99	1	'bbBLUE'	1

*Note: b=blank

CODEBOOK

V1 DRIVER SEX

(1) Male
(2) Female
(0) Unknown

V2 DAMAGE SEVERITY

(1) Minor
(2) Moderate
(3) Totaled
(0) Unknown

V3 DRIVER AGE

1 . . 99 } Age in years
00 Unknown

V4 VEHICLE MANUFACTURE

(1) General Motors
(2) Ford
(3) Chrysler
(4) AMC
(5) Other
(0) Unknown

FIGURE 3. SAMPLE ACCIDENT FILE

The number of different code values that can be used to represent the possible states of a variable is determined by a quantity known as the FIELD WIDTH of the variable. Field width corresponds to decimal digits in a number: that is, field width of one can store values from zero to nine; a field width of two can store values from zero to 99; etc. For instance, driver sex (Variable One in Figure 3) has a field width of one and is often characterized by the following three values:

(1) Male
(2) Female
(0) Unknown

The variable describing the age of the driver in years, on the other hand, has a field width of two characters and code values then can range from 00 to 99. The two variables we have discussed here have numeric code values (i.e., 0-2 or 0-99). Numeric codes are most useful for digital computers where arithmetic operations can be handled easily and quickly. However, some variables in the HSRI file have alphabetic code values. An alphabetic code value is denoted by primes before and after the value (i.e., 'RED', 'FORD', etc.) Thus, we might have an alphabetic variable with a field width of six that could take on possible values from 'AAAAAA' to 'ZZZZZZ' (including blanks). The use of such a variable for car color could then have the code values

'bbbRED' = RED
'bBROWN' = BROWN   b=blank
'ORANGE' = ORANGE
etc.

as in Variable 4 of Figure 3. Most SRS programs will only accept numerical codes for analysis purposes, although alphabetic codes can be used for filtering/subsetting purposes or recoded to numeric values (See Volume 3).

The MDAI master file is created directly from the data forms in Appendix A. One "Collision Performance and Injury Report" (CPIR) plus a supplement is edited and processed for each case vehicle investigated. The CPIR form is modular to the extent that one occupant section is coded for each case vehicle occupant, whether he is injured or not.

In order to create a fixed record length master file, the IBM 1800 pre-build program (Appendix B) formats one output record per occupant section (cards 11 to 26) which repeats the vehicle (cards 01 to 10) and supplement (cards 90 to 94) information that is common to each occupant. This output is used by the SRS file management programs to build and maintain an MDAI master file containing 829 variables for each case vehicle occupant.

From the master occupant file, three working or analysis files are created for use in the SPAD system. A case vehicle, case vehicle occupant, and occupant injury file are created by three special purpose routines. The vehicle file is created by copying the first 576 variables from the master file and restricting the output to the first occupant in each vehicle. The vehicle file, therefore, has one logical record per case vehicle investigated. The occupant file is created by simply copying the first 636 variables from the master file. Thus, the occupant file consists of one record for each case vehicle occupant. Each occupant record contains a duplicate of the vehicle variables for that occupant, i.e., the first 576 variables are identical in contents to those in the vehicle file.

In order to create the injury file, the entire CPIR occupant injury detail page (Figure 4) is recorded on the master file, with one variable for each cell in the table. Columns 22 to 31 on cards 12 to 26 are scanned for specific incidence of occupant injury. The vertical (body region) and horizontal (injury type/diagnosis) location is recorded for each non-zero injury severity code found. The other eight injury variables are created and copied out along with a duplicate of the first 636 occupant and vehicle variables. An average of 3.2 injury records are created for each occupant.

The structure of the three MDAI analysis file is summarized in Figure 5. The master file contains all case vehicle reports, while the three analysis files do not contain duplicate reports of the same case vehicle.

Vehicle File

Veh	V1-V576
1	Vehicle 1
2	Vehicle 2
	Etc.

Occupant File

Veh	Occ	V1-V576	V577-V636
1	1	Vehicle 1	Occupant 1
	2	Vehicle 1	Occupant 2
	3	Vehicle 1	Occupant 3
2	1	Vehicle 2	Occupant 1
	2	Vehicle 2	Occupant 2
		Etc.	

Injury File

Veh	Occ	Inj	V1-V576	V577-V636	V637-V647
1	1	1	Vehicle 1	Occupant 1	Injury 1
	2	1	Vehicle 1	Occupant 2	Injury 1
		2	Vehicle 1	Occupant 2	Injury 2
	3	1	Vehicle 1	Occupant 3	Injury 1
2	1	1	Vehicle 2	Occupant 1	Injury 1
		2	Vehicle 2	Occupant 1	Injury 2
		3	Vehicle 2	Occupant 1	Injury 3
	2	1	Vehicle 2	Occupant 2	Injury 1
			Etc.		

FIGURE 5.
STRUCTURE OF MDAI ANALYSIS FILES

FIGURE 4. CPIR REVISION 3 OCCUPANT INJURY DETAIL PAGE

	CARD NUMBER	OCCUPANT NO.	BODY REGION	★ ENTER CODE(S FOR AREA(S) OF POSSIBLE CONTACT					ENTER SEVERITY CODES: OVERALL INJURY TO BODY REGION	FRACTURE	LACERATION	CONTUSION	COMPLAINT OF PAIN	ABRASION	CONCUSSION	BURN	HEMORRHAGE	OTHER
1-9	10-11	12-13		14-15	16-17	18-19	20-21		22	23	24	25	26	27	28	29	30	31
	12		INTERNAL ORGANS															
DUPLICATE* FROM PRECEDING CARD	13		BRAIN															
	14		FACE															
	15		HEAD															
	16		NECK (CERVICAL REGION)															
	17		SHOULDER GIRDLE															
	18		RIGHT UPPER LIMB															
	19		LEFT UPPER LIMB															
	20		CHEST & UPPER BACK (THORAX)															
	21		LOWER BACK (LUMBAR REGION)															
	22		ABDOMEN															
	23		PELVIC GIRDLE															
	24		RIGHT LOWER LIMB															
	25		LEFT LOWER LIMB															
	26		WHOLE BODY															

MDAI FILE CONTENTS

The three parts of this section discuss the contents of the vehicle, occupant, and injury analysis files. A complete definition of each variable and code value is contained in Volume 4.

The contents of the MDAI data files is based upon the "Collision Performance and Injury Report", Long Form, Revision 3. Because of the strong emphasis of the CPIR on the crash phase, a number of other pre-crash, post-crash, and administrative variables have been coded on a supplementary form. Both of these forms are reproduced in Appendix A.

Several other new variables, not originally provided for in the data forms, are created by the IBM 1800 pre-build program (Appendix B). For example, variables 561 through 576 provide a summary of occupant information in the case vehicle file. Other computer variables are bracketed versions of numeric variables such as speed, vehicle weight, or occupant age--created so as to permit meaningful tabulations of many-valued variables. The remaining computed variables are numeric recodes of the Vehicle Damage Index letters which permit these items of information to be used in numerical analysis programs.

New variables have been added to the file all through this program. The original master file contained 696 variables compared with the 829 currently processed. It can be expected that more will be added in the future.

Each of the three analysis files will be discussed in turn.

VEHICLE FILE CONTENTS

There are 576 variables or items of information stored for each of the 1092 MDAI case vehicle as documented in Volume 4. These variables can be grouped under the following topics:

Variable Group	Variable Numbers
Case Identification	1-19
Environment	20-38
Vehicle Malfunctions	39-54
Collision Description	56-81
Other Vehicle Description	82-111
Case Vehicle	112-501
Description	112-135
Damage, Exterior	136-303
Damage, Interior	304-501
Case Vehicle Driver	502-523
Crash, Post-Crash	524-530
Pre-Crash	531-551
Program Matrix Cells	552-560
Occupant Summary	561-576

The vehicle file contains the variables that describe the accident. There is no "accident file" as such. For example, if both vehicles in a head-on collision are investigated and reported as case vehicles, two case vehicle computer records will be stored for the collision. The environmental conditions common to both vehicles (e.g., rate of precipitation, variable 30) will be identical in both case vehicle computer records. This situation can be identified because the team case number (variables 2 and 3) will be common to both records, but the vehicle number (variable 4) will increment by 1 for each case vehicle stored. Note that some environmental variables such as the road alignment, may be different for different case vehicles in the same collision.

Accident Factors	Variable Numbers
Identification	
Date	7-9
Time	511-513
Case Number	2-4
Publication Number	13-18
Location	14,21,531,532
Environment	22-38,550,551
Pre-Crash Responsible Vehicle	538-549
Post-Crash Factors	
Case Vehicle	525-526
Emergency Services	527-530
Team Recommendations (Matrix Cells)	552-560

Collision Description

The collision description is coded from the point of view of the case vehicle. A case vehicle must have run-off-the-roadway before the first impact to be coded "yes" in answer to this query. All the other configuration questions are independent of each other and are coded in combinations. Thus, if a case vehicle side-swipes a truck, strikes a gurad rail, and then rolls over in the same accident, all three events are recorded. This convention contrasts to the usual Level I or police accident data where only one event is coded per accident.

For those interested in analyzing the collision configuration variables, some words of caution are in order. The sequence of events is not coded--i.e., if a sidewsipe and a head-on are both coded, either may have preceded the other. The reported impact speed is by convention, that of the first impact--and this is not necessarily the most damaging impact. Finally, the primary vehicle damage index (VDI) is the one associated with the worst injury, and is not necessarily the first VDI in a chronological sense. While it seems clear at this writing that changes in reporting conventions would help to clear up such problems, such changes will be slow in coming because the need for them is often not recognized until the data are analyzed.

Collision Description	Variable Numbers
Collision Configuration	56-62
Vehicle to Object	56
Rollover	57
Ran-Off-Roadway	58
Vehicle to Vehicle	59-61
Other	62
Number of Vehicles	63
Objects Contacted	64-68
Case/Other Vehicle Speeds	74-81
Direction of Rollover	524
Total Energy Available	537

Vehicle Malfunction

Vehicle mechanical malfunctions (V39-V54) are coded only for the case vehicle. If the "other vehicle" had a tire blow-out and was not investigated as a case vehicle, the malfunction would not be recorded. To be coded, a malfunction must be suspected or alleged to have contributed to the accident. Thus, if a brake failure contributed to the severity of the accident that could not have been avoided even with good brakes--a malfunction is recorded. The following broad categories of vehicle malfunction are used:

Vehicle Malfunction

Brake System
Exhaust System
Suspension System
Tires
Electrical System
Throttle Controls
Driver Controls
Power Train
Fuel System
Visibility Items
Other:___________
Unknown

Vehicle Damage

The vehicle file contains a very extensive description of the damage sustained by the case vehicle. Variables V136 to V173 describe the overall vehicle damage in terms of cost, Vehicle Damage Index or Collision Deformation Classification, and sheet metal Damage/Crush. Case vehicle exterior damage is described while walking around the vehicle counterclockwise: wheel and tires, front exterior, left exterior, rear exterior, right exterior. The descriptions of fire are included with exterior damage.

Exterior Damage	Variables
Cost	V136
Vehicle Damage Indexes (CDC's)	V137-V151
Sheet Metal Damage/Crush	V162-V173
Wheels and Tires	V174-V180
Front Exterior:	V181-V201
Hood	V181-V192
Engine/Transmission Mounts	V193
Steering Flexible Coupling	V194-V196
Telescoping Unit	V197-V198
Fire	V199-V201
Left Exterior:	V202-V235
Pillars (A,B,C,D)	V203-V218
Roof Side Rail	V219-V220
Body Mount	V221
Doors	V222-V235
Rear Exterior:	V236-V268
Fuel Tank/Lines	V236-V242
Trailer and Hitch	V243-V244
Tailgate	V245-V257
Trunk Lid	V258-V264
Backlight Header	V268
Right Exterior:	V269-V303
(like left exterior)	

The case vehicle interior damage topics include the steering wheel, steering column, windshield, instrument panel, seats, and side interiors as outlined below:

Interior Damage	Variables
Steering Wheel	V304-V319
Steering Wheel EA Device	V312-V316
Steering Column Features	V320-V325
Column Movement	V326-V327
Column EA Devices	V328-V330
Column Rotation	V331
Compartment Deformation	V332-V337
Windshield Performance	V338-V343
Front Interior (Panel) Damage and Occ Contacts	V344-V394
Seats	V395-V434
Adjusters	V398-V405
Head Restraints	V411-V416
Rear Seats	V423-V434
Windows	V435-V445
Left/Right Side Damage and Occ Contacts	V446-V495
Roof	V498-V501

Vehicle Driver

The vehicle file is also logically the driver file as there is only one driver per case vehicle. It should be noted that all drivers in a particular accident will only be represented if all vehicles are investigated (become case vehicles). So, if the drunk driver, who ran a stop signal and caused the accident, was driving an old car*, he may not be represented in the data bank.

Driver Factors	Variables
Impairment	V69
Driver Education	V502
Driver's Record	V503-V505
Trip Plan	V506-V507
Route Familiarity	V508-V510
Psychological	V514-V517
Physiological	V518-V521
Pharmacological	V522-V523

*Current practice among MDAI teams is to report all vehicles on the appropriate CPIR. Early case reports generally included a CPIR form for only one vehicle unless both vehicles happened to satisfy the "acceptable vehicle" definition. Cornell III-A cases, and others from MVMA sponsorship still report only the acceptable vehicle on the CPIR form. Finally, when the "other vehicle" was a truck or bus it will not be listed in this file (because of the inappropriateness of the file structure) even though a CPIR form was supplied.

Occupant Summary

The last vehicle file variables (V561-V576) summarize the occupant information for the case vehicle. These summary variables are created automatically during the file building process, to provide the analysist the facility for occupant information on a vehicle by vehicle basis. For example, one may ask what is the distribution of injury severity for the right front occupant in vehicles with a driver fatality. Occupancy, Overall Injury Severity (AIS) and Restraint Usage is recorded for fine summary seat positions. The Overall Case Vehicle Injury Severity (AIS) is summarized in Variable 576 by recording the highest overall injury severity sustained by any one case vehicle occupant. This is a useful variable for splitting the file into three broad categories: property damage (AIS=0), injury producing (AIS=1-5) and fatailty producing (AIS=6-10).

OCCUPANT FILE CONTENTS

There are 60 additional variables coded for each of the MDAI case vehicle occupants. Energy occupant is recorded whether injured or not. Each occupant record repeats the first 576 vehicle variables for each occupant in the case vehicle. Thus, a case vehicle with 3 occupants would be processed into three occupant records, each containing the identical information for the first 576 variables. One occupant record is processed for unoccupied case vehicles with the Occupant Number (V577) coded as (00), and the other variables as "unknown". The occupant variables can be grouped as follows:

Occupant File	Variable(s)
Occupant Number	V577
Seating	V578-V581
Age, Weight & Height	V582-V590
Restraint System	V591-V602
Areas Contacted	V603
Ejection	V604-V605
Injury	V600,V606
Injury, Details	V607-V636

The first thing to be noticed about the occupant variables is that the Occupant Number (V577) contains no seating information. Seating is coded separately in the next three variables by location, position and posture. The Occupant Number is simply a counter starting at (01) for the first occupant coded. Thus, to make the occupant file "look like" a vehicle file (i.e., one record per case vehicle) the analysist could restrict the Occupant Number to (00,01). In order to look only at case vehicle driver, the analysist may restrict the Seated Location/Position, V58, to (44).

Occupant Number — V577

Seat Location
- (4) Front
- (5) Rear
- (6) Third
- (7) Other
- (0) Unknown

V578 →

Position on Seat
- (4) Left
- (5) Left Center
- (6) Center
- (7) Right Center
- (8) Right
- (9) All (Lying)
- (0) Unknown

V579 →

Location/Position (e.g., 44=FL) — V580

Occupant Age, Weight and Height are automatically provided with bracketed ranges (e.g., 5 year, 25 lb., 6 inch ranges) during the file build process, although the analysist can transform each variable into other ranges at the time of analysis. It should be noted that Sex has two additional code values for "large animal" (6) and "pregnant woman" (7).

Occupant Injury Severity (tissue damage) is recorded according to the American Medical Association Abbreviated Injury Scale (AIS). (See Volume 4, page 32.) The occupant file user should note that fatal cateogires (6-10) do not match the definition of fatality used in Level I or mass accident data. The police will code a traffic fatality six months to a year after the collision. In the AIS, the occupant must die within 24 hours. Fatalities after 24 hours are coded as (5), "Critical, survival uncertain". In order to record the true number of fatal occupants, the Treatment question in the original CPIR has been expanded to Treatment/Mortality (V606) and provided with a "Fatal after 24 hours" category.

The Occupant Injury Detail page from the CPIR form has been reproduced in Figure 4. Only the Areas of Possible Contact (columns 14-21) and Overall Injury to Body Region (column 22) are recorded in the occupant file. The remainder of the injury details (columns 23-31) are too cumbersome to analyze in this format and have been reformated into the injury file.

The Overall Injury to Body Region is at least equal to the highest AIS code for that region. The investigator records four areas of possible contact for each region sustaining an injury. For analysis purposes, these contacts are not recorded in any consistent sequence or order, e.g., the first contact area, the most probable contact area, or the worst injury producing contact areas might have been recorded first.

INJURY FILE CONTENTS

There are 10 variables coded for each injury sustained by a case vehicle occupant. For each injury an occupant receives, one injury record is stored with the first 636 variables repeated and 10 new injury variables as below:

Injury File	Variable(s)
Body Region	V637-V639
Total Number of Injuries	V640-V641
to Occupant	V640
to Body Region	V641
Injury Number Counter	V642, V647
Occupant Injury Counter	V647
Region Injury Counter	V642
Overall Body Region AIS	V643
Injury Description	V644, V645
Injury Diagnosis	V644
Injury Severity (AIS)	V645
Areas Contacted	V646

As discussed earlier, the injury file contains one record for each specific injury coded on the right hand side of the CPIR occupant injury detail page (Figure 4). For each injury, the corresponding Body Region and Injury Type/Diagnosis is recorded as outlined below. The overall injury severity and four contact areas for the injured region are also recorded. An injury counter (like a vehicle or occupant number) is stored for each new injury by occupant and body region.

Thus, by restricting the occupant injury counter to (00,01), the injury file would look like an occupant file. More interestingly, the body region injury counter can be restricted to (1) in order to analyze one computer record per body region, i.e., a body region file. This permits the analysist to look at injury to body regions as a function of occupant age, for example.

Body Region Codes	Injury Types
(12) Internal Organs	(1) Fracture
(13) Brain	(2) Laceration
(14) Face	(3) Contusion
(15) Head	(4) Pain
(16) Neck	(5) Abrasion
(17) Shoulder Girdle	(6) Concusion
(18) Right Upper Limb	(7) Burn
(19) Left Upper Limb	(8) Hemorrhage
(20) Chest and Upper Back	(9) Other
(21) Lower Back	(0) Not Applicable
(22) Abdomen	
(23) Pelvic Girdle	
(24) Right Lower Limb	
(25) Left Lower Limb	
(26) Whole Body	
(00) Not Applicable	

Some cautions must be observed when applying the injury file to problems of injury causation. First, no record is stored of which area of contact caused a specific injury, particularly if there was more than one injury to a body region. Second, two distinct injuries of the same type (e.g., two independently caused facial lacerations) are coded as one injury. Third, the categories of Internal Organs and Brain are not truly "geographical" regions of the body. This sometimes produces inconsistent coding of internal injuries, such as heart trauma. These inconsistencies result from the form in which the data have been reported, rather than from any limitations of the file construction.

Because of the necessity for adequate injury causation data, the Occupant Injury Classification (OIC) scheme (discribed in Appendix D) was developed as part of the MDAI Report Automation contract. Figure 5 outlines the OIC. Four letters are used to describe the specific Body Region, Aspect, Lesion, and Body System/Organ affected. In a manner similar to the Collision Deformation Classification (J224a) the OIC is terminated with the numeric AIS severity code. Essentially, the Occupant Injury Classification is simply the recognition that Body Region, Injury Diagnosis or Lesion, and Body System/Organ are independent dimensions or facets of injury classification. It is expected that this new classification system will be introduced in parallel with the existing system to determine whether it adequately removes the uncertainties of the present arrangement.

SECTION 4

DISCUSSION OF FILE UTILIZATION

This section discusses the project activities from the point of view of increasing the effectiveness of the accident data bank utilization. Analysis of the Multidisciplinary Accident Data is the subject of Volume 2. File utilization has been provided to the sponsor through documentation and training on a time-shared accident data bank and statistical analysis facility resident on the University's Michigan Terminal System (MTS).

The file user's first introduction is to the Simplified Procedures for Analysis of Data (SPAD) system. The SPAD system permits the user to perform five analysis functions on a number of accident data files (See Table 2) including the MDAI vehicle, occupant and injury files described in the previous section. These operations are performed in a pseudo-conversational manner from remote computer terminals and do not require the user to learn how files are stored or how programs are loaded for execution. He is only required to provide the parameters unique to his analysis problem. The analysis and data file facilities outlined in Table 3 are documented in detail in Volume 3.

Copies of the SPAD Manual (Volume 3) and codebooks describing the code values for each of the files listed in Table have been provided to the NHTSA staff and to six of the MDAI teams. Updates to this documentation are distributed as new materials become available.

Table 2

Summary of Files Presently Available in the SPAD System

Source	DATA LEVEL I (Police)	II	III (MDAI)
MDAI Teams			X
Michigan			
Washtenaw County (68-71)	X	X	X
Oakland County (68-71)	X		X
Texas			
Bexar County (69-70)	X		X
New York			
Cornell Aero Labs (70)	X		X
Florida			
Dade County (69-70)	X		X
Washington			
Seattle (69-70)	X		
Colorado			
Denver (69-70)	X		

Table 3

Analysis Functions Available in the SPAD System

Function	Description	Example
Data Set List	List the values of any selected variables for any chosen subset of the data file.	List case number, age and sex of driver, and severity of injury to the neck for all cases involving Fords damaged in the front and with a reported impact speed greater than 20 miles per hour.
Histogram	Print a pictorial display (bar graph) for any variable and for any subset of the data.	Two bargraphs showing the number of head-on and the number of rear end accidents by hour of the day.
Means and Marginals	Tabulate the distribution of the number of cases at each level of some variable for any chosen subset, and also present the mean, standard deviation, and kurtosis.	Print the number of drivers in each age group for drivers involved in accidents during hours of darkness, and also print the average age and its standard deviation.
Analysis of Variance	Calculate the average value of some dependent variable for each level of another variable, and display this mean, the standard deviation, and several statistics showing significance of the association	Display the average age of female drivers for each day of the week: then display similar tables for cases in which the driver was drinking or not drinking.
Bivariate Frequencies	Tabulate a two way table for any two variables and for any subset; present associated statistics (such as chi-square) when desired	Display the number of accidents by severity and by day of the week; list also the value of the chi-square statistic to indicate whether the reported variation is of statistical significance.

As the file user becomes more sophisticated he learns that the SPAD system is simply a shorthand version of the more popular analysis programs and data files available in the Statistical Research System. These more advanced analysis tools and additional data files are available as the experience and interest of the individual indicates. Some of the additional statistical packages are Linear Regression, Partial Correlation, Multivariate Analysis of Variance, Automatic Interaction Detector, Multiple Classification Analysis and Factor Analysis.

USER TRAINING

Training is an essential element for the successful utilization of the data files and analysis tools. On March 31, 1971, a presentation was given at NHTSA. Over thirty NHTSA staff members attended the session reviewing the automation project, and presenting the availability of the analysis tools. Fifteen persons returned on the second day for a "how-to-do-it" session.

With time, the number of users broadened to include six of the MDAI teams and a number of new staff people at NHTSA as well as in the automotive manufacturing companies. A second seminar/workshop was conducted on February 10-11, 1972, at the Highway Safety Research Institute. Thirty government and industry attendees learned how to access the data through two days of presentations and group practice sessions. Organizations represented at this latter workshop included:

- National Highway Traffic Safety Administration
  - Information Systems Division
  - Technical Reference Division
- Government Accounting Office
  - Washington, D.C. and Detroit Offices
- American Motors Corporation
- Chrysler Motor Corporation
- Ford Motor Corporation
- General Motors Corporation
  - Safety Research and Development Laboratory
- Southwest Research Institute
- Cornell Aeronautical Laboratory
- Indiana University
  - Institute for Research in Public Safety
- University of Southern California
  - Institute of Aerosapce Safety and Management
- University College London, England
  - Research Group in Traffic Studies
- University of Michigan
  - School of Public Health
  - Highway Safety Research Institute

The program for this seminar is given in Table 4 .

Table 4

MDAI Report Automation-Seminar/Workshop Program

February 10, 1972, HSRI Seminar Room

9:00 am	Introduction - Jim O'Day	
	-Introductions, attendees, HSRI staff	
	-Seminar Outline, Background	
	What Data is Available	
	-HSRI Accident Data Files	
	-File Structure, Available Files	
9:30 am	How do I Access this Data? - Marianne Stover	
	-Statistical Research System Structure	
	-Structuring the analysis problem	
	Filter, Recode, Lable, Variable List, Parameters, Printing	
	-Michigan Terminal System-SPAD-SRS	
	-SPAD Primer, distribution, contents	
COFFEE BREAK		
10:15 am	What Analysis can I do?	
	-Available Analysis Programs - John Green	
	Easy access programs (SPAD)	
	New special purpose analysis and display programs	
	-Examples and limitations of accident data analysis - Jim O'Day	
	Review of recently completed analysis	
	Comparison of files for analysis purposes	
10:50 am	MDAI Report Automation Review - Joe Marsh	
	-What is on file and how it got there	
	-One-way frequency (univariate) distributions	
11:20 am	HSRI Facilities	
	-HSRI IBM 1800	
	-Building Tour - library, test sled	
	-Accident Investigation and Data Editing Facilities	
LUNCH		
1:30 pm	Specifics of Computer File Utilization	
	-Use of Teletype in MTS" Film	
	-MTS Discussion - John Green	
	-SPAD for first time users - Joe Marsh	
	Data set list in 10 steps	
	Bivariate tables - with recode and local filters	
COFFEE BREAK		

Table 4 Continued

Available computer terminals

Workshop - Jim O'Day
Development of problem statements
Break into analysis groups

Advanced Topics for Experienced Users - John Green
Experienced users will form separate group for duration of workshop to explore new display programs (3-D plots) and advanced SRS programs (AID).

February 11, 1972, HSRI Room 131

9:00 am Review and Further Topics - Marianne Stover
-SPAD - Univariate and Histogram, ANOVA
-SRS - Statistical Research System

Workshop - Jim O'Day
Questions/Answers
Review of analysis problems
Break into groups for computer terminal exercise

LUNCH

1:30 pm Workshop
Continued computer terminal exercise

3:30 pm Review and Summary - Jim O'Day
-Questions/Answers
-Operating Environment of the Remote terminal user SPAD documentation, Who to call.

Plans for the Future - Sam Schultz
MIDAS - Michigan Interactive Data Analysis System.

While the system for accessing data is relatively simple, familiarity gained by using the data is necessary for successful operation. Even though a user has attended workshops, operational questions will arise. HSRI encourages data users to call about any problem however small.

The accident data bank and analysis facilities are, in fact, operating systems and are therefore prone to user problems such as errors in the data, program bugs, incomplete documentation, and misunderstandings.. While every effort is made to minimize these errors both telephone and computer communication channels have been set up to provide feedback in the evolution of the system.

CURRENT FILE USAGE

One unique and valuable aspect of this accident data facility is that all users are provided private access to the files through the use of a time shared terminal system. No record is maintained of the particular analyses conducted by each user, but it is possible to note total usage (in terms of terminal hours) and to tabulate the particular files used over a period of time. It has been observed that the NHTSA Staff has averaged approximately 15 hours of terminal time per month over the last 6 months.

As noted above there are many sets of accident data available for interrogation by users. Most of these are physically stored on magnetic tape, and are made accessible to one user at a time by virtue of his requesting a tape mount. The MDAI vehicle and injury files are also stored on tape. As seen in Table 5, the MDAI files are the most frequently used of all the accident files.

This frequent usage generated a conflict in that often two users would want access to this data simultaneously. To alleviate this problem the MDAI occupant file has been placed into random access disk file storage. This procedure allows all users access to the file at any time, and saves the user both the time and charges associated with tape mounting and tape drive usage. During the month of August the MDAI occupant file was accessed 150 times by all users.

Table 5

Number of August 1972 Tape Mounts Using the SPAD System for each of Several Files

Data File	Number of Tape Mounts
Washtenaw County Files	11
Oakland County Files	2
Denver Files	16
Texas Files	9
Seattle Files	6
Florida Files	3
Cornell Files	29
CPIR (Revision 2)	14
MDAI (Accident and Injury)	40
	130

APPENDIX A

CPIR Form and Supplement

This appendix contains annotated Collision Performance and Injury Report (CPIR) Long Form Revision Number 3 (General Motors Safety Research & Development Laboratory, 1969) and the Supplement of additional questions. The CPIR has been annotated with all the new code values currently being used. Only passenger cars, pickup trucks and vans are coded on this form for computer processing. Large trucks (tractor-trailers), vans, motorcycles and off-the-road vehicles are not processed on this CPIR form.

The supplement questions coded by the Highway Safety Research Institute are documented on pages A31 through A38. The additional questions deal primarily with pre-collision and administrative information. The variables available for analysis are documented in section 1 of Volume 4 and include several summary variables computed during the file build process.

COLLISION PERFORMANCE and INJURY REPORT

LONG FORM

(REVISION NUMBER 3)

GM
PG2070

(THIS FORM REPLACED PG2002 IN SEPTEMBER 1969)

A 1

FORM VERSION NUMBER 3 (1) REPORT NUMBER __ __ __ __ __ __ __ __ (2 3 4 5 6 7 8 9) Team Letters CARD NUMBER 0 1 (10 11) DATE OF COLLISION MO. / DAY / YR. __ __ / __ __ / __ __ (12 13 / 14 15 / 16 17) (999999) Unknown	TIME OF COLLISION ________ AM PM DATE OF FIELD INVESTIGATION Watch for junk yard changes INVESTIGATOR ________ Serial Number for each Case Vehicle in an accident Blank — Only one Case Vehicle in accident (1) — Case Vehicle 1 of several in accident (2) — Case Vehicle 2 of several case vehicles LOCATION WHERE VEHICLE WAS EVALUATED: ________ REPORT PREPARED BY ________	KEYPUNCH ONLY: DATE REC'D. PUNCHED VERIFIED

	PUNCH CODE	CARD COL.
LOCATION		
STATE: ________ FIPS code	— —	18-19
CITY, TOWNSHIP, ETC.: ________		
AREA (1) URBAN (2) RURAL (0) UNKNOWN	—	20
LOCALITY (1) MANUFACTURING OR INDUSTRIAL (2) SHOPPING OR BUSINESS (3) APARTMENTS (4) SCHOOL OR PLAYGROUND (5) RESIDENTIAL (6) FARM (7) UNDEVELOPED (0) UNKNOWN	—	21
ENVIRONMENTAL CONDITIONS		
LIMITED ACCESS HIGHWAY (1) YES (2) NO (0) UNKNOWN	—	22
ROAD TOTAL TRAFFIC LANES — Case Vehicle (1) 1-Lane (2) 2-Lane (3) 3-Lane (4) 4 or More Lanes (5) 4 or More Lanes Divided (6) Parking Lot, Driveway (7) Other, e.g. RR Tracks, Ramps (0) Unknown	—	23
OTHER ROAD TOTAL TRAFFIC LANES WIDTH (IF AT INTERSECTION) CHOOSE FROM ABOVE LIST OR (9) NOT APPLICABLE	—	24
TYPE OF ROAD SURFACE (1) Asphalt, Bituminous Concrete (2) CONCRETE (3) GRAVEL (4) MORE THAN ONE TYPE (5) OTHER ________ (0) UNKNOWN	—	25

Case Vehicle Only	PUNCH CODE	CARD COL.
ROAD ALIGNMENT VERTICAL PLANE (1) LEVEL (2) CREST OF HILL (3) SLOPE 2% grade (4) BOTTOM OF HILL (0) UNKNOWN	—	26
HORIZONTAL PLANE (1) STRAIGHT (2) CURVE (0) UNKNOWN	—	27
SURFACE COVERING (01) DRY WATER (02) DAMP (03) WET (04) PUDDLED (05) UNKNOWN AMOUNT SNOW (06) LOOSE (07) PACKED (08) CONDITION UNKNOWN (09) ICE (10) SLUSH (11) SPILLED GRAVEL (12) OTHER ________ (00) UNKNOWN	— —	28-29
PRECIPITATION (1) NONE (2) RAIN (3) SNOW (4) HAIL (5) SLEET (6) OTHER: ________ (0) UNKNOWN	—	30
RATE OF PRECIPITATION (3) NOT APPLICABLE (4) LIGHT, Mist (5) MODERATE (6) HEAVY (0) UNKNOWN	—	31
SURFACE SLIPPERY (1) YES (2) NO (0) UNKNOWN	—	32

COLLISION DESCRIPTION

POSSIBLE MECHANICAL MALFUNCTION

ENVIRONMENTAL CONDITIONS

ENVIRONMENTAL CONDITIONS

	PUNCH CODE	CARD COL.
SPEED LIMIT (1) 5-25 MPH (2) 26-30 (3) 31-35 (4) 36-40 (5) 41-45 (6) 46-55 (7) 56-65 (8) 66-75 (9) OVER 75 MPH (0) UNKNOWN	___	33
ROAD DEFECTS (not design deficiencies) (1) YES (2) NO (0) UNKNOWN	___	34
TEMPERATURE, F (1) BELOW ZERO (2) 0-19 (3) 20-29 (4) 30-34 (5) 35-39 (6) 40-59 (7) 60-79 (8) 80-99 (9) 100 OR OVER (0) UNKNOWN	___	35
CROSSWIND (1) NONE (2) LIGHT (3) STRONG (4) STRONG & GUSTY (0) UNKNOWN	___	36
TIME OF DAY (1) DAY (2) NIGHT (3) DUSK (4) DAWN (0) UNKNOWN	___	37
VISIBILITY LIMITATION (for accident) (1) None (2) Cloudy - Dark (3) Fog (4) Smoke (5) Windshield Condition (6) Glare (7) Other: ________ NEW CODES (8) Rain (NEW) (9) Snow (NEW) (0) Unknown	___	38
VISIBILITY OBSTRUCTION (for accident) (1) None (2) Building (3) Sign (4) Bushes (5) Tree (6) Hill or Curve in Road (7) Other: ________ NEW CODES (8) Vehicle in Transport (NEW) (9) Parked Vehicle (NEW) (0) Unknown	___	39

POSSIBLE MECHANICAL MALFUNCTION

INVESTIGATION OF THE POSSIBILITY OF MECHANICAL MALFUNCTION

THIS SECTION SHOULD BE FILLED OUT IF A MECHANICAL MALFUNCTION IS RECOGNIZED, OR SUSPECTED BY THE INVESTIGATOR OR WAS ALLEGED TO HAVE CONTRIBUTED TO THE ACCIDENT INVOLVING THIS VEHICLE. SUPPORT ANY ITEMS CHECKED OR NOTATED BY COMMENTS.

CHECK ITEMS INVOLVED:

- ☐ BRAKE SYSTEM
- ☐ EXHAUST SYSTEM
- ☐ STEERING SYSTEM
- ☐ SUSPENSION SYSTEM
- ☐ TIRES
- ☐ ELECTRICAL SYSTEM
- ☐ THROTTLE CONTROLS
- ☐ DRIVER CONTROLS
- ☐ POWER TRAIN
- ☐ FUEL SYSTEM
- ☐ VISIBILITY ITEMS
- ☐ OTHER: ________

	PUNCH CODE	CARD COL.
NUMBER OF ITEMS ~~CHECKED~~ INVOLVED: (Not "Items Looked at") (Not "Items Alleged")	___	40
WAS COMMENT ABOUT MECHANICAL MALFUNCTION MADE BY ANY PERSON(s)? (1) YES (2) NO	___	41

IF "YES", GIVE COMMENT(s) AND NAME(s) AND ADDRESS(es) OF PERSON(s):

____

POSSIBLE MECHANICAL MALFUNCTION

COMMENTS AND OBSERVATIONS OF INVESTIGATOR ABOUT THE POSSIBILITY OF MECHANICAL MALFUNCTIONS:

STIGATOR:

DATE OF INVESTIGATION

DATE OF REPORT

GENERAL INFORMATION

IMPAIRMENT

COLLISION TYPE

COLLISION CONFIGURATION (of case vehicle)	PUNCH CODE	CARD COL.
VEHICLE TO OBJECT (1,2,0)*	—	42
ROLLOVER (1,2,0)* (90° or more)	—	43
RAN OFF THE ROADWAY (1,2,0)* (Before first impact)	—	44
VEHICLE TO VEHICLE (1) Yes, Configuration unknown (NEW) (2) No (3) Head-on (F to F) (4) Intersection type L (2/72) (T + L before 2/72) (5) Side-swipe (6) Rear-impact (F and B) (7) Other: ______ New Code (8) Intersection type T (2/72) (0) Unknown	—	45
VEHICLE TO STOPPED VEHICLE (1,2,0)* (Either vehicle)	—	46
VEHICLE TO MOVING VEHICLE (1,2,0)*	—	47
OTHER (1,2,0)*: ______	—	48
VEHICLES INVOLVED TOTAL NUMBER (INCLUDING CASE VEHICLE) In Accident	—	49

OBJECTS CONTACTED

ENTER OBJECTS IN ORDER OF CONTACT DURING COLLISION

Fill with (02)'s for "None"

	— —	50-51
	— —	52-53
	— —	54-55
	— —	56-57

(02) None
(03) Other Automobile
(04) Ground (rollover only)
(05) Guardrail
(06) Bridge (rail)
(07) Sign
(08) Ditch
(09) Embankment (snowbank)
(10) Culvert
(11) Fence
(12) Pole or Tree
(13) Pedestrian
(14) Large Animal
(15) Motorcycle
(16) Large Truck - Type Unknown (see 20-25) below
(17) Train or Bus
(18) Pedacycle (bicycle+)
(19) Building
(20) Light truck/pickup truck

New Codes

(22) Tractor without Trailor (9/72)
(23) Van delivery truck
(24) Straight truck
(25) Tractor-trailor combination
(26) Multi-purpose vehicle (jeep)
(40) Object disengaging from other vehicle (i.e., loose tire, box 9/72)
(50) Hydrants, short posts, stumps (9/72)
(51) Mailbox (rural), small posts/trees
(52) Pier, Pillar (e.g., bridge support)
(53) Retaining wall, abutment

Highway Fixtures:

(54) Impact attenuator
(55) Breakaway Fixtures
(99) Other: ______

*WHERE (1,2,0) IS INDICATED, USE 1 FOR YES
2 FOR NO
0 FOR UNKNOWN

CASE VEHICLE DRIVER'S ABILITY TO DRIVE IMPAIRED BY (CHOOSE NO MORE THAN TWO)	PUNCH CODE	CARD COL.
(00) UNKNOWN (02) NONE (03) DRINKING INVOLVED (Broad) (04) Drunk By Local Legal Standards (05) ASLEEP (06) FATIGUE (07) RECKLESSNESS (08) INATTENTION (09) LACK OF TRAINING (10) EMOTIONAL STATE (11) MEDICATION (12) Drugs (narcotic) Fill Both (13) ILLNESS (or otherwise) (14) INFIRMITIES (15) PHYSICALLY HANDICAPPED	— —	58-59
(16) OTHER: ______	— —	60-61
SOURCE OF INFORMATION: ______		
TRAFFIC VIOLATION (EITHER DRIVER) (1) YES (2) NO (0) UNKNOWN DESCRIBE VIOLATION: ______ Citation need not be issued, but only indicated.	—	62
LEGAL ACTION WAS TRAFFIC VIOLATION CITATION ISSUED TO ANYONE? (1,2,0)*	—	63
IF "YES", CIRCLE VIOLATOR: DRIVER OF CASE VEHICLE DRIVER OF OTHER VEHICLE PEDESTRIAN OTHER: ______		
(Accident Point of View) TYPE OF LOSS PERSONAL INJURY (1,2,0)*	—	64
PROPERTY DAMAGE (1,2,0)*	—	65

COLLISION SKETCH

Based on Information From _______________

1. Draw heavy lines to show highway detail at the location of collison.
2. Give name of streets and highways and US, State and Interstate Route numbers, if any.
3. Identify all objects in sketch. Case vehicle should always be labeled "A". Time sequence numbers may be added (e.g., A1, A2).
4. Include dimensions when possible.

INDICATE NORTH BY ARROW

COLLISION SKETCH

DESCRIBE COLLISION EVENTS _______________

INFORMATION SOURCES: _______________

REPORTED BY: _______________
(Attach Police Report)

COMMENTS

Record four speed estimates, three digits each.
-Do not code range of speeds
-(888) for "Other Vehicle" Not applicable

SPEEDS

CASE VEHICLE	PUNCH CODE	CARD COL.	OTHER VEHICLE	Always Fill in	CARD COL.
ESTIMATED SPEED* (MPH)			ESTIMATED SPEED* (MPH)		
PRIOR TO IMPACT ESTIMATED BY ________	___ ___ ___	66-68	PRIOR TO IMPACT ESTIMATED BY ________	___ ___ ___	72-74
At First Impact ESTIMATED BY ________	___ ___ ___ Note	69-71	At First Impact ESTIMATED BY ________	___ ___ ___	75-77
				END OF CARD 01	

*IF SPEEDS ARE UNKNOWN, ENTER 999 IN PUNCH CODE COLUMN

OTHER VEHICLE

See CPIR page 7 for details

NOTE: A complete analysis of this accident require that a minimum amount of information be obtained on the other vehicle(s) involved. Therefore, the informat on on this page should be completed even though a separate long form may be filled out on these other vehic es.

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 0 (10) 2 (11)

OTHER VEHICLE DESCRIPTION

VEHICLE IDENTIFICATION NUMBER

12	13	14	15	16	17	18	19	20	21	22	23	24

MAKE ______

MODEL ______

CODE TO BE INSERTED

__ __ __ __ __
25 26 27 28 29

MODEL YEAR 19 __ __ (30 31)

See CPIR page 7 for details

WEIGHT OF VEHICLE, LBS. __ __ __ __ (32 33 34 35)

ODOMETER READING (IF OVER 100,000 USE 99 999) __ __ __ __ __ (36 37 38 39 40)

	PUNCH CODE	CARD COL.
BODY STYLE (1) 2-DOOR HARDTOP (2) 2-DOOR SEDAN OR COUPE (3) 4-DOOR HARDTOP (4) 4-DOOR SEDAN (5) STATION WAGON (6) CONVERTIBLE (7) VAN (8) TRUCK (9) OTHER (BUS, ETC.) ______ (0) UNKNOWN	__	41
ENGINE NUMBER OF CYLINDERS (Enter "0" if unknown)	__	42
HIGH PERFORMANCE (1,2,0)*	__	43
NUMBER OF OCCUPANTS	__ __	44-45
VEHICLE LOADING (4) BELOW FULL RATED LOAD (5) NEAR FULL RATED LOAD (6) ABOVE FULL RATED LOAD (0) UNKNOWN	__	46

*WHERE (1,2,0) IS INDICATED, USE 1 FOR YES
2 FOR NO
0 FOR UNKNOWN

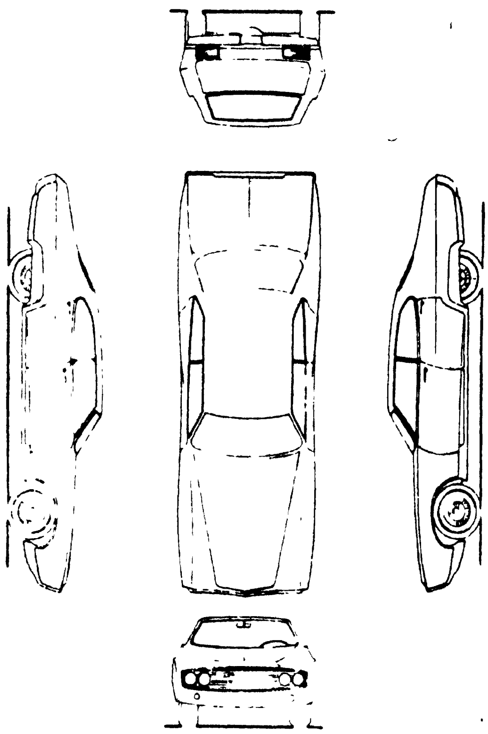
DAMAGE INDEX (OTHER VEHICLE)

__ __ - __ __ __ __ - __
47 48 49 50 51 52 53

Estimate Unknown Letters

VEHICLE DAMAGE

(This space may be used to enter details and notes about the other vehicle. See page 9 for instructions.)



COMMENTS. ______

Investigator can submit several "Other Vehicle" pages, but only one will be computer processed.

IF SEPARATE REPORT WAS MADE, GIVE REPORT NUMBER ______

Fill in if "Other Vehicle" reported on separate CPIR.

END OF CARD 02

OTHER VEHICLE

CASE VEHICLE

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 0 3 (10, 11)

CASE VEHICLE DESCRIPTION

VEHICLE IDENTIFICATION NUMBER

12	13	14	15	16	17	18	19	20	21	22	23	24

Fill serial numbers with 9's (Not dashes) to correct length

MAKE ____________

MODEL ____________

Fill in Make/Model Code

CODE TO BE INSERTED by team

Unknown (00000) __ __ __ __ __ (25–29)

MODEL YEAR 19 __ __ (30, 31)
Unknown (99)

Shipping Weight of Vehicle, lbs. __ __ __ __ (32, 33, 34, 35)
Unknown (0000), Over 10,000 use (9999)

ODOMETER READING __ __ __ __ __ (36, 37, 38, 39, 40)
(IF OVER 100,000: USE 99 999) Unknown (00000)

	PUNCH CODE	CARD COL.
BODY STYLE (Match to Pillar Damage, p. 12, 15) (Code Sun Roof as 1 to 5, not 6) (1) 2-Door Hardtop (no upper B pillar) (2) 2-Door Sedan or Coupe (any upper B) (3) 4-Door Hardtop (4) 4-Door Sedan (5) Station Wagon or Pickup Car (6) Convertible - soft or hard shell (7) Van (not walk-in) (8) Truck (9) Other (e.g. bus, jeep, train) (0) Unknown	___	41
BODY STRUCTURE (1) BODY AND FRAME (2) UNITIZED (3) INTEGRAL - STUB FRAME (4) OTHER ________ (0) UNKNOWN	___	42
ENGINE NUMBER OF CYLINDERS (Enter "0" if unknown)	___	43
HIGH PERFORMANCE (1,2,0)*	___	44
NUMBER OF OCCUPANTS Includes Driver (Enter 99 if unknown) Must match number of occupant info. sections	__ __	45-46

*WHERE (1,2,0) IS INDICATED, USE 1 FOR YES
2 FOR NO
0 FOR UNKNOWN

	PUNCH CODE	CARD COL.
VEHICLE LOADING (4) BELOW FULL RATED LOAD (5) NEAR FULL RATED LOAD (6) ABOVE FULL RATED LOAD (0) UNKNOWN	___	47
EQUIPMENT OPTIONS TRANSMISSION (4) AUTOMATIC + Semi Automatic (5) MANUAL (0) UNKNOWN	___	48
STEERING (4) POWER (5) MANUAL (0) UNKNOWN	___	49
BRAKES (4) POWER (5) MANUAL (0) UNKNOWN	___	50
BRAKES - TYPE (4) DRUM - ALL WHEELS (5) DISC - FRONT WHEELS (6) DISC - ALL WHEELS (0) UNKNOWN	___	51
BRAKE ANTI-LOCK DEVICE (2) NONE INSTALLED (4) TWO-WHEEL (5) FOUR-WHEEL (0) UNKNOWN	___	52
Top Position at Time of Collision (3) Solid Top - Not Applicable (4) Convertible Soft Top Up or Closed (5) Retracted Soft Top or Hard Shell Removed (6) Removable Hard Shell Installed (NEW) (7) Sun Roof - Closed (NEW) (8) Sun Roof - Open (NEW) (0) Unknown	NEW CODES ___	53

CASE VEHICLE REPAIR OR REPLACEMENT COST Unknown (9999) $ __ __ __ __ (54, 55, 56, 57)

CASE VEHICLE DAMAGE INDEX

PRIMARY DAMAGE

WORST → Worst-most significant (e.g., related to injury)

NEXT WORST __ __ __ __ __ __ __ (58, 59, 60, 61, 62, 63, 64)

SECONDARY DAMAGE Unknown or None (99-0000-0)

Fill Both __ __ __ __ __ __ __ (65, 66, 67, 68, 69, 70, 71)

END OF CARD 03

Always complete entire page

CASE VEHICLE

EXTERIOR DAMAGE (During Collision)

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 0 (10) 4 (11)

	PUNCH CODE	CARD COL
SHEET METAL DAMAGE		
FRONT (1,2,0)* (2) if none	—	12
REAR (1,2,0)*	—	
LEFT SIDE (1,2,0)*	—	14
RIGHT SIDE (1,2,0)*	—	15
ROOF (1,2,0)*	—	16
OTHER (1,2,0)*: ____________	—	17

REMARKS: ____________

Record only CONTACT or DIRECT DAMAGE

Do not include Indirect Damage

Fill in one per VDI first letter

- with one VDI, fill only one crush
- with two VDI, fill only two crushes
- if more contact impacts, record each

Match 1 to 1

SHEET METAL CRUSH

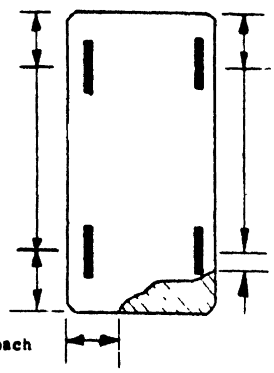
TO BE FILLED IN BY INVESTIGATOR. INSERT MAXIMUM CRUSH DIMENSION TO THE NEAREST INCH. DIMENSIONS MUST AGREE WITH DIAGRAMS ON FACING PAGE. (INSERT "99", IF UNKNOWN INSERT "98" IF 98 INCHES OR OVER) (00) if none

	PUNCH CODE	CARD COL
FRONT (INCHES)	— —	18-19
REAR	— —	
LEFT SIDE	— —	
RIGHT SIDE	— —	24-25
ROOF Downward only Includes Trunk, hood	— —	26-27
OTHER:	— —	28-29

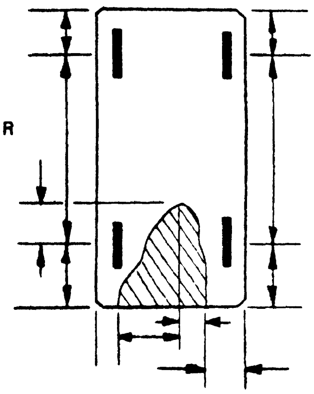
Note

EXAMPLES.

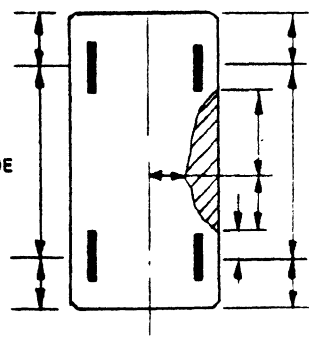
FRONT OR REAR



FRONT OR REAR



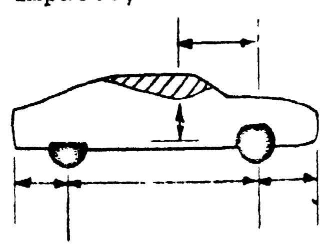
SIDE



Fill in one per VDI first letter

- with one VDI, fill only one crush
- with two VDI, fill only two crushes
- if more contact impacts, record each

ROOF (REFERENCE TO TOP OF DOOR SILL OR WINDOW SILL)



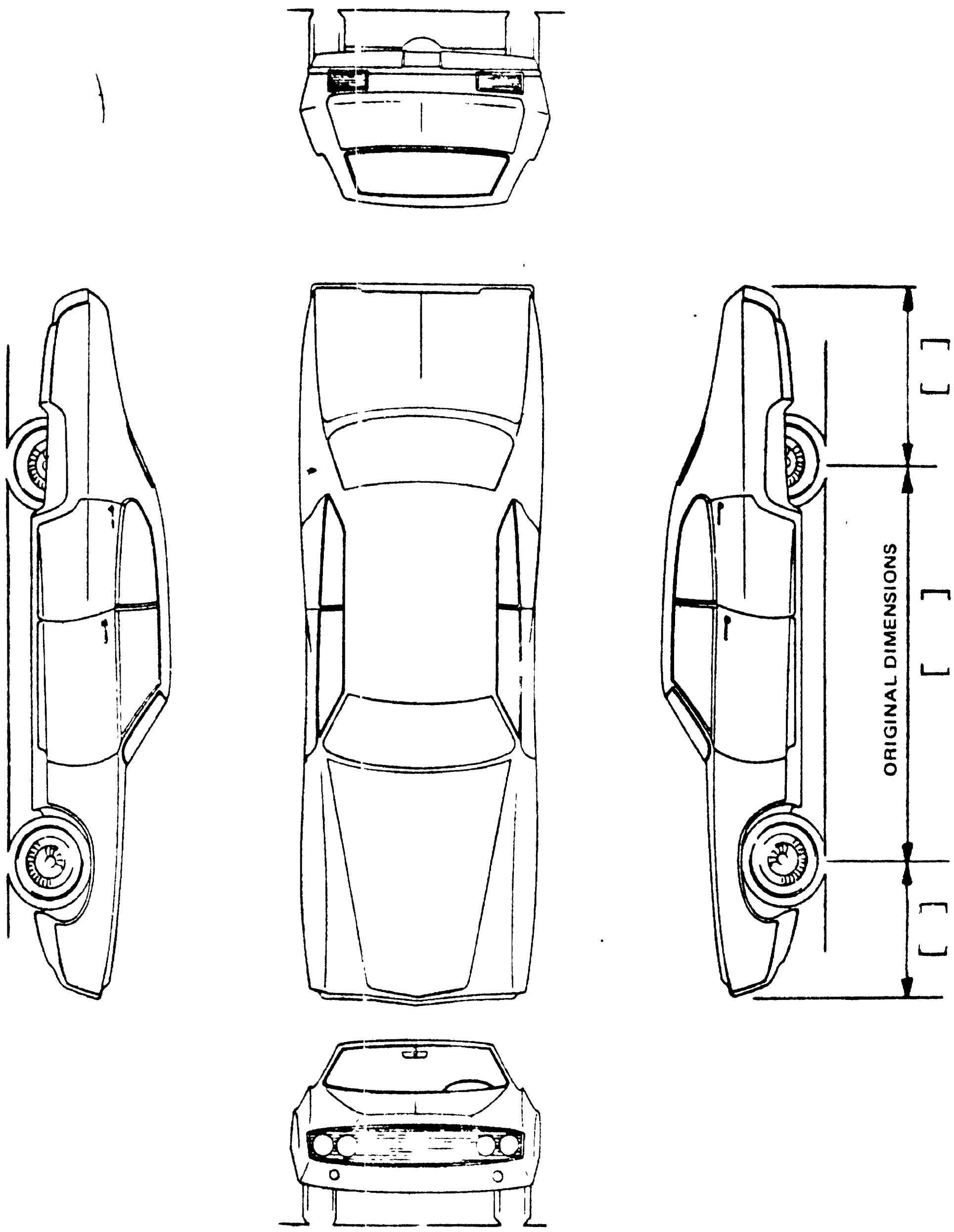
*WHERE (1,2,0) IS INDICATED, USE 1 FOR YES
2 FOR NO
0 FOR UNKNOWN

SHEET METAL

EXTERIOR DAMAGE

FIELD INVESTIGATOR INSTRUCTIONS:

1. Indicate crushed areas by outlining new perimeter of vehicle and shading the damaged areas on the large sketch below. Use as many sketches as ncessary to completely describe the damage.
2. Enter the dimensions on the sketch(es) measured to the point of maximum penetration by the object(s) contacted. Use the examples on the facing page as a guide.
3. Enter the three dimensions to the center of the wheels (wheelbase, front and rear overhangs) on both sides of the car.
4. Add other dimensions as necessary to completely describe the damage.



VEHICLE SKETCH

WHEELS AND TIRES

WHEELS	PUNCH CODE	CARD COL.
ORIGINAL EQUIPMENT TYPE		
FRONT (1,2,0)*	___	30
REAR (1,2,0)*	___	31
DAMAGED (1,2,0)*	___	32
DESCRIBE DAMAGE AND NON O.E. WHEELS		
Do not include tire damage		

TIRES	PUNCH CODE	CARD COL.
TREAD TYPE (4) REGULAR; (5) NON-STUDDED SNOW; (6) STUDDED SNOW; (7) 'SLICK'; (8) LEFT AND RIGHT SIDES DIFFERENT; (9) OTHER: ______; (0) UNKNOWN — FRONT	___	33
REAR	___	34
TREAD WEAR (4) LIGHT; (5) MEDIUM; (6) HEAVY; (7) BALD; (8) LEFT AND RIGHT SIDES DIFFERENT; (9) OTHER: ______; (0) UNKNOWN — FRONT	___	35
REAR	___	36
PROFILE (4) REGULAR 80,78; (5) WIDE OVAL 70,60,50; (6) LEFT AND RIGHT SIDES DIFFERENT; (7) OTHER ______; (0) UNKNOWN — FRONT	___	37
REAR	___	38
CARCASS TYPE (4) BIAS PLY; (5) BELTED-BIAS PLY; (6) RADIAL PLY; (7) LEFT AND RIGHT SIDES DIFFERENT; (8) OTHER ______; (0) UNKNOWN — FRONT	___	39
REAR	___	40

TIRES (CONT'D.)

SIZE

FRONT: LEFT ______ RIGHT ______

REAR: LEFT ______ RIGHT ______

MANUFACTURER

FRONT: LEFT ______ RIGHT ______

REAR: LEFT ______ RIGHT ______

MODEL

FRONT: LEFT ______ RIGHT ______

REAR: LEFT ______ RIGHT ______

CODE

FRONT: LEFT ______ RIGHT ______

REAR: LEFT ______ RIGHT ______

LOAD RANGE

FRONT: LEFT ______ RIGHT ______

REAR: LEFT ______ RIGHT ______

*WHERE (1,2,0) IS INDICATED, USE 1 FOR YES
2 FOR NO
0 FOR UNKNOWN

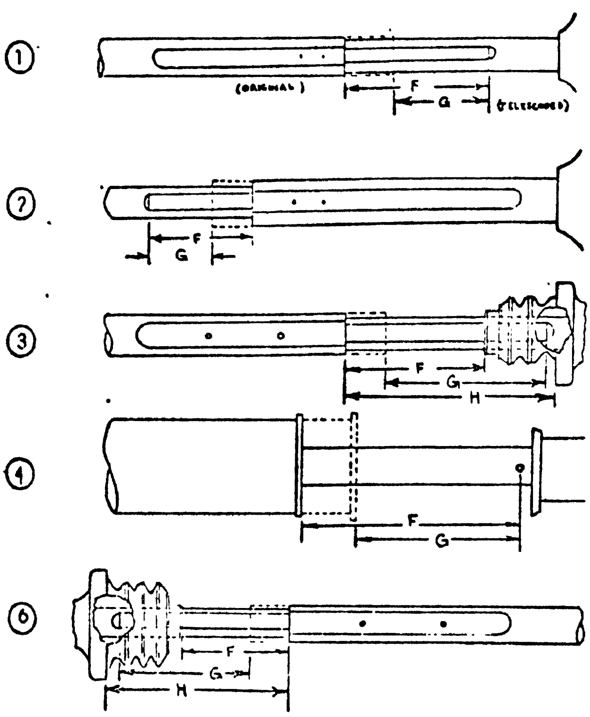
FRONT EXTERIOR

HOOD PERFORMANCE	PUNCH CODE	CARD COL
(FRONT OF VEHICLE) (VW front trunk)		
HOOD LATCH(ES) (3) for Not Applicable		
RELEASED (1,2,0)*	___	41
DAMAGED (1,2,0)*	___	42
JAMMED (1,2,0)*	___	43
HOOD HINGES		
LEFT — DAMAGED (1,2,0)*	___	44
LEFT — SEPARATED (1,2,3,4,5,0)*	___	45
RIGHT — DAMAGED (1,2,0)*	___	46
RIGHT — SEPARATED (1,2,3,4,5,0)*	___	47
HOOD REMAINED ON VEHICLE (1,2,0)* (during collision)	___	48
REAR EDGE OF HOOD		
ELEVATED (1,2,0)*	___	49
CONTACTED WINDSHIELD (1,2,0)* ↑	___	50
PENETRATED WINDSHIELD (1,2,0)*	___	51
OPTIONAL HOOD INSTALLED (1,2,0)*	___	52
ENGINE OR TRANSMISSION MOUNT SEPARATION (1,2,0)*	___	53
STEERING COLUMN FLEXIBLE COUPLING		
EQUIPPED (1,2,0)*	___	54
SEPARATED (1,2,3,4,5,0)*	___	55
OTHER DAMAGE (1,2,3,0)*	___	56
DESCRIBE: Flexible Rubberized Coupling not a pot joint		

*USE 1 FOR YES 2 FOR NO 3 FOR NOT APPLICABLE 0 FOR UNKNOWN

(4) Partial Separation
(5) Complete Separation

ENGINE COMPARTMENT TELESCOPING UNIT



LOWER TELESCOPING SHAFT

TYPE OF UNIT	PUNCH
(5) None Installed (1-6) See Above Sketch (8) Double U Joint (Foreign Imports) (9) Others ________ NOTE: IF NONE	NEW CODES ___ 57
ORIGINAL LENGTH (See Table Above) (F)________ TELESCOPED LENGTH (Measure, See Diagrams Above) (G)________	(888) for None Installed, Not Applicable
DIFFERENCE (F minus G)________ (ENTER 99.9 IF UNKNOWN)	___ ___ . ___ 58 59 60
	END OF CARD 04

HOOD

FIRE

LEFT PILLARS

FIRE

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 0 (10) 5 (11)

	PUNCH CODE	CARD COL.
FIRE (Accident View Point) (1) Yes - time unknown (2) No Fire (4) Pre-Crash Fire Start (NEW) (5) At-Crash Fire Start (NEW) (6) Post-Crash Fire Start (NEW) (0) Unknown	___	12
EXTENT OF FIRE (to Case Vehicle) (3) No Fire, Not Applicable (4) Minor - easily extinguished (5) Major (e.g., entire interior or engine) (0) Unknown	___	13
FIRE ORIGIN (in Case Vehicle) (3) No Fire, Not Applicable (4) Engine Compartment (5) Passenger Compartment (6) Luggage Compartment (7) Fuel Tank, lines, filler (8) Other:________ (0) Unknown	___	14

NEW CODES

NOTES ABOUT PILLARS ________

Match Pillar coding to page 7, Body Style

Upper B Pillar:
(3) for hardtops, soft top convertibles
(1,2) for roll bars, hard shell convertibles

Upper C Pillar:
(3) for soft top convertibles
(1,2) for hard shell convertibles

C Pillar: any pillar between B and D on Vans, 4 Doors, and Station Wagons
Lower B and C: (3) for jeep style
Lower D Pillar:
(3) Sedans, Hardtops
(1,2) pickups, pickup-cars, Station Wagons, Vans

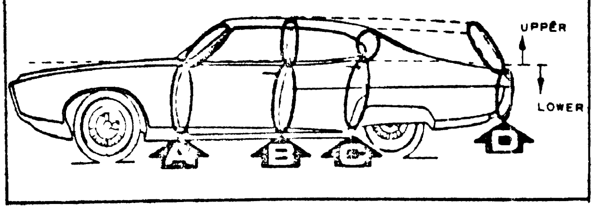
____

____

____

____

LEFT PILLARS



LEFT EXTERIOR

LEFT PILLARS		PUNCH CODE	CARD COL.
If left pillars were not damaged or separated or left roof side rail was not damaged or buckled, place a "1" in code column. Always complete entire page		___	15
A-PILLAR			
UPPER	DAMAGED (1,2,0)*	___	16
	SEPARATED (1,2,3,4,5,0)*	___	17
LOWER	DAMAGED (1,2,0)*	___	18
	SEPARATED (1,2,3,4,5,0)*	___	19
B-PILLAR (Also Rear Pillar on Pick-Up Truck, Corvette, 70-71 Camaro, (70-71 Firebird)			
UPPER	DAMAGED (1,2,3,0)*	___	20
	SEPARATED (1,2,3,4,5,0)*	___	21
LOWER	DAMAGED (1,2,0)*	___	22
	SEPARATED (1,2,3,4,5,0)*	___	23
C-PILLAR			
UPPER	DAMAGED (1,2,3,0)*	___	24
	SEPARATED (1,2,3,4,5,0)*	___	25
LOWER	DAMAGED (1,2,3,0)*	___	26
	SEPARATED (1,2,3,4,5,0)*	___	27
D-PILLAR (Station Wagon & Limousine)			
UPPER	DAMAGED (1,2,3,0)*	___	28
	SEPARATED (1,2,3,4,5,0)*	___	29
LOWER	DAMAGED (1,2,3,0)*	___	30
	SEPARATED (1,2,3,4,5,0)*	___	31

LEFT ROOF SIDE RAILS Includes convertibles if top closed	PUNCH CODE	CARD COL.
DAMAGED (1,2,3,0)* (Damaged if buckled)	___	32
BUCKLED (1,2,3,0)*	___	33

*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES, 2 FOR NO, 3 FOR NOT APPLICABLE, 0 FOR UNKNOWN
(4) Partial Separation
(5) Complete Separation

LEFT EXTERIOR

SIDE STRUCTURE – LEFT SIDE	PUNCH CODE	CARD COL.
LEFT BODY MOUNT SEPARATION (1,2,3,0)* (3 = Unitized)	___	34
If door hinges and latches were not damaged and doors did not jam or open during collision, and continuity of the side structure was maintained, place a "1" in code column. Always complete entire page	___	35
DOOR LATCHES — LEFT FRONT — DAMAGED (1,2,3,0)*	___	36
DOOR LATCHES — LEFT FRONT — RELEASED (1,2,3,0)*	___	37
DOOR LATCHES — LEFT REAR — DAMAGED (1,2,3,0)*	___	38
DOOR LATCHES — LEFT REAR — RELEASED (1,2,3,0)*	___	39
DOOR HINGES (Includes Van side doors) — LEFT FRONT — DAMAGED (1,2,3,0)*	___	40
DOOR HINGES — LEFT FRONT — SEPARATED (1,2,3,4,5,0)*	___	41
DOOR HINGES — LEFT REAR — DAMAGED (1,2,3,0)*	___	42
DOOR HINGES — LEFT REAR — SEPARATED (1,2,3,4,5,0)*	___	43
CONTINUITY OF SIDE STRUCTURE MAINTAINED (1,2,3,0)* i.e., Is Side Boundary Broken. Not restricted to vehicles with reinforced side structure	___	44
DOORS OPENED DURING COLLISION — LEFT — FRONT (1,2,0)*	___	45
DOORS OPENED DURING COLLISION — LEFT — REAR (1,2,3,0)*	___	46
DOORS JAMMED CLOSED — LEFT — FRONT (1,2,0)*	___	47
DOORS JAMMED CLOSED — LEFT — REAR (1,2,3,0)*	___	48

REAR EXTERIOR

	PUNCH CODE	CARD COL.
FUEL TANK AND LINES — APPROXIMATE FUEL LEVEL AT TIME OF IMPACT: (4) LESS THAN 1/2; (5) 1/2 OR MORE; (0) UNKNOWN	___	49
TANK RETENTION: (4) COMPLETE RETENTION; (5) PARTIAL DISENGAGEMENT; (6) COMPLETE DISENGAGEMENT; (0) UNKNOWN	___	50
TANK DEFORMED (1,2,0)* includes neck	___	51
FUEL LEAKAGE PRESENT (1,2,0)* (if 2, → Location of Leaks)	___	52
LOCATION OF LEAKS — FROM THE TANK (1,2,3,0)*	___	53
FROM THE NECK (1,2,3,0)*	___	54
FROM THE LINES (1,2,3,0)*	___	55
TRAILER AND HITCH: (1) Yes, Type Unknown; (2) No; (3) Ball and Socket, Temporary Bumper (e.g., rental clamp-on); (4) Ball and Socket, Bumper only (e.g., light truck); (5) Ball and Socket - Frame Hitch (e.g., frame and bumper); (6) Equalizing, load distributing; (7) Ring and Pintle (e.g., double tractor); (8) Fifth Wheel (e.g., semi); (9) Other (e.g., clevis and pin); (0) Unknown	___	56
TRAILER BEING TOWED (AT TIME OF COLLISION): (1) Yes, Type Unknown; (2) No (hitch, no trailer); (3) Not Applicable (no hitch); (4) Travel Trailer/Camper; (5) Mobile Home; (6) Boat/Snowmobile/ATV Trailer; (7) Rental/Cargo Trailer; (8) Car; (9) Other: ________; (0) Unknown	___	57

New codes

TRAILER — FUEL TANK — LEFT SIDE STRUCTURE

*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES, 2 FOR NO, 3 FOR NOT APPLICABLE, 0 FOR UNKNOWN. (4) Partial Separation (5) Complete Separation

REAR EXTERIOR

TRUNK

TAILGATE

LUGGAGE AREA

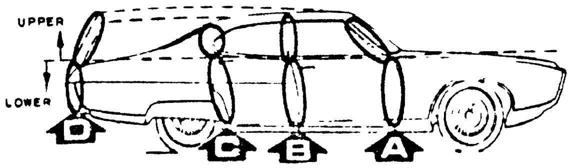
FILL IN TRUNK LID OR TAILGATE DETAILS AND REST OF PAGE.

	PUNCH CODE	CARD COL.
TAILGATE PERFORMANCE Includes back doors of vans		
LATCHES		
RELEASED (1,2,0)*	___	58
DAMAGED (1,2,0)*	___	59
LATCH OR TAILGATE JAMMED (1,2,0)*	___	60
HINGES Code 3 hinges for two-way tailgate		
BOTTOM LEFT — DAMAGED (1,2,3,0)*	___	61
BOTTOM LEFT — SEPARATED (1,2,3,4,5,0)*	___	62
BOTTOM RIGHT — DAMAGED (1,2,3,0)*	___	63
BOTTOM RIGHT — SEPARATED (1,2,3,4,5,0)*	___	64
TOP LEFT — DAMAGED (1,2,3,0)*	___	65
TOP LEFT — SEPARATED (1,2,3,4,5,0)*	___	66
TOP RIGHT — DAMAGED (1,2,3,0)*	___	67
TOP RIGHT — SEPARATED (1,2,3,4,5,0)*	___	68
EQUIPPED WITH TWO-WAY TAILGATE (1,2,0)*	___	69
TAILGATE ELECTRIC WINDOW OPERABLE (1,2,3,0)*	___	70
	END OF CARD 05	

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 0 (10) 6 (11)

	PUNCH CODE	CARD COL.
TRUNK LID PERFORMANCE (REAR OF VEHICLE) (VW engine cover)		
LATCHES		
RELEASED (1,2,3,0)*	___	12
DAMAGED (1,2,3,0)*	___	13
LATCH OR LID JAMMED (1,2,3,0)*	___	14
HINGES		
LEFT — DAMAGED (1 2 3 0)*	___	15
LEFT — SEPARATED (1,2,3,4,5,0)*	___	16
RIGHT — DAMAGED (1 2 3 0)*	___	17
RIGHT — SEPARATED (1,2,3,4,5,0)*	___	18
TRUNK AREA (partitioned luggage area) (front of VW, rear of pickup or van) DAMAGED (1,2,3,0)*	___	19
SPARE TIRE SEPARATION (1,2,3,0)* (4) for spare tire not initially attached	___	20
TRUNK - PASSENGER COMPARTMENT PARTITION DAMAGE (1,2,3,0)*	___	21
BACKLIGHT HEADER (REAR WINDOW TOP FRAME) (none on convertibles) BACKLIGHT HEADER DAMAGED OR BUCKLED (1,2,3,0)*	___	22

RIGHT PILLARS



*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES, 2 FOR NO, 3 FOR NOT APPLICABLE, 0 FOR UNKNOWN; (4) Partial Separation, (5) Complete Separation

RIGHT EXTERIOR

RIGHT PILLARS	PUNCH CODE	CARD COL.
If right pillars were not damaged or separated or right roof side rail was not damaged or buckled, place a "1" in code column. **Always complete entire page**	___	23
A-PILLARS		
UPPER — DAMAGED (1,2,0)*	___	24
UPPER — SEPARATED (1,2,3,4,5,0)*	___	25
LOWER — DAMAGED (1,2,0)*	___	26
LOWER — SEPARATED (1,2,3,4,5,0)*	___	27
B-PILLAR (ALSO REAR PILLAR ON PICK-UP TRUCK, CORVETTE, (70–71 Camaro, 70–71 Firebird)		
UPPER — DAMAGED (1,2,3,0)*	___	28
UPPER — SEPARATED (1,2,3,4,5,0)*	___	29
LOWER — DAMAGED (1,2,0)*	___	30
LOWER — SEPARATED (1,2,3,4,5,0)*	___	31
C-PILLAR		
UPPER — DAMAGED (1,2,3,0)*	___	32
UPPER — SEPARATED (1,2,3,4,5,0)*	___	33
LOWER — DAMAGED (1,2,3,0)*	___	34
LOWER — SEPARATED (1,2,3,4,5,0)*	___	35
D-PILLAR (STATION WAGON & LIMOUSINE)		
UPPER — DAMAGED (1,2,3,0)*	___	36
UPPER — SEPARATED (1,2,3,4,5,0)*	___	37
LOWER — DAMAGED (1,2,3,0)*	___	38
LOWER — SEPARATED (1,2,3,4,5,0)*	___	39
RIGHT ROOF SIDE RAILS Includes convertibles if top closed		
DAMAGED (1,2,3,0)* (Damaged if buckled)	___	40
BUCKLED (1,2,3,0)*	___	41
WINDSHIELD HEADER Always Fill in		
DAMAGED OR BUCKLED (1,2,0)*	___	42

SIDE STRUCTURE – RIGHT SIDE	PUNCH CODE	CARD COL.
RIGHT BODY MOUNT SEPARATION (1,2,3,0)* (3 — Unitized)	___	43
If door hinges and latches were not damaged and doors did not jam or open during collision, and continuity of the side structure was maintained, place a "1" in code column. **Always complete entire page**	___	44
DOOR LATCHES		
RIGHT FRONT — DAMAGED (1,2,3,0)*	___	45
RIGHT FRONT — RELEASED (1,2,3,0)*	___	46
RIGHT REAR — DAMAGED (1,2,3,0)*	___	47
RIGHT REAR — RELEASED (1,2,3,0)*	___	48
DOOR HINGES Includes Van side doors		
RIGHT FRONT — DAMAGED (1,2,3,0)*	___	49
RIGHT FRONT — SEPARATED (1,2,3,4,5,0)*	___	50
RIGHT REAR — DAMAGED (1,2,3,0)*	___	51
RIGHT REAR — SEPARATED (1,2,3,4,5,0)*	___	52
CONTINUITY OF SIDE STRUCTURE MAINTAINED (1,2,3,0)*	___	53
i.e., Is Side Boundary Broken. Not restricted to vehicles with reinforced side structure		
DOORS OPENED DURING COLLISION		
RIGHT — FRONT (1,2,0)*	___	54
RIGHT — REAR (1,2,3,0)*	___	55
DOORS JAMMED CLOSED		
RIGHT — FRONT (1,2,0)*	___	56
RIGHT — REAR (1,2,3,0)*	___	57

RIGHT SIDE STRUCTURE

RIGHT PILLARS

*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES, 2 FOR NO, 3 FOR NOT APPLICABLE, 0 FOR UNKNOWN, (4) Partial Separation, (5) Complete Separation

STEERING WHEEL

STEERING WHEEL	PUNCH CODE	CARD COL.
TYPE GM, Only	99 Unknown — —	58-59
NOTES ON NON-ORIGINAL EQUIPMENT STEERING WHEEL: __________ __________ __________		
STEERING WHEEL RIM DAMAGE (2) NONE (4) SLIGHTLY DEFORMED (5) SEVERELY BENT (6) BROKEN (0) UNKNOWN	____	60
OCCUPANT CONTACT (1,2,0)*	____	61
STEERING WHEEL SPOKES NUMBER OF SPOKES (ENTER "O" IF UNKNOWN)	____	62
DAMAGE (2) NONE (4) SLIGHTLY DEFORMED (5) SEVERELY BENT (6) BROKEN (0) UNKNOWN	____	63
OCCUPANT CONTACT (1,2,0)*	____	64
HORN RING, HORN BUTTON(S), OR SPOKE SHROUD DAMAGED (1,2,0)*	____	65
OCCUPANT CONTACT (1,2,0)*	____	66

Probable Contact (Need not include injury)

STEERING WHEEL ENERGY ABSORBING DEVICE TABLE

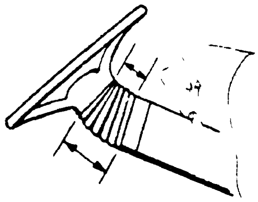
Corporation	Year	Make	Length
Chrysler	70	Barracuda Challenger	4.9"
Ford	70-72	Capri	6" total 3" external

STEERING WHEEL ENERGY ABSORBING DEVICE	PUNCH CODE	CARD COL.
(SEE DRAWING ON PAGE 18 FOR LOCATION) EQUIPPED (1,2,0)*	____	67

ENERGY ABSORBING DEVICE FINAL POSITION

MEASURE THE MINIMUM AND MAXIMUM OVERALL LENGTH OF THE ENERGY ABSORBING DEVICE (BETWEEN THE STEERING WHEEL AND STEERING COLUMN).

ENTER THESE LENGTHS BELOW

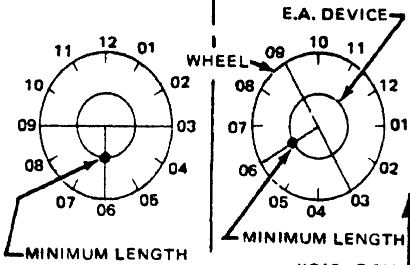


MAX. = ____ in., MIN. = ____ in.

THE E.A. DEVICE ROTATES WITH THE STEERING WHEEL. WE WANT TO KNOW WHERE THIS MINIMUM LENGTH OCCURRED (AROUND THE CIRCUMFERENCE OF THE E.A. DEVICE) WITH RESPECT TO THE SPOKES. RECORD BELOW THE O'CLOCK POSITION AT WHICH THIS MINIMUM LENGTH WAS MEASURED.

EXAMPLES

O'CLOCK = 0 6 | O'CLOCK = 0 6



"O'CLOCK" = ____ ____ (68, 69)

(ENTER 00 IF UNKNOWN)

ENERGY ABSORBING DEVICE COMPRESSION

FOLLOWING TO BE FILLED IN

8's for Not Equipped

(ENTER 99.9 IF UNKNOWN)

ORIGINAL LENGTH (H) ____ IN.
(SEE TABLE AT LEFT)
DAMAGED MAX. LENGTH (X) ____ IN.
DIFFERENCE (H-X) ____ IN. — __ __ . __ (70, 71, 72)
ORIGINAL LENGTH (H) ____ IN.
(SEE TABLE AT LEFT)
DAMAGED MIN. LENGTH (Y) ____ IN.
DIFFERENCE (H-Y) ____ IN. — __ __ . __ (73, 74, 75)

DEVICE EXTENDED
(4) X GREATER THAN H
(5) X AND Y GREATER THAN H
(6) NEITHER
(0) UNKNOWN
____ 76

END OF CARD 06

1 FOR YES 3 FOR NOT APPLICABLE
2 FOR NO 0 FOR UNKNOWN

STEERING WHEEL

STEERING WHEEL AND COLUMN

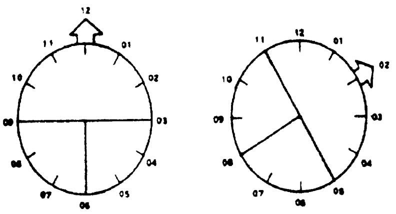
DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 0 7 (10 11)

STEERING WHEEL POSITION AT TIME OF COLLISION

	PUNCH CODE	CARD COL.
IN WHAT O'CLOCK POSITION WAS THE NORMAL TOP OF THE WHEEL POINTED WHEN THE COLLISION OCCURRED?		
O'CLOCK =	__ __	12-13

EXAMPLES

O'CLOCK = 1 2 O'CLOCK = 0 2



(NORMAL STRAIGHT AHEAD)

(00) UNKNOWN

DO NOT EDIT

STEERING WHEEL PAD
(LOAD DISTRIBUTING MATERIAL)

	PUNCH CODE	CARD COL.
EQUIPPED (1,2,0)*	____	14
DEFORMED (1,2,3,0)* (PUT NOTES ON FOLD-OUT FLY-LEAF)	____	15

TILT FEATURE

	PUNCH CODE	CARD COL.
EQUIPPED (1,2,0)*	____	16
FINAL POSITION (3) NOT APPLICABLE (4) NORMAL (5) TILTED UP (6) TILTED DOWN (0) UNKNOWN	____	17

TELESCOPING FEATURE

	PUNCH CODE	CARD COL.
EQUIPPED (1,2,0)*	____	18
FINAL POSITION (3) NOT APPLICABLE (4) NORMAL (5) ABOVE NORMAL (6) BELOW NORMAL (0) UNKNOWN	____	19

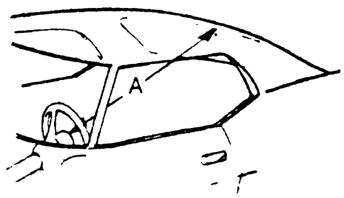
SWING-AWAY FEATURE

	PUNCH CODE	CARD COL.
EQUIPPED (1,2,0)*	____	20
FINAL POSITION (3) NOT APPLICABLE (4) NORMAL (5) RIGHT OF NORMAL (0) UNKNOWN	____	21

FINAL COLUMN POSITION

MEASURE THE DISTANCE FROM THE STEERING WHEEL CENTER TO THE TOP OF THE REAR WINDOW GLASS, DIRECTLY BEHIND THE HUB. ("A" IN SKETCH).

ENTER THIS DISTANCE IN BLANK "A".



A: ________ INCHES

COLUMN MOVEMENT (strictly)

If top or rear window glass is displaced, then use (999)

Not a measure of passenger compartment size reduction

FROM A CORRESPONDING UNDAMAGED VEHICLE, MAKE A MEASUREMENT SIMILAR TO "A" ABOVE, AND RECORD IT IN BLANK "B". (PLACE TILT STEERING WHEEL IN MID-POSITION AND TELESCOPING COLUMNS IN FULL DOWN POSITION).

ORIGINAL DIMENSION (B) ________ IN.

DAMAGED VEHICLE DIMENSION (A) ________ IN.

DIFFERENCE |A-B| ________

(999) if Unknown

__ __ __ (22 23 24) Note

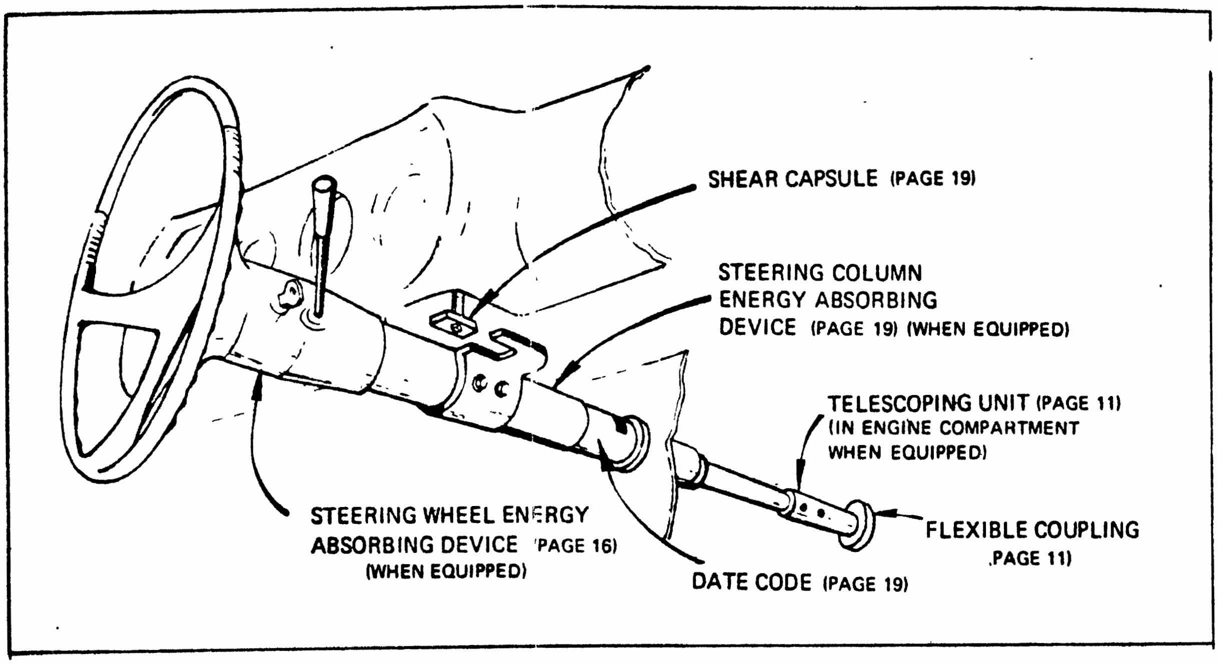
DIRECTION OF MOTION
(4) FORWARD (A GREATER THAN B)
(5) REARWARD (A LESS THAN B)
(6) NEITHER
(0) UNKNOWN

__ 25

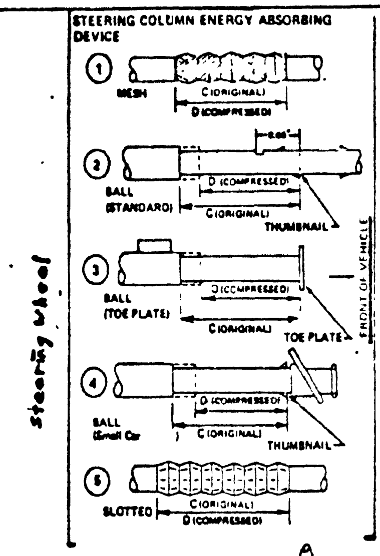
*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES, 2 FOR NO, 3 FOR NOT APPLICABLE, 0 FOR UNKNOWN

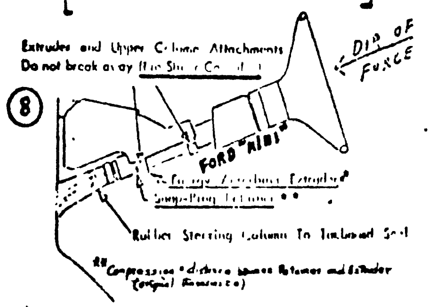
STEERING WHEEL AND COLUMN

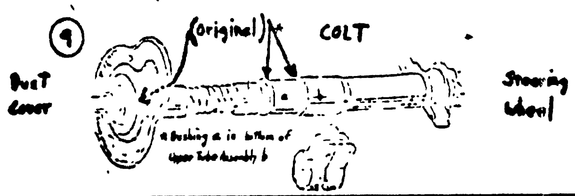
STEERING COLUMN (CONT'D.)



STEERING COLUMN (CONT'D.)







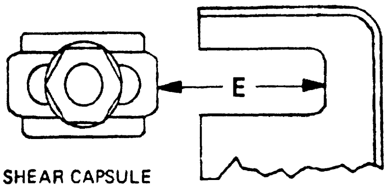
STEERING COLUMN ENERGY ABSORBING DEVICE

TYPE OF DEVICE

	PUNCH
(7) Not Equipped (1) Mesh (2) Ball (Standard) (3) Ball (with Toe Plate) (4) Ball (Vega) (5) Slotted (6) Other: ________ (8) Ford Mini-Column — NEW CODES (9) Collapsable Tube (Colt, European) (0) Unknnown	NEW CODES __ 26
ORIGINAL LENGTH (See Table on Page 18) (C) ______ COMPRESSED LENGTH (Measure, See Diagrams above) (D) ______ COMPRESSION (C minus D) ______ (ENTER 99.9 IF UNKNOWN) NOTE ALL DIMENSIONS IN PUNCH COLUMN SHOULD BE IN INCHES AND TENTHS,	8's for Not Equipped __ __ . __ 27 28 29 Note

SHEAR CAPSULE SEPARATION

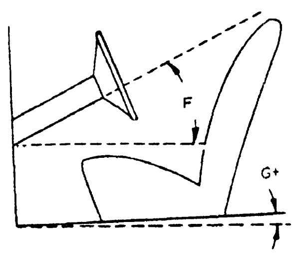
(SEE DRAWING ON PAGE 18 FOR LOCATION)



NOTE: WHEN CAPSULES HAVE SEPARATED IT MAY BE NECESSARY TO LIFT COLUMN ASSEMBLY INTO POSITION AGAINST INSTRUMENT PANEL BEFORE MEASURING.

	PUNCH
SHEAR CAPSULE SEPARATION DISTANCE ('E' IN DIAGRAM ABOVE) (ENTER 99.9 IF UNKNOWN) (888) if not equipped	__ __ . __ 30 31 32 Note

STEERING COLUMN VERTICAL ANGLE



MEASURE THE ANGLE THE STEERING COLUMN MAKES WITH THE HORIZONTAL ('F' IN DIAGRAM ABOVE), AND THE ANGLE THE DOOR SILL MAKES WITH THE HORIZONTAL ('G' IN DIAGRAM) AND ENTER THEM BELOW. ANGLES WHICH TILT DOWN TOWARD THE FRONT OF THE CAR ARE POSITIVE.

(NOTE: LIFT COLUMN INTO POSITION FOR MEASUREMENT)

F: ________ DEGREES; G: ________ DEGREES

	PUNCH
COLUMN VERTICAL ROTATION FINAL COLUMN POSITION COLUMN ANGLE (Relative to Ground) (F) ____ VEHICLE ANGLE (G) ____ COLUMN ANGLE (Relative to Vehicle) (F-G=H) ____ FROM A CORRESPONDING UNDAMAGED VEHICLE, MAKE A MEASUREMENT SIMILAR TO "H" ABOVE AND RECORD IT IN BLANK "J" ORIGINAL DEMENSION (J) ____ DAMAGED VEHICLE DIMENSION (H) ____ COLUMN ROTATION (H-J) ____ (ENTER 99 IF UNKNOWN) (98) Rotated - Unknown amount (9/72)	Either + or - __ __ 33 34

STEERING COLUMN

PASSENGER COMPARTMENT

GENERAL INFORMATION

GENERAL INFORMATION	PUNCH CODE	CARD COL
PASSENGER COMPARTMENT REDUCED IN SIZE (1,2,0)* A	___	35
EXTERNAL OBJECT INTRUSION (1,2,0)* B DESCRIBE ON FOLD-OUT FLY-LEAF	___	36
INTERNAL LOOSE OBJECT (1,2,0)* C	___	37
VERTICAL ROTATION OF INSTRUMENT PANEL (1,2,0)* no buckle alone	___	38
FIREWALL (COWL) DEFORMATION (1,2,0)*	___	39
FLOORPAN DEFORMATION (1,2,0)* (INCLUDING TOEPAN)	___	40

WINDSHIELD

WINDSHIELD	PUNCH CODE	CARD COL
CRACKED (1,2,3,0)* Cracked if broken	___	41
BROKEN (1,2,3,0)* (Plastic Interlayer Torn)	___	42
OCCUPANT CONTACT (1,2,3,0)* If no contact then	___	43
CRACKED OR BROKEN BY OCCUPANT CONTACT (1,2,3,0)*	___	44
BOND SEPARATED (1,2,0)* Out of molding? (IF "YES", ESTIMATE PERCENT____)	___	45
WINDSHIELD CODE	___ ___ (XY) Unknown	46-47

WINDSHIELD MARK

DRAW GLASS MANUFACTURER'S WINDSHIELD MARK WHICH IS LOCATED ALONG THE BOTTOM OF THE WINDSHIELD AT CENTER OR AT ONE CORNER.

EXAMPLE OF TYPICAL MARK:

SAFETY L O F PLATE

ASI GA

LAMINATED

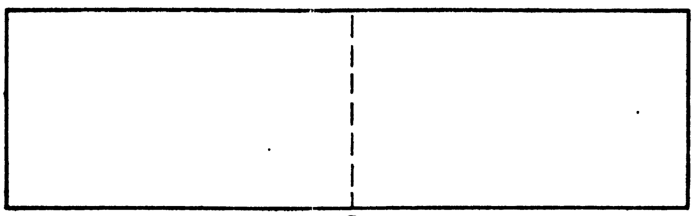
Most Important — M3

A. Internal boundary of passenger compartment moved inward due to either direct or indirect damage.

B. Internal boundary of passenger compartment moved inward due to direct damage as in a side collision or rollover, i.e., external object went inside original internal boundary line. Includes, but is not limited to penetration.
Note: The boundary does not have to be broken. If compartment is "opened up" the "continuity of side structure" (page 13, 15) is not maintained.

C. Code on Internal Loose Object even if not involved, it could have caused injury.

LOCATE AREA OF WINDSHIELD INTEREST OR DAMAGE WITH DIMENSIONS (VERTICAL & HORIZONTAL) ON THIS DIAGRAM OF THE WINDSHIELD AS VIEWED FROM INSIDE.



L ℄ R

*WHERE (1,2,3,0) IS INDICATED, USE 1 FOR YES, 2 FOR NO, 3 FOR NOT APPLICABLE, 0 FOR UNKNOWN

PASSENGER COMPARTMENT

Probable Contact
(Need not include injury)

NOTE: IF THERE WERE NO OCCUPANTS, CIRCLE THIS NOTE AND STOP HERE.

INSTRUMENT PANEL

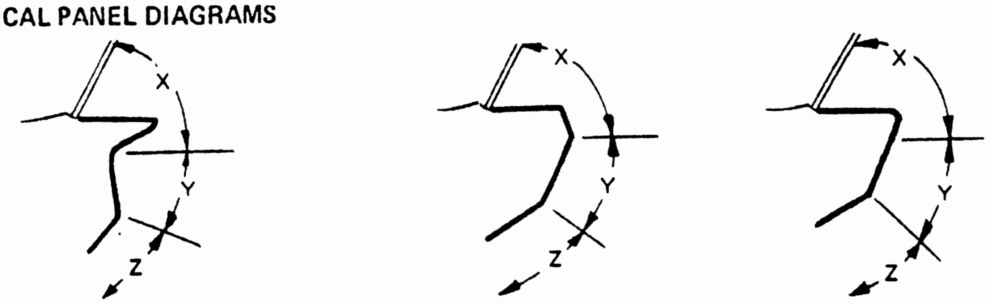
Always complete entire page

	EQUIPPED (1,2,0)*		DAMAGED (1,2,3,0)*		OCCUPANT CONTACT (1,2,3,0)*	
	PUNCH CODE	CARD COL.	PUNCH CODE	CARD COL.	PUNCH CODE	CARD COL.
UPPER PANEL ("X" IN DIAGRAMS)			___	48	___	49
MIDPANEL ("Y" IN DIAGRAMS)			___	50	___	51
LOWER PANEL ("Z" IN DIAGRAMS)			___	52	___	53
ASHTRAY			___	54	___	55
CONTROL KNOBS AND LEVERS			___	56	___	57
GLOVE COMPARTMENT AREA			___	58	___	59
INSTRUMENTS – OEM only			___	60	___	61
PARKING BRAKE RELEASE OR BRACKET	___	62	___	63	___	64
AIR CONDITIONING OUTLETS OR UPPER VENTILATION OUTLETS	___	65	___	66	___	67
HEATER OR AIR CONDITIONING DUCTS	___	68	___	69	___	70
RADIO	___	71	___	72	___	73
OTHER. e.g., package shelf, CB radio, tape deck, add on A.C. (MORE THAN ONE ITEM MAY BE NOTED) USE (3)'s if no item noted			___	74	___	75

END OF CARD 07

INSTRUMENT PANEL

TYPICAL PANEL DIAGRAMS



*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES 2 FOR NO 3 FOR NOT APPLICABLE 0 FOR UNKNOWN

PASSENGER COMPARTMENT

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 0 (10) 8 (11)

OTHER INTERIOR DAMAGE

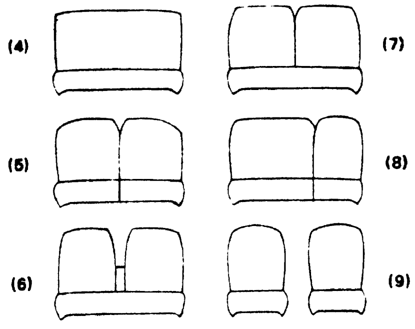
OTHER INTERIOR ITEMS (FRONT OF VEHICLE)

Always complete entire page

	EQUIPPED (1,2,0)* PUNCH CODE	EQUIPPED CARD COL.	DAMAGED (1,2,3,0)* PUNCH CODE	DAMAGED CARD COL.	OCCUPANT CONTACT (1,2,3,0)* PUNCH CODE	OCCUPANT CONTACT CARD COL.
FOOT CONTROLS			___	12	___	13
IGNITION KEYS			___	14	___	15
REAR VIEW MIRROR			___	16	___	17
SUNVISOR AND FITTINGS			___	18	___	19
WINDSHIELD TOP MOLDING			___	20	___	21
LEFT A-PILLAR (UPPER OR LOWER)			___	22	___	23
RIGHT A-PILLAR (UPPER OR LOWER)			___	24	___	25
CONSOLE	___	26	___	27	___	28
TRANSMISSION SELECTOR LEVER						
ON STEERING COLUMN	___	29	___	30	___	31
ON CONSOLE OR FLOOR	___	32	___	33	___	34

*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES, 2 FOR NO, 3 FOR NOT APPLICABLE, 0 FOR UNKNOWN

PASSENGER COMPARTMENT (CONT'D.)

SEATS TYPE OF FRONT SEAT 3) Drivers Seat Only (9/72)	PUNCH CODE	CARD COL.
 (0) UNKNOWN	___	35
FOLDING BACKS (1,2,0)*	___	36
DELUXE ACCESSORIES (1,2,0)* (any accessories on back of front seat, 2/72)	___	37
TYPE OF SEAT ADJUSTERS — Driver's Side (4) MANUAL (5) POWER (6) RIGID (7) OTHER ________ (0) UNKNOWN	___	38
TYPE OF SEAT ADJUSTMENT — Driver's Side (3) NONE (NOT APPLICABLE) (4) 2-WAY (5) 4-WAY (6) 6-WAY (7) OTHER ________ (0) UNKNOWN	___	39
DAMAGE TO ADJUSTERS (1,2,0)* Include Rigid	___	40
TYPE OF DAMAGE TO ADJUSTERS (CHOOSE TWO) (2) None (4) Chucking (some free play) (5) Deformed and Released (6) Separated (0) Unknown Fill Both	___ ___	41 42
LOCATION OF SEPARATION (3) NOT APPLICABLE (no 6's above) (4) AT FLOOR (5) AT ADJUSTER (6) AT SEAT (0) UNKNOWN	___	43

POSITION OF SEAT Prior to crash	PUNCH CODE	CARD COL.
DRIVER'S SEAT (4) FORWARD (5) MIDDLE (6) REARWARD (0) UNKNOWN	___	44
RIGHT FRONT PASSENGER'S SEAT (3) NOT APPLICABLE (No Seat) (4) FORWARD (5) MIDDLE (6) REARWARD (0) UNKNOWN code the same if bench seat	___	45
DAMAGE TO FRONT SEAT		
BACKREST DAMAGE (1,2,0)*	___	46
CUSHION DAMAGE (1,2,0)*	___	47
CONTACTED BY REAR OCCUPANT (1,2,3,0)* — 3: If no rear occupant	___	48
SEAT CENTER ARMRESTS (FRONT)		
EQUIPPED (1,2,0)*	___	49
DAMAGED (1,2,3,0)*	___	50
HEAD RESTRAINTS (FRONT) Driver's Side		
EQUIPPED (1,2,0)*	___	51
REMOVED PRIOR TO COLLISION (1,2,3,0)* — 3: Integral	___	52
RETAINED DURING COLLISION (1,2,3,0)* — 3: Integral	___	53
DAMAGED (1,2,3,0)*	___	54
OCCUPANT CONTACT (1,2,3,0)*	___	55
HEAD RESTRAINT ADJUSTMENT AT TIME OF COLLISION — Driver's Side (3) Not Applicable, None, Integral (4) UP from seat top (5) DOWN on seat top (0) Unknown	___	56

SEATS

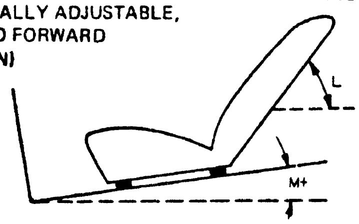
PASSENGER COMPARTMENT (CONT'D.)

SEATS (CONT'D)

	PUNCH CODE	CARD COL.
FRONT SEAT BACK LOCKS — If Non-Folding (col. 36=2), Use (3)'s		
LEFT — EQUIPPED (1,2,3,0)	___	57
LEFT — HELD (1,2,3,0)*	___	58
RIGHT — EQUIPPED (1,2,3,0)	___	59
RIGHT — HELD (1,2,3,0)*	___	60

FRONT SEAT BACK ANGLE

IF THE VEHICLE WAS REAR IMPACTED, MEASURE THE FRONT SEAT BACK ANGLE AT THE LEFT AND RIGHT SEAT BACK FRAMES. (IF SEAT BACK ANGLE IS NORMALLY ADJUSTABLE, MOVE TO FORWARD POSITION)



MEASURE THE ANGLE THE SEAT BACK MAKES WITH HORIZONTAL (L IN DIAGRAM), AND THE ANGLE THE DOOR SILL MAKES WITH HORIZONTAL (M IN DIAGRAM) AND ENTER BELOW.

LEFT SIDE	RIGHT SIDE
L ___ DEG. M ___ DEG.	L ___ DEG. M ___ DEG.

SEAT BACK ROTATION

	DEGREES LEFT	DEGREES RIGHT	PUNCH CODE	CARD COL.
FINAL SEAT ANGLE (ENTER 99 IF UNKNOWN)			Always complete entire page	
SEAT ANGLE (L) (Relative to Ground)	___	___		
VEHICLE ANGLE (M)	___	___	(98) Rotated - Unknown amount (9/72)	
SEAT ANGLE (L-M=P) (Relative to Vehicle)	___	___		
FROM A CORRESPONDING UNDAMAGED VEHICLE, MAKE A MEASUREMENT SIMILAR TO "P" ABOVE AND RECORD IT IN BLANK "R" BELOW.				
ORIGINAL ANGLE (R)	___	___		
DAMAGED SEAT ANGLE (P)	___	___	Don't Use 88's	
DIFFERENCE |R-P|	___	___		
LEFT SEAT ANGLE DIFFERENCE (Either + or -)			___ ___	61-62
RIGHT SEAT ANGLE DIFFERENCE			___ ___	63-64

TYPE OF REAR SEAT	PUNCH CODE	CARD COL.
(2) NO SEAT (4) NON-FOLDING (5) FOLDING (0) UNKNOWN	___	65

END OF CARD 08

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 0 (10) 9 (11)

	PUNCH CODE	CARD COL.
DAMAGE TO REAR SEAT		
BACKREST DAMAGED OR LOOSENED (1,2,3,0)*	___	12
CUSHION DAMAGED OR LOOSENED (1,2,3,0)*	___	13
SEAT CENTER ARMRESTS (REAR)		
EQUIPPED (1,2,3,0)*	___	14
DAMAGED (1,2,3,0)*	___	15
REAR SEAT BACK LOCKS — If Non-Folding (col 65=4), Use (3)'s		
LEFT — EQUIPPED (1,2,3,0)*	___	16
LEFT — HELD (1,2,3,0)*	___	17
RIGHT — EQUIPPED (1,2,3,0)*	___	18
RIGHT — HELD (1,2,3,0)*	___	19
THIRD SEAT		
EQUIPPED (1,2,0)*	___	20
BACKREST DAMAGED (1,2,3,0)*	___	21
CUSHION DAMAGED (1,2,3,0)*	___	22
BACKLIGHT (REAR WINDOW)		
DAMAGED (1,2,3,0)*	___	23
OCCUPANT CONTACT (1,2,3,0)*	___	24
BACKLIGHT HEADER		
DAMAGED (1,2,3,0)* (3 — Convertibles)	___	25
OCCUPANT CONTACT (1,2,3,0)*	___	26
WINDOWS CLOSED AT TIME OF COLLISION — (1) Glass Area 100 % Closed; (2) Open area; (3) Solid, no Window		
LEFT FRONT (1,2,3,0)*	___	27
LEFT REAR (1,2,3,0)*	___	28
RIGHT FRONT (1,2,3,0)*	___	29
RIGHT REAR (1,2,3,0)*	___	30
BACKLIGHT (1,2,3,0)*	___	31
ALL SIDE WINDOWS OPERABLE AFTER COLLISION (1,2,3,0)*	___	32
POWER SIDE WINDOWS EQUIPPED (1,2,0)* (PUT NOTES ON FOLD-OUT FLY-LEAF)	___	33

*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES, 2 FOR NO, 3 FOR NOT APPLICABLE, 0 FOR UNKNOWN

PASSENGER COMPARTMENT (CONT'D.)

Probable Contact
(Need not include injury)

LEFT SIDE INTERIOR

LEFT SIDE INTERIOR		DAMAGED (1,2,3,0)*		OCCUPANT CONTACT (1,2,3,0)*	
		PUNCH CODE	CARD COL.	PUNCH CODE	CARD COL.
FRONT	DOOR	___	34	___	35
	HARDWARE	___	36	___	37
	ARMREST	___	38	___	39
	GLASS	___	40	___	41
REAR	DOOR AREA Code (1,2), if rear seat area	___	42	___	43
	HARDWARE	___	44	___	45
	ARMREST	___	46	___	47
	GLASS	___	48	___	49
ROOF SIDE RAIL Code (3), if top down or removed		___	50	___	51
B-PILLAR (ALSO REAR PILLAR ON PICK-UP TRUCK, CORVETTE, '71 FIREBIRD & CAMARO)	Upper or Lower Pillar	___	52	___	53
C-PILLAR	Upper or Lower Pillar	___	54	___	55
D-PILLAR (REAR PILLAR ON STATION WAGONS & LIMOUSINES)	Upper or Lower Pillar	___	56	___	57
OTHER	USE (3)'s if no item noted	___	58	___	59
				END OF CARD 09	

LEFT SIDE INTERIOR

* IF ARE INDICATED, USE 1 FOR YES 3 FOR NOT APPLICABLE
2 FOR NO 0 FOR UNKNOWN

PASSENGER COMPARTMENT (CONT'D.)

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD 1 (10) 0 (11)

RIGHT SIDE INTERIOR		DAMAGED (1,2,3,0)* PUNCH CODE	CARD COL.	OCCUPANT CONTACT (1,2,3,0)* PUNCH CODE	CARD COL.
RIGHT SIDE INTERIOR — FRONT	DOOR	___	12	___	13
	HARDWARE	___	14	___	15
	ARMREST	___	16	___	17
	GLASS	___	18	___	19
REAR	DOOR AREA Code (1,2), if rear seat area	___	20	___	21
	HARDWARE	___	22	___	23
	ARMREST	___	24	___	25
	GLASS	___	26	___	27
ROOF INTERIOR	ROOF SIDE RAIL Code (3), if top down or removed	___	28	___	29
	B-PILLAR (ALSO REAR PILLAR ON PICK-UP TRUCK, CORVETTE, '71 FIREBIRD & CAMARO)	___	30	___	31
	C-PILLAR (B-, C-, D-PILLAR: Upper or Lower Pillar)	___	32	___	33
	D-PILLAR (REAR PILLAR ON STATION WAGONS & LIMOUSINES)	___	34	___	35
	OTHER: USE (3)'s if no item noted	___	36	___	37
ROOF INTERIOR	HEADLINING Code (3), if top down or removed	___	38	___	39
	ROOF STRUCTURE Code (3), if top down or removed	___	40	___	41
				END OF CARD 10	

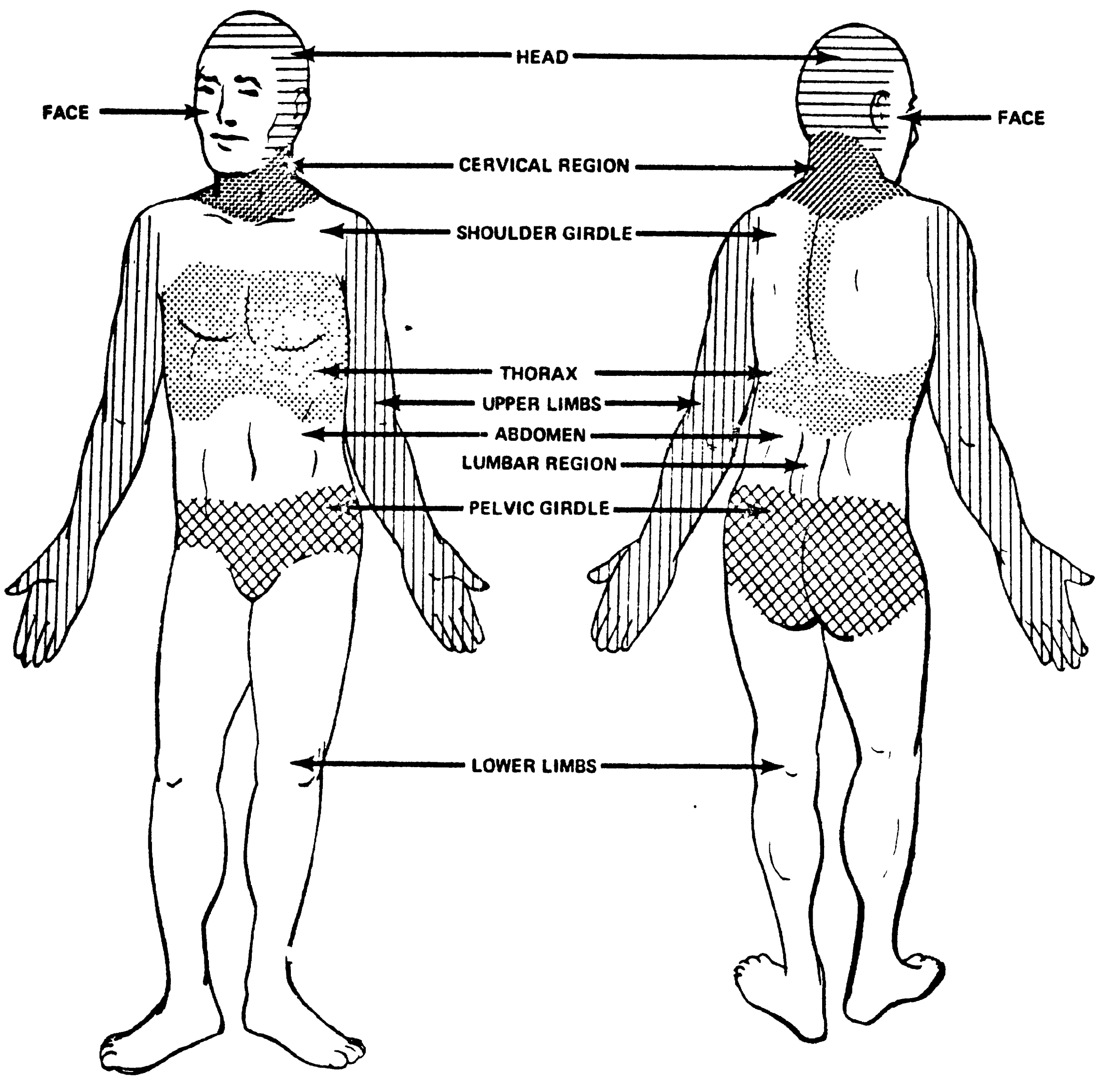
*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES 2 FOR NO 3 FOR NOT APPLICABLE 0 FOR UNKNOWN

OCCUPANT INFORMATION SECTION

1. THIS SECTION IS TO BE FILLED IN FOR EACH OCCUPANT, WHETHER INJURED OR NOT.

2. IF THERE ARE MORE THAN THREE OCCUPANTS, USE ADDITIONAL BLANK COPIES OF THIS FORM AND ATTACH OCCUPANT PAGES TO THIS REPORT.

3. THE FOLLOWING FIGURE IS AN EXPLANATION OF THE BODY REGIONS LISTED ON PAGES 31, 35 AND 39.



OCCUPANT

OCCUPANT INFORMATION

DUPLICATE COLUMNS 1-9 FROM PRECEDING CARD	1 __	10 11
Number each Occupant, starting with (01). Not related to seated position.	PUNCH CODE	CARD COL.
OCCUPANT NUMBER COUNTER	__ __	12-13
SEAT LOCATION (4) FRONT (5) REAR (6) THIRD (7) OTHER: e.g., rear station wagon floor (0) UNKNOWN	___	14
POSITION ON SEAT (4) LEFT (5) LEFT CENTER (6) CENTER (7) RIGHT CENTER (8) RIGHT (9) ALL (Lying on seat) (9/72) (0) UNKNOWN	___	15
POSTURE (1) SITTING ON SEAT (2) ON LAP OR IN ARMS (3) STANDING ON SEAT (4) STANDING ON FLOOR (5) IN BASSINET (6) IN CHILD SEAT (7) LYING ON SEAT (8) LYING OR SITTING ON FLOOR (9/72) (9) EXTERNAL TO PASS. COMP. (0) UNKNOWN	___	16
AGE YEARS, OR	__ __	17-18
MONTHS (INFANTS) to 24 months (ENTER "0"S IF UNKNOWN)	__ __	19-20
WEIGHT, LBS. (ENTER "0"S, IF UNKNOWN)	__ __ __	21-23
HEIGHT, INCHES (ENTER "0"S, IF UNKNOWN)	__ __	24-25
SEX (4) Male (5) Female (6) Large Animal (NEW) (7) Pregnant Woman (NEW, 2/72) (0) Unknown NEW CODES	___	26

RESTRAINT SYSTEM	PUNCH CODE	CARD COL.
LAP BELT		
EQUIPPED FOR THIS POSITION (1,2,0)*	___	27
WORN BY OCCUPANT (1,2,3,0)*	___	28
WORN SNUGGLY (1,2,3,0)*	___	29
LOCKING RETRACTOR (1,2,3,0)*	___	30
UPPER TORSO RESTRAINT		
EQUIPPED FOR THIS POSITION (1,2,0)*	___	31
WORN BY OCCUPANT (1,2,3,0)*	___	32
WORN CORRECTLY (1,2,3,0)*	___	33
INERTIA REEL (1,2,3,0)*	___	34
IF ANY PART OF SYSTEM IS NOT ORIGINAL EQUIPMENT BY MANUFACTURER, DESCRIBE SYSTEM ON FOLD-OUT FLY-LEAF.		
LAP and/or UPPER TORSO RESTRAINT USAGE CODE	__ __	35-36
IF THE LAP BELT WAS WORN, TRACE THE OUTLINE OF THE TAB END HARDWARE ON THE BACK COVER & LABEL IT. IF THE SHOULDER BELT WAS WORN TRACE THE OUTLINE OF THE TAB END HARDWARE ON THE BACK COVER & LABEL IT. TYPE OF SYSTEM USED (3) Not Applicable, Not Used (4) 3-point (5) 4-point (6) Other (Not 2-point) (0) Unknown	___	37
CHILD RESTRAINT SYSTEM: NOTE MAKE AND MODEL NUMBER ___ ___ New codes defined as needed		
CHILD RESTRAINT CODE	__ __	38-39
	___	40
	___	41

*WHERE (1,2,0) OR (1,2,3,0) ARE INDICATED, USE 1 FOR YES 3 FOR NOT APPLICABLE
2 FOR NO 0 FOR UNKNOWN

OCCUPANT INFORMATION

EJECTION	PUNCH CODE	CARD COL.
DEGREE OF EJECTION (2) NONE (4) PARTIAL (5) COMPLETE (0) UNKNOWN	—	42
AREA OF EJECTION (3) NOT APPLICABLE (1) WINDOW, LEFT SIDE (2) " , RIGHT SIDE (4) " , REAR (5) DOOR, LEFT SIDE (6) " , RIGHT SIDE (7) TAILGATE (8) WINDSHIELD (9) ROOF OR OPEN CONVERTIBLE (0) UNKNOWN	—	43
TREATMENT/MORTALITY (0) None (1) First Aid - On-scene or outpatient (2) Hospitalized - Observation under 24 hours (3) Hospitalized - Significant Treatment or over 24 hours (4) Fatal - Dead at Scene (5) Fatal - Dead on Arrival at Hospital (6) Fatal - Dead within 24 hours (7) Fatal - Dead 24 hours to 1 year (8) Fatal - Time of Death Unknown (9) Unknown	NEW CODES —	44
OVERALL SEVERITY OF INJURIES (Due to crash only, see page 54 for non-crash factors) (00) NONE (01) MINOR (02) NON-DANGEROUS, MODERATE (03) NON-DANGEROUS, SEVERE (04) DANGEROUS, SERIOUS (05) DANGEROUS, CRITICAL (06) FATAL LESIONS IN 1 REGION (07) FATAL LESIONS IN 1 REGION (08) FATAL LESIONS IN 2 REGIONS (09) FATAL LESIONS IN 3 OR MORE REGIONS (98) INJURY UNKNOWN (99) INJURED, SEVERITY UNKNOWN (10) FATAL, details unknown (9/72)	— —	45 46
	END OF CARD	

*HOSPITALIZED: INJURIES REQUIRING HOSPITAL RECUPERATION AND TREATMENT FOR A PERIOD OF AT LEAST ONE DAY. "HELD FOR OBSERVATION ONLY" IS NOT CONSIDERED "HOSPITALIZED" IN THIS DEFINITION.

CODES FOR AREAS OF OCCUPANT CONTACT

(USE THESE CODES ON PAGE 31)

FRONT OF PASSENGER COMPARTMENT
- (05) Instrument Panel
- (09) Steering Assembly
- (12) Windshield
- (02) Glove compartment area
- (03) Hardware items (ashtray, instruments, knobs, etc.)
- (04) Heater or AC Ducts
- (01) Air conditioning or ventilation outlets
- (06) Mirrors
- (07) Parking Brake
- (08) Radio
- (10) Sunvisors & fittings, and/or top molding (header)
- (11) Transmission selector lever
- (53) Parcel Tray (New 7/72)

SIDES
- (20) Surface of side interiors
- (19) Hardware
- (13) Armrests
- (22) Window glass
- (21) Window frames
- (14) A-pillar
- (15) B-pillar
- (16) C-pillar
- (17) D-pillar
- (18) Courtesy lights

INTERIOR
- (29) Front seatbacks
- (33) Restraint system hardware
- (34) Restraint system webbing
- (30) Head restraints
- (32) Other occupants
- (31) Interior loose object
- (50) Rear seat (NEW)
- (51) Front seat cushion (NEW)
- (52) Internal flying glass (NEW)

ROOF
- (26) Roof side rails
- (10) Sunvisors & fittings and/or top modling (header)
- (25) Roof or convertible top
- (24) Coat hooks
- (18) Courtesy Light

FLOOR
- (11) Transmission selector lever
- (40) Floor
- (28) Foot controls
- (27) Console

REAR
- (23) Backlight (rear window)
- (39) Backlight header

EXTERIOR TO PASSENGER COMPARTMENT
- (35) Hood
- (36) Objects exterior to car
- (37) Outside surface of car
- (38) Other: ________

(98) Impact Force, "Whiplash" Hyperextension/compression
(00) Contact, but area unknown
(99) Missing Data

NEW CODES

OCCUPANT

OCCUPANT INJURY DETAIL

1. This page is only for the occupant just described.
2. Enter occupant number from page 28. (This refers only to the order in which occupant information is entered and is not related to seated position.)
3. Enter severity code (only one per box) for each type of injury to each body region. (Mark boxes with 1-6, 9, 8 only, as instructed inside back cover.) (X),(Y)
4. Do not fill in the boxes where there was no injury.
5. If you are reasonably assured that one or more specific components or area(s) contacted by this occupant resulted in an associable injury, enter the proper code(s) in the starred (★) section. (See Page 29 for codes.)
6. Do not fill in the boxes where there was no contact.

DUPLICATE FROM PRECEDING CARD	CARD NUMBER	OCCUPANT NO.	BODY REGION	★ ENTER CODE(S) FOR AREA(S) OF POSSIBLE CONTACT. One 2-digit code per box.				ENTER SEVERITY CODES: OVERALL INJURY TO BODY REGION	FRACTURE	LACERATION	CONTUSION	COMPLAINT OF PAIN	ABRASION	CONCUSSION	BURN	HEMORRHAGE	OTHER
1-9	10-11	12-13		14-15	16-17	18-19	20-21	22	23	24	25	26	27	28	29	30	31
	12		INTERNAL ORGANS														
	13		BRAIN														
	14		FACE														
	15		HEAD														
	16		NECK (CERVICAL REGION)														
	17		SHOULDER GIRDLE														
	18		RIGHT UPPER LIMB														
	19		LEFT UPPER LIMB														
	20		CHEST & UPPER BACK (THORAX)														
	21		LOWER BACK (LUMBAR REGION)														
	22		ABDOMEN														
	23		PELVIC GIRDLE														
	24		RIGHT LOWER LIMB														
	25		LEFT LOWER LIMB														
	26		WHOLE BODY					NOT a summary of rows above									

Enter at least one contact code per body region injured. Use (00) if contact area unknown.

Equal to highest AIS digit to the right

KEYPUNCH NOTE Each line represents one card. Punch only the lines with handwritten information

Form Version Number 3 / 1

Report Number

2 3 – 4 5 6 7 8 – 9

Card Number 9 0 / 10 11

REPORTING DATA (99999) for Unknown

Date of Field Investigation

MO DAY YEAR

__ __ __ __ __ __ (12 13 14 15 16 17)

Date Submitted/Published (inside title page)

__ __ __ __ __ __ (18 19 20 21 22 23)

Team case number

__ __ __ __ __ __ __ __ __ __ __ (24 25 26 27 28 29 30 31 32 33 34)

HSRI CPIR Editor

(1)	JD	(A)	DS
(2)	PG	(B)	Ed B
(3)	BB	(C)	Ed C
(4)	BP	(D)	Ed D
(5)	BG	(E)	Ed E
(6)	SV	(F)	Ed F
(7)	PK	(G)	Ed G
(8)	JW	(H)	Ed H
(9)	AM	(I)	Ed I
(0)	Unknown		

__ 35

Number of CASE VEHICLES reported in accident (Completed CPIRs) __ 36

Original Vehicle Report Form

(0) No Form (MDC)
(1) CPIR - R1
(2) CPIR - R2
(3) CPIR - R3
(4) NHTSA
(7) CPIR - Baylor
(8) UCLA - TRG

__ 37

Recommendations/Conclusions

Matrix Cell		Number (9) for "9 or More"
	Human	
1	Pre-Crash	__ 38
2	Crash	__ 39
3	Post-Crash	__ 40
	Vehicle	
4	Pre-Crash	__ 41
5	Crash	__ 42
6	Post-Crash	__ 43
	Environment	
7	Pre-Crash	__ 44
8	Crash	__ 45
9	Post-Crash	__ 46

H S __ __ __ __ __ __ __ __ (47 48 49 50 51 52 53 54 55 56)

P B __ __ __ __ __ __ __ __ (57 58 59 60 61 62 63 64 65 66)

Other Vehicle CPIR Report No.
If 3 Case Vehicles, link 1 to 2, 2 to 3, and 3 to 1.

__ __ – __ __ __ __ __ – __ (67 68 69 70 71 72 73 74)

Date Edited

__ __ – __ __ – __ __ (75 76 77 78 79 80)

end of card 90

Duplicate Col 1-9 from Preceeding 9 1
10 11

SUPPORTING DATA

(1) Yes
(2) No
(3) Not applicable
(0) Unknown

	Code	Col.
Psychological Factors		
Psychological Review	___	12
Any Personal Interviews	___	13
Katz Adjustment Scales (KAS)	___	14
Michigan Alcoholism Screening Test (UM)	___	15
Driver's License Record (Previous Accidents)	___	16
Medical Factors(included)		
Medical Examiners/Autopsy	___	17
AFIP Medicolegal Autopsy	___	18
Toxicological/Alcohol Test Includes Breathalyzer Case Driver Only	___	19
Medical Report	___	20
Medical Summary/Diagram	___	21
X-Rays(taken or included)	___	22
Medical History	___	23
Accident Factors (included)		
Map Location	___	24
Collision Diagram/Sketch	___	25
Site Accident History	___	26
Narrative Description	___	27
Police Report	___	28
Who Estimated Speeds for Case Vehicle (0) No One (1) Investigator (2) Police (3) Driver (4) Witness/Passenger (8) Other:______ (9) Unknown		
Prior to Impact	___	29
At Impact	___	30

Vehicle Factors	Code	Col.
NHTSA Vehicle Condition And Maintenance Report	___	31
If (1) then 1		
Mechanical Malfunction Inspection	___	32
Inspection Records	___	33
Registration Records	___	34
Sheet Metal Crush Diagram/Sketch	___	35
Inches, Coded	___	36
Measurements Taken		
Telescoping Unit	___	37
EA Steering Wheel	___	38
A (Column to Rear)	___	39
EA Steering Column	___	40
VIN Included	___	41
VDI Included	___	42
VM/M Code Included	___	43

Photographs (number)	Code	Col.
TOTAL= Black and white + Color Slides	_ _ / _ _	44 45 / 46 47
and TOTAL= Site/Location Photos + Vehicle Exterior Photos + Vehicle Interior Photos + Autopsy/Medical Photos	_ _ / _ _ / _ _ / _ _	48 49 / 50, 51 / 52, 53 / 54, 55
Total Number Photos (99 Unknown) (98) over 97	_ _	56, 57

HIT LAB NUMBER

_ _ _ _ _ _ _
58 59 60 61 62 63 64

End of Card 91

Duplicate Col. 1-9 from Preceeding 9 2 (10 11)

CASE VEHICLE MALFUNCTION
From CPIR page 2
(1) yes
(2) no
(0) unknown

	Code	Col
(01) Brake System	__	12
(02) Exhaust System	__	13
(03) Steering System	__	14
(04) Suspension System	__	15
(05) Tires	__	16
(06) Electrical System	__	17
(07) Throttle System	__	18
(08) Driver Controls	__	19
(09) Power Train	__	20
(10) Fuel System	__	21
(11) Visibility Items	__	22
(12) Other: ________	__	23
(13) Applicable, but unknown	__	24
Primary Item Noted Above (01 to 13) from above (00) None (99) Unknown	__ __	25,26
Had Routine Maintenance been Performed	__	27

CASE VEHICLE DRIVER'S RECORD

	Code	Col
Driver Education (1) None (2) High school (3) Commercial (4) Informal (5) Military (6) Professional (8) Other: ________ (9) Yes, Unknown source (0) Unknown	__	28
Number* of Previous Moving Violations	__	29
Number* of Previous Collisions	__	30
Number* of Previous License Suspensions	__	31

* Use (8) for "More than 7."
Use (9) for unknown.

CASE VEHICLE DRIVER'S TRIP PLAN

	Code	Col
Origin (1) Home (2) Work (3) Shopping (4) Recreation (5) Friend/Relatives (6) Cocktail Lounge/Bar/Wet Party (7) Church (8) School (9) Other (0) Unknown	__	32
Destination Code as above	__	33
Route Familiarity (1,2,0)	__	34
Area Familiarity (1,2,0)	__	35
Route Useage (1) Daily (2) Weekly (1-4 times) (3) Monthly (1-3 times) (4) Quarterly (1-2 times) (5) Annually (1-3 times) (6) Less than annually (7) Never (0) Unknown	__	36

TIME (2400 hour clock) of:
(9999 Unknown)

Departure __ __ __ __ (37)
Impact __ __ __ __ (41) From CPIR page 1
Expected Arrival __ __ __ __ (45)

Card 9 2 Continued

PSYCHOLOGICAL FACTORS (Case Driver)	Code	Col.
Stress That Day		
(1) Argument with Relations or Friends. (2) Argument with Boss or Co-worker (3) Loss of Friend or Relative (4) Financial Difficulty (5) School Problems/ Work Problems (6) Legal/Police Problems (7) Social Agency/Consulor Problems (8) Other: ________ (9) None (0) Unknown	—	49
Marital State		
(1) Single (2) Married (3) Common Law (4) Separated (5) Divorced (6) Widowed (0) Unknown	—	50
Occupation (1970 Census Users Guide)		
(10) White Collar (11) Professional,Technical (12) Manager,Administrator (except Farm) (13) Sales workers (14) Clerical,kindred (20) Blue Collar (21) Craftsmen,kindred (22) Operatives,except transport (23) Transport equipment operatives(drivers) (24) Laborers,except farm (30) Farm Workers (31) Farmers,Farm managers (32) Farm laborers,Farm foreman (40) Service Workers (41) Service workers,except below (42) Private household workers (50) Housewife (60) Student (70) Military (80) Retired ( ) Unemployed(over a month) (00) Unreported,Unknown	— —	51, 52

Note: If several jobs, use major time
If temp. unemployed, use last job

PHYSIOLOGICAL FACTORS (Case Driver)	Code	Col.
Permanent Physiological Conditions		
(1) Infirmities (Arthritis, Senility, etc.) (2) Diabetes (3) Brain (Epilepsy, Stroke) (4) Cardio-Vascular (Heart failure, Angina, Infection) (5) Vision/Hearing Restricted (6) Respiratory Condition (7) Paralegic, amputee (8) Other: ________ (9) None (0) Unknown	—	53
Transient Physiological Condition (Choose no more than two) See CPIR page 4		
(00) Unknown (02) None (03) Blackouts (04) Dozing (05) Fatigue (06) Drunk (07) Drinking Involved (08) Drug or Medication (See Pa S5) (09) Flu, Headcold, etc. (10) Fractured Member (11) Menstrual Period (12) Pregnancy (13) Hangover (14) Not wearing corrective lenses (99) Other: ________	— — — —	54,5 56, 57
Non-Impact Medical Condition All Case Occupants Not Just Driver		
(0) None (1) Yes - Time and Type Unknown (2) Pre-Crash Fatal (Clinical Death at Wheel) (3) Pre-Crash Non-Fatal (Prior Injury, Stroke) (4) Pre-Crash Unknown Type (5) Post-Crash Fatal (Drowning) (6) Post-Crash Non-Fatal (7) Post-Crash Unknown Type (8) Other: ________ (9) Unknown	—	58

Card 92

Continued

	Code	Col
Pharmacological Agents Noted (noted, but not necessarily causal)	___	59

(1) Yes, Unknown or Other:________
(2) None noted, No BA test, (000) Below
(3) Stimulants, Prescriptive/Narcotics (Amphetamines, cocaine, bennies)
(4) Stimulants, Over-the-Counter (Caffiene, 'no doz')
(5) Depressants, Prescriptive/Narcotics (Barbiturates, opiates, tranquilizers)
(6) Depressants, Over-the-Counter (Alcohol, sleeping compounds)
(7) Antihistamines
(8) Hallucinogens (LSD, DMT, mescaline, psilocybin)
(9) Marijuana
(0) Unknown

Blood Alcohol Level (MG %)

. ___ ___ ___ 60 61 62

(999) Unknown, No Results
(000) No Drinking, or "—Results"

CRASH FACTORS

	Code	Col
Inital Clock Direction of Rollover (Case vehicle, horizontal clock)	___ ___	63,64

(12)- - Over Front End

(09)  (03)-Over Right

(06)- - Over Back End
(00) No Rollover
(98) Rollover, Direction Unknown
(99) Unknown if Rollover

POST CRASH FACTORS

	Code	Col
Case Vehicle, Final Location	___	65

(1) In Traffic Way
(2) On Shoulder
(3) Off-Road, Median
(4) Off-Road, Side
(5) In Water Way
(9) Other:________
(0) Unknown

	Code	Col
Case Vehicle, Final Attitude O'Clock Position	___ ___	66,67

(12) ——— Upright

(09)  — (03) On Side

(06) ——— Inverted
(00) On End
(99) Unknown
O'Clock=

Post Accident Factors:

	Code	Col
Fire Control used, if fire (1,2,0)	___	68
Extrication used (1,2,0)	___	69
Ambulance Service used (1,2,0)	___	70
Towing Service used (1,2,0)	___	71

Duplicate col 1-9 from preceeding 2 1
10 11

PRE CRASH PHASE
(Accident Viewpoint)

General Locality
(1) Freeway (Limit Access)
(2) Urban
(3) Urban-Rural (House near road)
(4) Rural (Fields)
(9) Unknown

Code	Col.
—	12

Particular Location
(01) 1-Lane, Not Intersection
(02) 2-Lane, Not Intersection
(03) 3-Lane, Not Intersection
(04) More than 3-Lane
(05) Off Road
(06) Intersection
(07) Expressway
(08) Interchange, Main Lanes
(09) Interchange, Other Lanes (Ramps)
(10) Bridges, Tunnels, Viaducts
(11) Parking Lots
(12) Driveways
(99) Unknown

Code	Col.
— —	13,14

Report Numbers of Vehicles Ranked in Order of Responsibility for Causing Collisions

All 0's for No Vehicle
NOTE→ All 8's for Non-Case Vehicle
All 9's for Unknown
Fill in all Responses

Most Responsible Vehicle

__ __ - __ __ __ __ __ - __
15 16 17 18 19 20 21 22

Second Most Responsible Vehicle

__ __ - __ __ __ __ __ - __
23 24 25 26 27 28 29 30

Third Most Responsible Vehicle

__ __ - __ __ __ __ __ - __
31 32 33 34 35 36 37 38

Responsibility of Case Vehicle

(1) Most Responsible
(2) Second Most Responsible
(3) Third Most Responsible
... Etc.
(9) Missing Data

Code	Col.
—	39

Total Energy Available

(Total Foot-pounds x 10^6 for first and second most responsible vehicle. See Energy Table. 9999 for unknown.)

__ __ . __ __
40 41 42 43

(9998) for over 9997

PRE-CRASH MOVEMENT OF MOST RESPONSIBLE VEHICLE

Pre-Crash Basic Movement

(1) Straight Ahead
(2) Turning, Curve Following
(3) U Turn
(4) Reverse, Backing
(5) Lane Changing
(6) Parked, Stopped
(7) Entering, Leaving Driveway (use 4 if backing)
(8) Starting to Move
(9) Unknown

Code	Col.
—	44

Character of Movement

(00) Straight Ahead
(01) Straight Ahead, Road turned to left
(02) Straight Ahead, Road turned to Right
(03) Off RHS of Road
(04) Off RHS of Lane
(05) Off RHS, and back again
(06) Veered Right
(07) Turned Hard Right
(08) Off LHS of Road
(09) Off LHS of Lane
(10) Off LHS, and back again
(11) Veered Left
(12) Turned Hard Left
(13) Vehicle Stopped
(14) Other
(99) Unknown

Code	Col.
— —	45 46

Primary Factor Responsible For Accident

(1) Driver Omission or Unaware Error
(2) Driver Commission or Aware Error
(3) Vehicle Defect
(4) Trafficway Defect
(5) Ambience
(9) Unknown

Code	Col.
—	47

Card 93 Continued

st Responsible Vehicle!

Primary Error
(Pick first and second most significant)

(00) No Error
(01) Under Estimation
(02) Falling Asleep, Blackout, Death-at-Wheel
(03) Diverted Attention
(04) Inexperienced Driving or Erratic Driving
(05) Drunken Driving, Drinking Involved, or Narcotics or Medication
(06) Right of Way
(07) Turning Error
(08) Signalling Error
(09) Speeding
(10) Overtaking
(11) Following too Closely
(12) Signs, Signals Disobeyed
(13) Wrong Way into oncoming traffic
(14) Lack of Lights
(15) Lack of Brakes
(16) Other: ________
(17) Avoidance Maneuver
(18) Over correction maneuver
(99) Unknown

Code	Col.
— —	48 49
— —	50 51

Degree of Driver Attention

(1) No Awareness (e.g. asleep)
(2)
(3)
(4)
(5) Complete Awareness of all Driving Tasks
(9) Unknown

Code	Col.
—	52

Driving Complexity

(1) Complete Familiarity (e.g. Familiar Car, Frequent Route, and Unobstructed Open Country)
(2)
(3)
(4)
(5) Peak Complexity (e.g. Peak Hour Traffic and Unfamiliar Mid City)
(9) Unknown

Code	Col.
—	53

Avoidance Maneuvers

(0) None
(1) Braking
(2) Steering
(3) Braking and Steering
(4) Acceleration
(5) Acceleration and Steering
(6) Brake Release
(9) Unknown

	Code	Col
Most Responsible Vehicle	—	54
Second Most Responsible Vehicle	—	55

Vehicle Combination
(e.g. 5,6 = Bus, Motorcycle)

(0) No other Vehicles
(1) Large Car (> 3800 lbs)
(2) Medium Car (2800-3800 lbs)
(3) Small Car (< 2800 lbs)
(4) Truck
(5) Bus
(6) Motorcycle
(7) Utility or Jeep
(8) Other: ________
(9) Unknown

	Code	Col
Most Responsible Vehicle	—	56
Second Most Responsible Vehicle	—	57

Movement of Second Most Responsible Vehicle

(0) No Second Vehicle
(1) Straight Ahead
(2) Left Turning
(3) Right Turning
(4) Stopped
(5) Other: ________
(9) Unknown

Code	Col
—	58

Hazardous Road Conditions
(Rank by Significance)
Cause Only

(0) None
(1) Surface Under Water
(2) Surface Slippery (oil, ice, water, etc.)
(3) Shoulders Slippery
(4) Weather Obstructions (snow, fog, etc.)
(5) Light (sun, headlight, etc.)
(6) Obstacle on Road (e.g. car)
(7) Road Construction, Repair or Disrepair
(8) Other: ________
(9) Unknown

Code	Col
—	59
—	60

End of card 93

Comments:

Revision 3

Report Number ___ ___ - ___ ___ ___ ___ ___ - ___ (2 3 4 5 6 7 8 9)

Card Type 9 4 (10 11)

HSRI ANALYSIS

Case Vehicle

MPH at Impact
(999 Unknown) ___ ___ ___ (12 13 14)

Primary Damage Index
(99-0000-0 Unknown)
___ ___ - ___ ___ ___ ___ - ___ (15 16 17 18 19 20 21)

Secondary Damage Index
___ ___ - ___ ___ ___ ___ - ___ (22 23 24 25 26 27 28)

Sheet Metal Crush
(98 if over 97 inches)
(99 if unknown)

	Code	Col.
Front (Inches)	___ ___	29, 30
Rear	___ ___	31, 32
Left Side	___ ___	33, 34
Right Side	___ ___	35, 36
Roof	___ ___	37, 38
Other	___ ___	39, 40

Other Vehicle

MPH at Impact
(888 for N/A) ___ ___ ___ (41 42 43)

Damage Index
(99-0000-0) No Other Vehicle
___ ___ - ___ ___ ___ ___ - ___ (44 45 46 47 48 49 50)

APPENDIX B

An IBM 1800 program pre-file build program has been developed in Fortran IV. The program reads the keypunched "Collision Performance and Injury Report" Revision 3 and supplementary form IBM cards, as displayed in Appendix A. The program reformats the data for updating the MDAI master file, computes new variables (i.e., summary variables, bracketed ranges, and alpha to numeric conversions), and performs over 400 data checks for wild or invalid codes and internal inconsistencies within the data (e.g., rear door damage on a 2 door car).

The complete program as now constituted is comprised of 4 main programs and 10 subroutines as listed below. A summary flow chart for each program and subroutine are included in the first portion of this appendix. Copies of the Fortran IV program listings have been provided to the NHTSA Information Systems Division. A complete list of data checks performed by the program is included in the last portion of this appendix.

Main Programs	Subroutines
CPBEG	CPIRA
CPIR	CPIRB
CP	CPIRX
CP1	CPIRV
	CPSUM
	CPSM2
	CPPLR
	CPPL1
	CPPL2
	CPIRZ

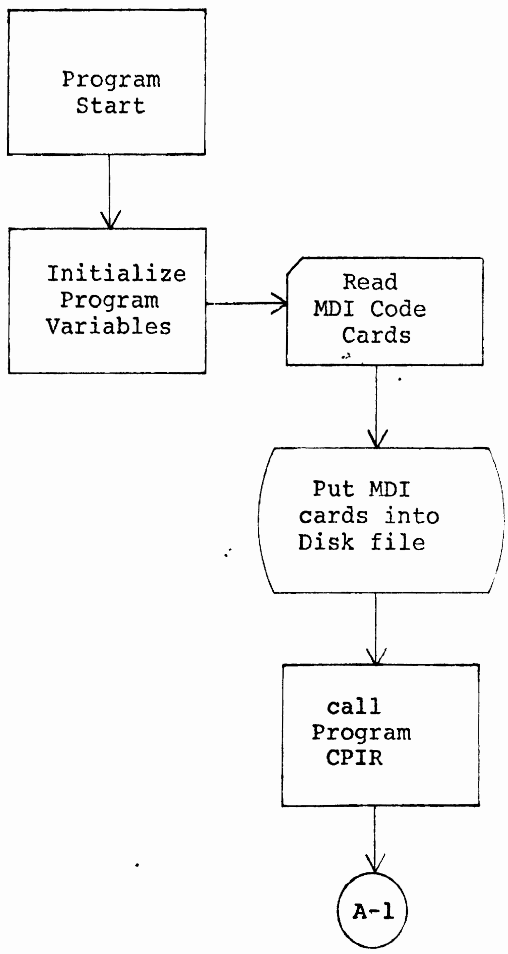
Program CPBEG

Program CPBEG starts the program.

The program begins by initializing certain areas of a 78 x 3 array to be used later in subroutines CPSUM and CPSM2 if summary sheets are outputted.

The program also reads in the current MDI team code cards and sets up a file called 'MDI'.

The program will then link to program CPIR.

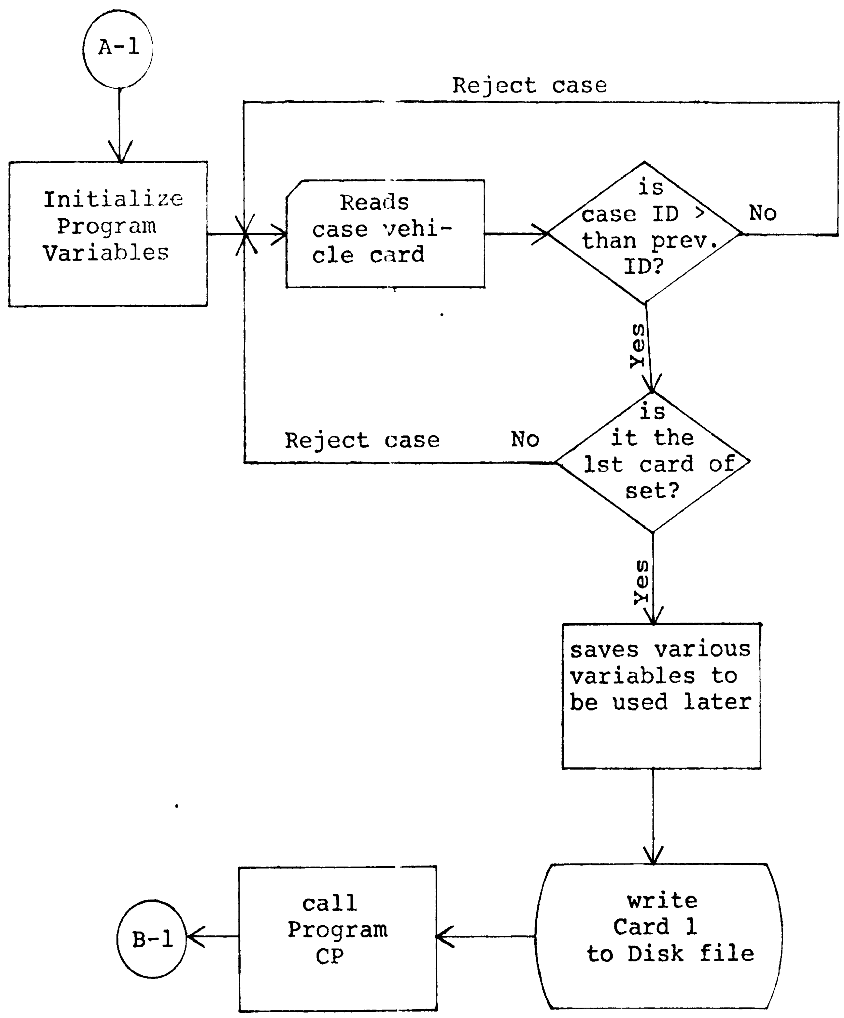


Program CPIR

Reads in first data card and checks to see if case ID is greater than previous case ID or if it is the first card of a new case.

Program will reject any and all cases that are out of sequence and also if the set internally is out of sequence. Appropriate messages are typed out.

Upon finding a good case ID and also a card '1', the program will save certain variables to be used later in the program and then will place card '1' on a file.



Program CP

Program CP checks for a card '2', if card '1' indicated that there was another vehicle involved.

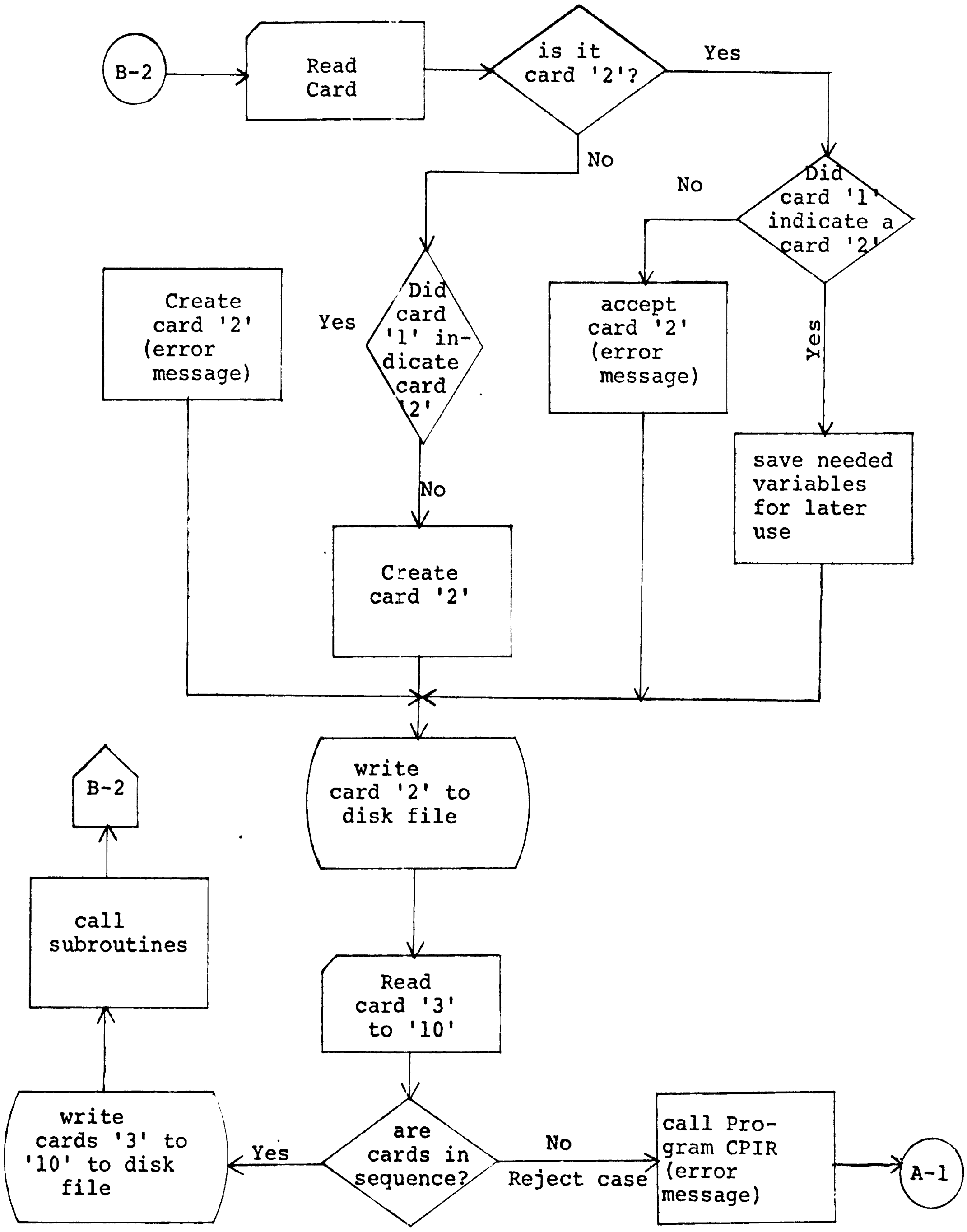
If card '2' is found than various variables are saved. If card '2' was indicated but not found, a card '2' will be created and an appropriate error message printed out. If 'no other vehicle involved' is indicated and card '2' is found, program will accept it but will print appropriate error message. If no other vehicle is involved and no card '2' found, program will create card '2' filling in the appropriate zeroz and blanks. Card '2' is then written to disk file.

Next, cards '3' to '10' are read, checking for proper ID and sequence and written to the disk file after saving all variables needed for later processing.

Program continues by calling subroutines CPIRA, CPRIB, CPRIV, CPIRX, CPSUM, CPSM2, CPPLR, CPPL1, CPPL2, AND CPRIZ.

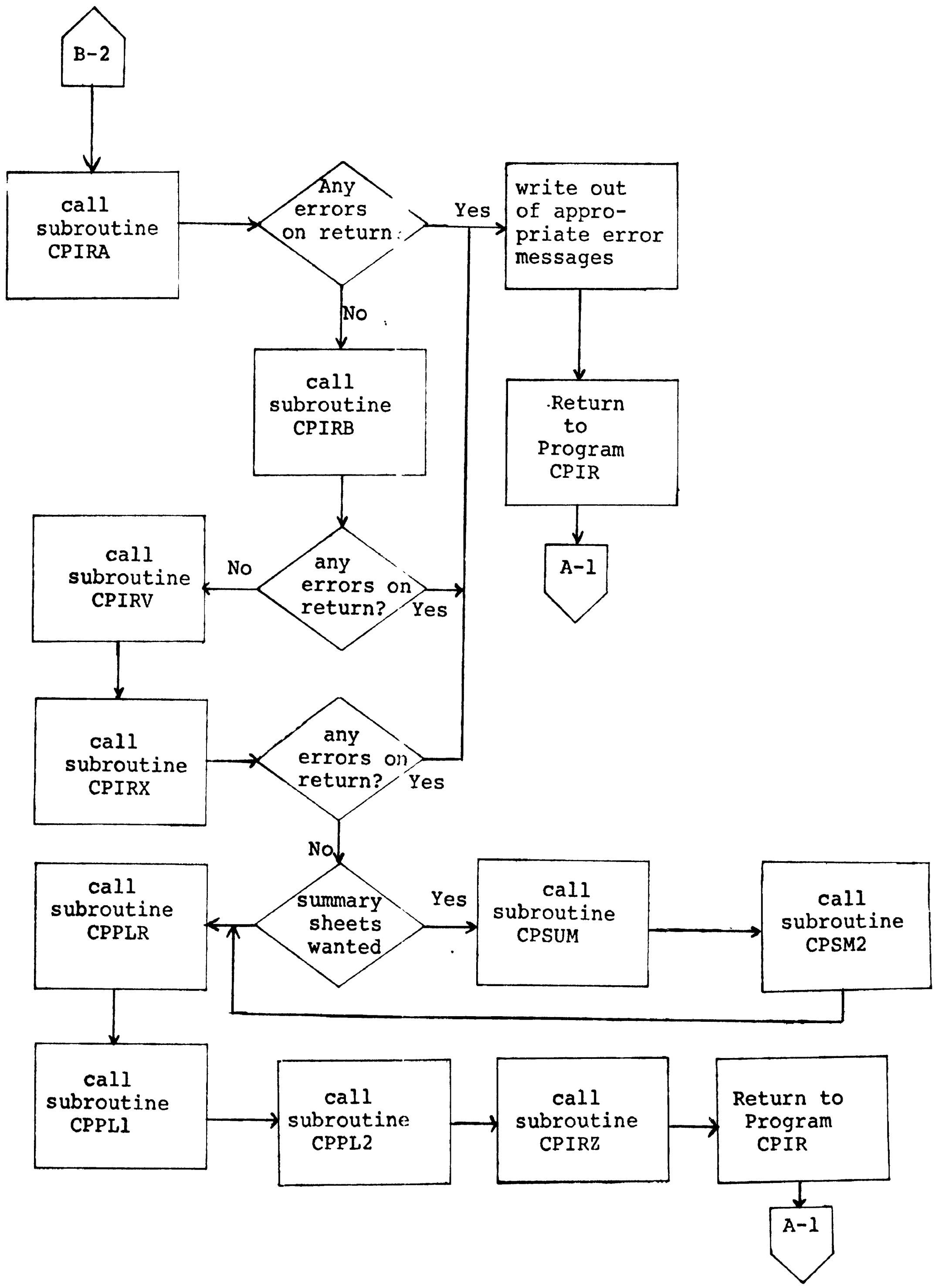
See write-up on particular subroutine for specific function. In the processing of all cards--checks are made for proper ID and card sequence. If out of sequence, the entire case will be rejected.

Program CP



B-2
Read Card
is it card '2'?
Yes
No
Did card '1' indicate a card '2'
No
Yes
Did card '1' indicate card '2'
Yes
No
Create card '2' (error message)
accept card '2' (error message)
save needed variables for later use
Create card '2'
write card '2' to disk file
B-2
call subroutines
Read card '3' to '10'
write cards '3' to '10' to disk file
Yes
are cards in sequence?
No
Reject case
call Program CPIR (error message)
A-1

Program CP (Conc.)



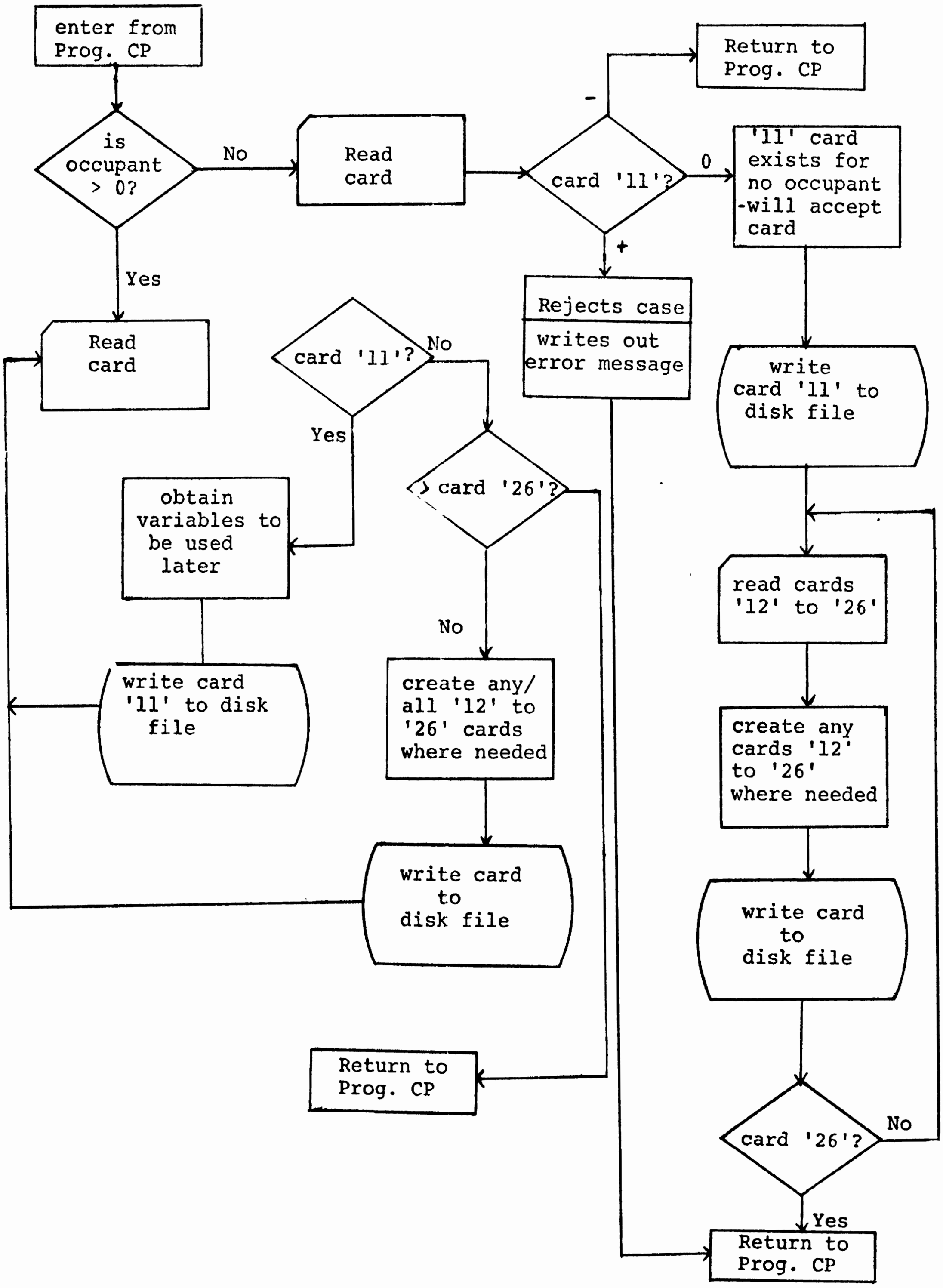
Subroutine CPIRA

Subroutine CPIRA will check for proper number of occupant cards (card '11') and in proper order. Will create card '11' if needed and will also check for cards '12' to '26', creating any blank cards to fill in the proper sequence.

The subroutine will also write cards to disk file after saving needed variables for checking purposes.

It then returns to main line program CP for further processing of data cards.

Subroutine CPIRA



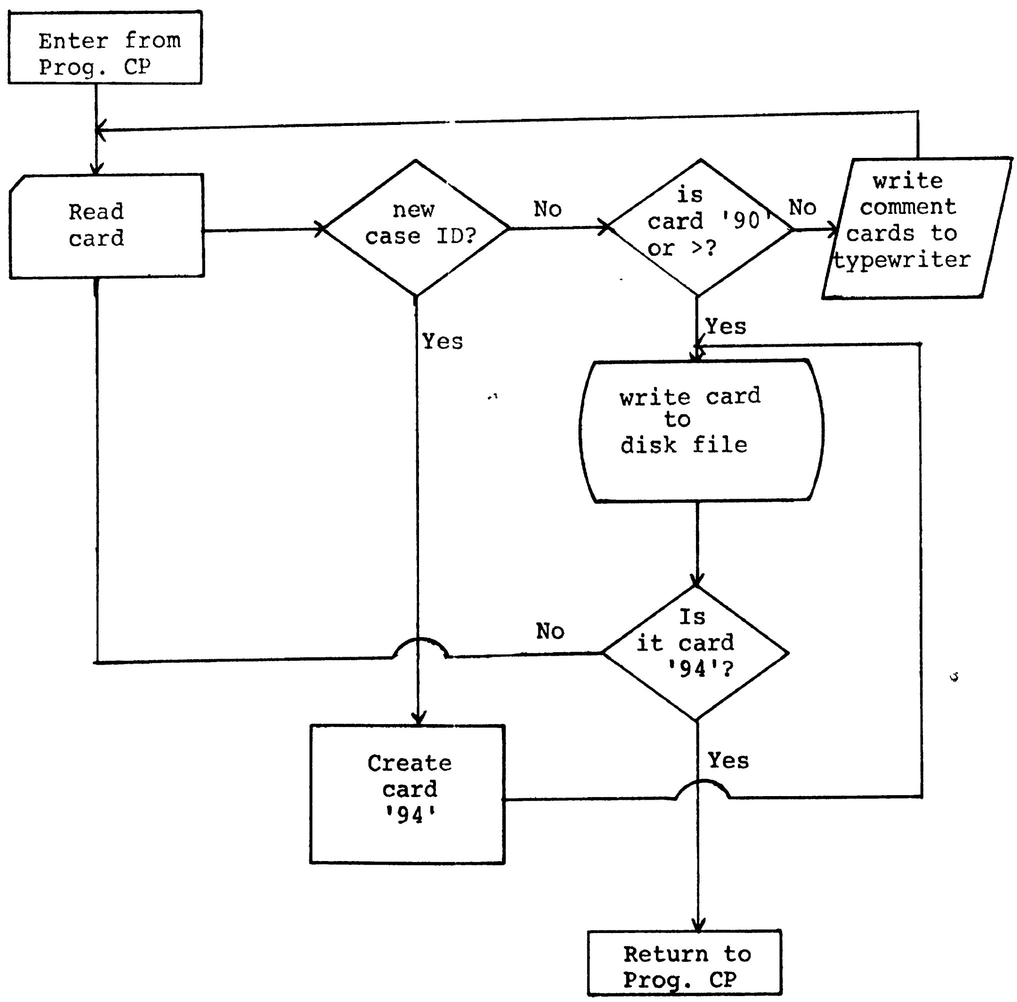
Subroutine CPIRB

Subroutine CPIRB processes all cards greater than '26' and up to and including card '94'.

The subroutine treats all cards '27' to '84' (if there are any) as comment cards and as such does not store the contents but only prints the comments out.

The Program will read cards '90' to '94' and if there is no card '94', the program will create one.

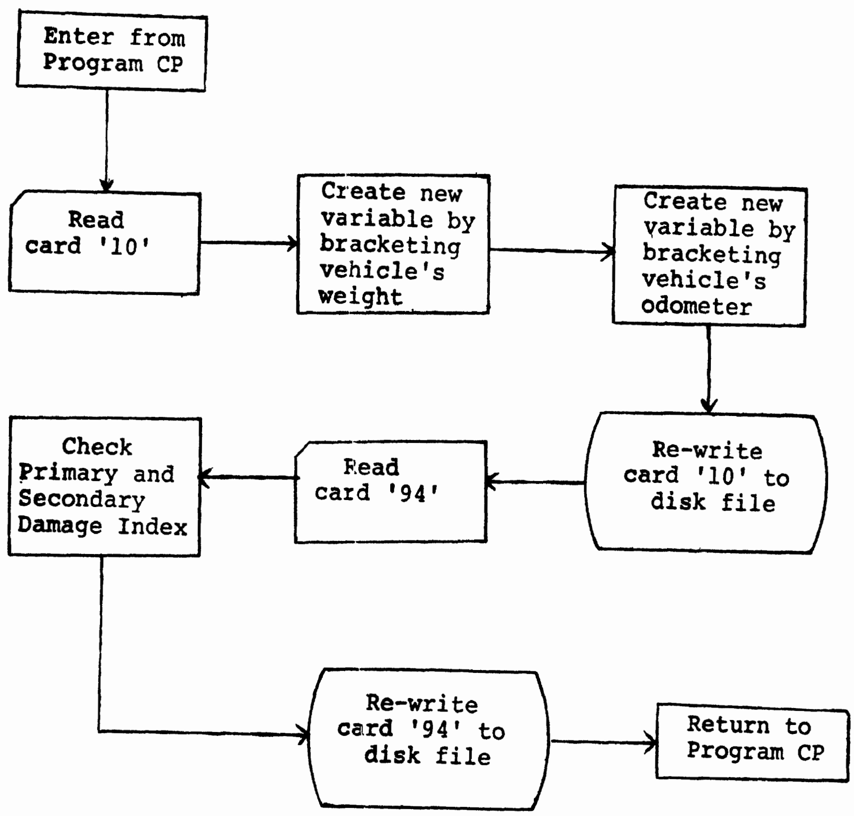
Cards are written to the disk file and then subroutine returns to main line CP.



Subroutine CPIRV

Subroutine CPIRV creates new variables for card '10' by bracketing vehicle weights and odometer readings and also for card '94' where the Primary and Secondary Damage Index is checked for legitimacy.

Program returns to main line CP.



Subroutine CPIRX

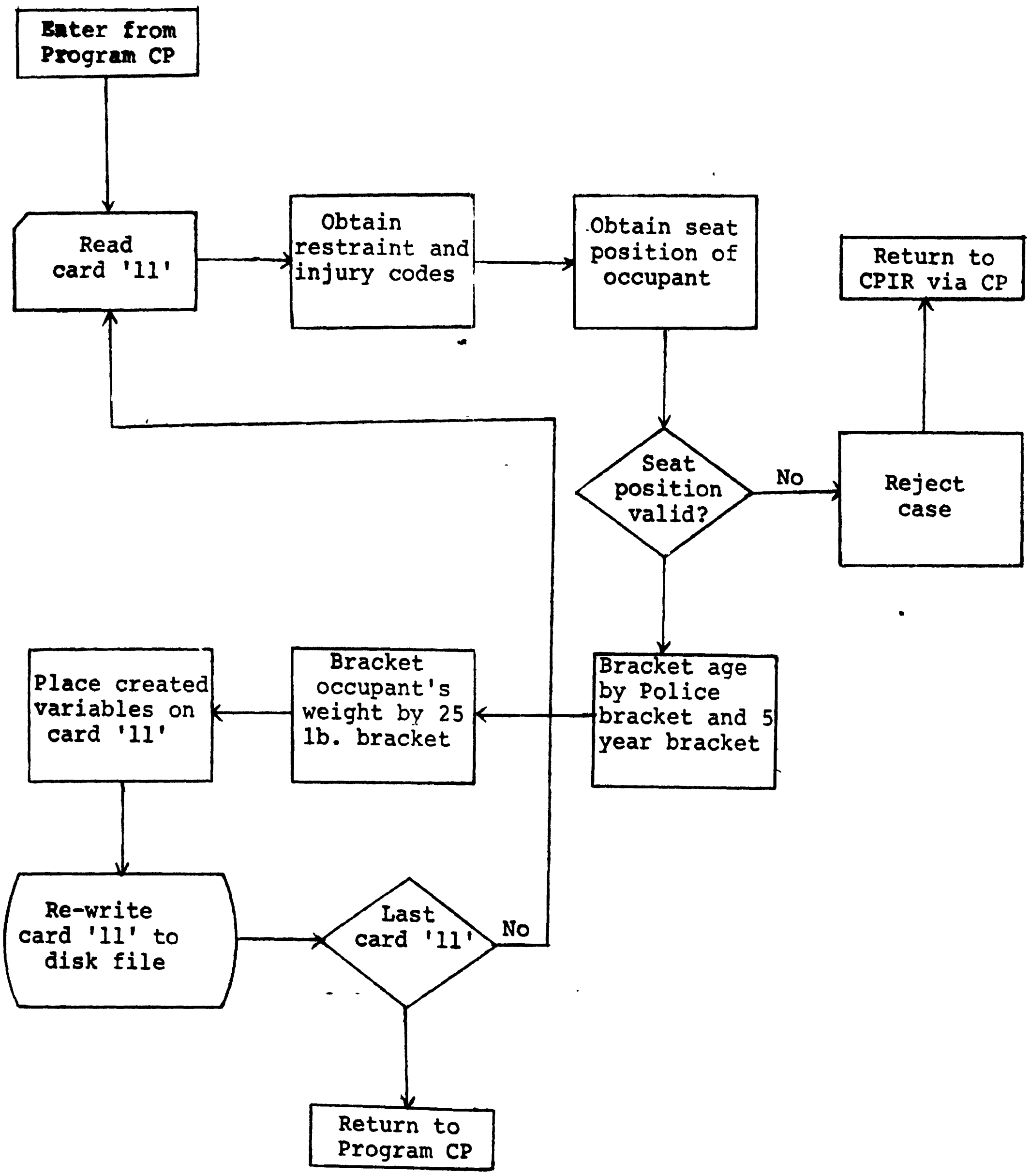
Subroutine CPIRX reads card '11' and finds seat and position location, severity and restraint code. Rejects case if invalid code for seat location or position.

Program brackets age by Police bracket and 5 year bracket.

Program also brackets occupant weight by 25 lbs. bracket.

Places variables on card '11' and replaces on disk file.

Returns to main line program CP.



Subroutines CPSUM & CPSM2

These two (2) subroutines put out a summary sheet of the case vehicle if requested by the program.

A sample of a summary sheet is attached.

ACCIDENT INVESTIGATION SUMMARY--UNIVERSITY OF MICHIGAN HIGHWAY SAFETY RESEARCH INSTITUTE

CASE NUMBER RTI 5 ACCIDENT DATE 10-23-69 RTI 5

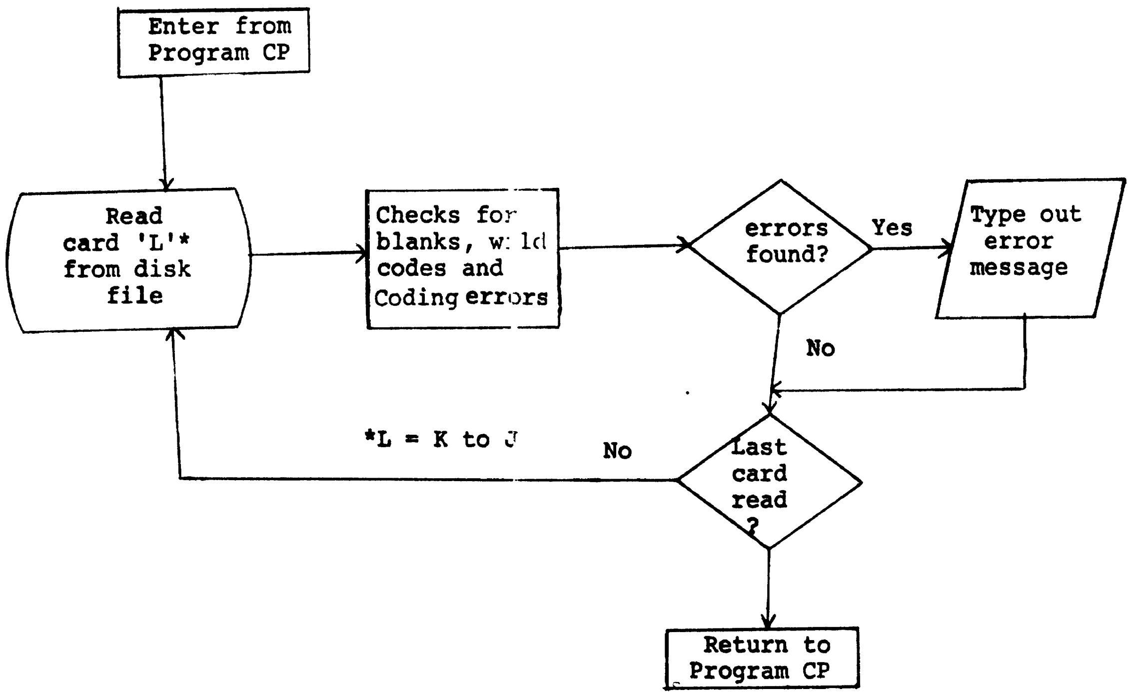
	DATA	NOTES
CASE VEHICLE	A 1969 FORD FULL SIZE 2 DOOR SEDAN. 1 OCCUPANTS	
OBJECT STRUCK	STRAIGHT TRUCK	
OTHER VEHICLE	A 1968 GMC STRAIGHT TRK.	
COLLISION TYPE	INTERSECTION L	
DAMAGE INDEX	PRIMARY 12-FDEW-3 SECONDARY 04-RBMW-3	
OCCUPANT I. D.	DRIVER /24YRS, 175LBS, 71IN. , MALE.	
INJURY SEVERITY	DRIVER /MINOR	
RESTRAINTS USED	DRIVER /LAP BELT UPPER TORSO	
EST. IMPACT SPEED	CASE VEHICLE-35 MPH. OTHER VEHICLE-35 MPH.	
ST'G. COL. COLLAPSE: E. A. DEVICE CAPSULES TELESCOPING UNIT	0.0 IN. SEPARATION	
SEAT PERFORMANCE: LATCH TRACK OTHER	NO DAMAGE	
GENERAL COMMENTS	26 IN. CRUSH TO FRONT 12 IN. CRUSH, R. SIDE	

Subroutines CPPLR, CPPL1, CPPL2

These three (3) subroutines do all the checking for valid codes, wild code checks, keypunching errors and code range checking.

Any errors found are typed out with the appropriate message of what is wrong, giving the case ID, card number and column number.

These messages are given to the coders for correction. See list of checks following these flowcharts.

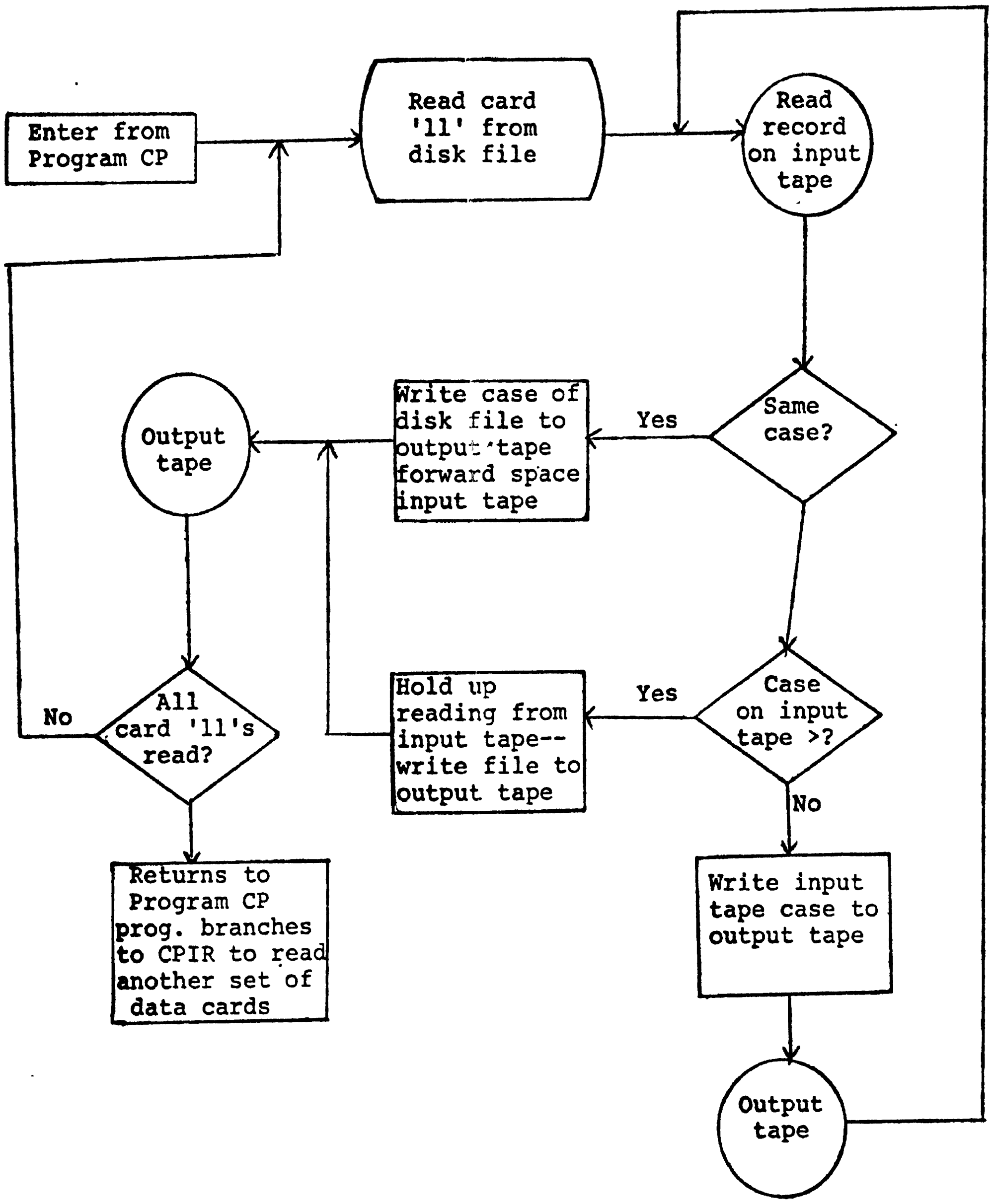


*All three (3) subroutines are similar in content--K represents the beginning card to be checked and J represents last card to be checked in the subroutine.

Subroutine CPIRZ

Subroutine CPIRZ will create a new output magnetic tape by writing new occupant cases to tape, merging with previous data on input tape and deleting incorrect occupant cases and inserting the corrected version before returning to main line program CPIR to obtain a new set of data.

The newly created output tape becomes the input tape for later updating until a sufficient number of cases has been collected to warrent updating the time shared SPAD data bank.



Note: Program ends by finding a blank input card--where any records on input tape will be written to output tape before exiting.

IBM 1800 Pre-Build Program Data Checks

Card	.Column(s)	Entry Check	
1	.30	≠(1) and 1.31=(3)	Precipitation rote?
1	.30	=(1) and 1.31≠(3)	precipitation type?
1	.39	=(7)	check other obstruction
1	40	≠(0) and 92.25-26=(00)	code malfunctions
1	.51-52	=(16)	recode large truck
1	.52-53	=(16)	recode large truck
1	.54-55	=(16)	recode large truck
1	.56-57	=(16)	recode large truck
1	.64-65	=(12)	code PD=1 if injury=1
1	.66-68	=(000-100,999)	wild code check
1	.69-71	=(000 -100,999)	wild code check
1	.71	≠blank	keypunch check
1	.72	=(8) and card 2 exists	other vehicle speed=888?
1	.72	≠(8) and card 2 not read	other vehicle card 2 missing
1	.72-74	=(000-100,999)	wild code check
1	.75-77	=(000-100,999)	wild code check
1	.77	≠blank	keypunch check
2	.30-31	(50-75,99)	build code check
2	.47-48	(00-12,99)	build code check
2	.53	≠blank	keypunch check
3	.28-29	=(13,26)	ck truck V M/M code
3	.30-31	(50,75,99)	wild code check

IBM 1800 Pre-Build Program Data Checks

Card	.Column(s)	Entry Check	5.20	5.38	6.28	6.47	
3	.41						ck upper B and rear door damage
		=(1)	(3)	(3)	(3)	(3)	
		=(3)	(3)	(0,1,2)	(3)	(0,1,2)	
		=(6)	(3)	(0,1,2,3)	(3)	(0,1,2,3)	
		=(2)	(0,1,2)	(3)	(0,1,2)	(3)	
		=(4,5)	(0,1,2)	(3)	(0,1,2)	(0,1,2)	
		=(7,8,9)	(0,1,2)	(0,1,2,3)	(0,1,2)	(0,1,2,3)	
		=(0)	(0)	(0)	(0)	(0)	
3	.41	≠(6) and 3.53≠(3)					convertible?
3	.41	=(6) and 6.22=(1,2,0)					convert. back. header?
3	.42	=(2) and 5.34≠(3)					unitized L body mount
3	.42	=(2) and 6.34≠(3)					unitized R body mount
3	.58-59	(00-12,99)					wild code check
3	.65-66	(00-12,99)					wild code check
3	.71	≠blank					keypunch check
4	.12-17	=(0,1,2)					wild code check
4	.30-32	=(0,1,2)					wild code check
4	.41	=(1) and 4.43=(1)					hood jammed or released?
4	.41-44	=(0,1,2,3)					wild code check
4	.48-54	=(0,1,2)					wild code check

IBM 1800 Pre-Build Program Data Checks

Card	.Column(s)	Entry Check	
4	.50-51	=(21)	hood contacted if penetrated
4	.57-60	≠blank	keypunch check
5	.12	=(1)	check fire coding
5	.16,18,19,20,22,24, 25,26,28,30	=(0,1,2,3)	wild code check
5	.17,19,21,23,25,27,29,31	=(0,1,2,3,4,5)	wild code check
5	.22,38,70	≠blank	keypunch code
5	.32	≠(1) and 5.33=(1)	L roofrail damage?
5	.32-39	=(0,1,2,3)	wild code check
5	.40,42	=(0,1,2,3)	wild code check
5	.41,43	=(0,1,2,3,4,5)	wild code check
5	.44	=(3)	L side continuity?
5	.44-48	=(0,1,2,3)	wild code check
5	.45	=(1) and 5.47=(1)	LF door open or jammed?
5	.46	=(1) and 5,48=(1)	LB door open or jammed?
5	.51-55	=(0,1,2,3)	wild code check
5	.52	=(2) and 5.57-55≠(333)	fuel leakage?
5	.56	=(1)	ck hitch coding
5	.57	=(1)	ck trailer coding
5	.58	=(1,2,0) and 6.12=(0,1,2)	trunk and tailgate?
5	.58-60	=(0,1,2,3)	wild code check
5	.61,62,65,67	=(0,1,2,3)	wild code check

IBM 1800 Pre-Build Program Data Checks

Card	.Column(s)	Entry Check	
6	.12-14	=(0,1,2,3)	wild code check
6	.15,17,19,21,23	=(0,1,2,3)	wild code check
6	.16,18,20,22	=(0,1,2,3,4,5)	wild code check
6	.24,26,28,30,32,34, 36,38	=(0,1,2,3)	wild code check
6	.25,27,29,31,33	=(0,1,2,3,4,5)	wild code check
6	.30,47,76	≠blank	keypunch check
6	.40-48	=(0,1,2,3)	wild code check
6	.49,51	=(0,1,2,3)	wild code check
6	.50,52	=(0,1,2,3,4,5)	wild code check
6	.53	=(3)	R side continuity?
6	.53-57	=(0,1,2,3)	wild code check
6	.54	=(1) and 5.56=(1)	RF door open or jammed?
6	.55	=(1) and 5.57=(1)	RB door open or jammed?
7	.26	=(7) and 7.30=(9)	shear capsule?
7	.35-36	=(21)	intrusion and size reduction
7	.35-40	=(0,1,2)	wild code check
7	.41-42	=(21,31,01)	ck windshield crack
7	.41-45	=(0,1,2,3)	wild code check
7	.43-44	=(21,22,20)	ck occ. windshield contact
7	.46	≠(A-Z)	ck windshield code
7	.48-75	=(0,1,2,3)	wild code check
7	.75	≠blank	keypunch check

IBM 1800 Pre-Build Program Data Checks

Card	.Column(s)	Entry Check	
8	.12-34	=(0,1,2,3)	wild code check
8	.35	=(4,6,7) and 8.45=(3)	ck RF seat position
8	.39	=(0,3-7)	wild code check
8	.40	=(2) and 8.41-42≠(22)	ck damage to adjusters
8	.40-42	=(122)	code adj damage type
8	.41	=(6) and 8.43=(3)	ck separation location
8	.41	≠6 and 8.42≠(6) and 8.43≠(3)	ck separation location
8	.42	=(6) and 8.43=(3)	ck separation location
8	.46-55	=(0,1,2,3)	wild code check
8	.57-60	=(0,1,2,3)	wild code check
8	.65	≠blank	keypunch check
9	.12-59	=(0,1,2,3)	wild code check
9	.16-17	=(23)	rear seat locks?
9	.20	=(2) and 9.21-22≠(33)	third seat?
9	.42	=(3)	interior near door area?
9	.59	≠blank	keypunch check
10	.12-41	=(0,1,2,3)	wild code check
10	.41	≠blank	keypunch check
11	.17-18	=(02-90,00)	wild code check
11	.19-20	=(00-24)	wild code check
11	.21-23	=(000,010-250)	wild code check
11	.24-25	=(00,24-80)	wild code check
11	.27	=(1)	wild code check

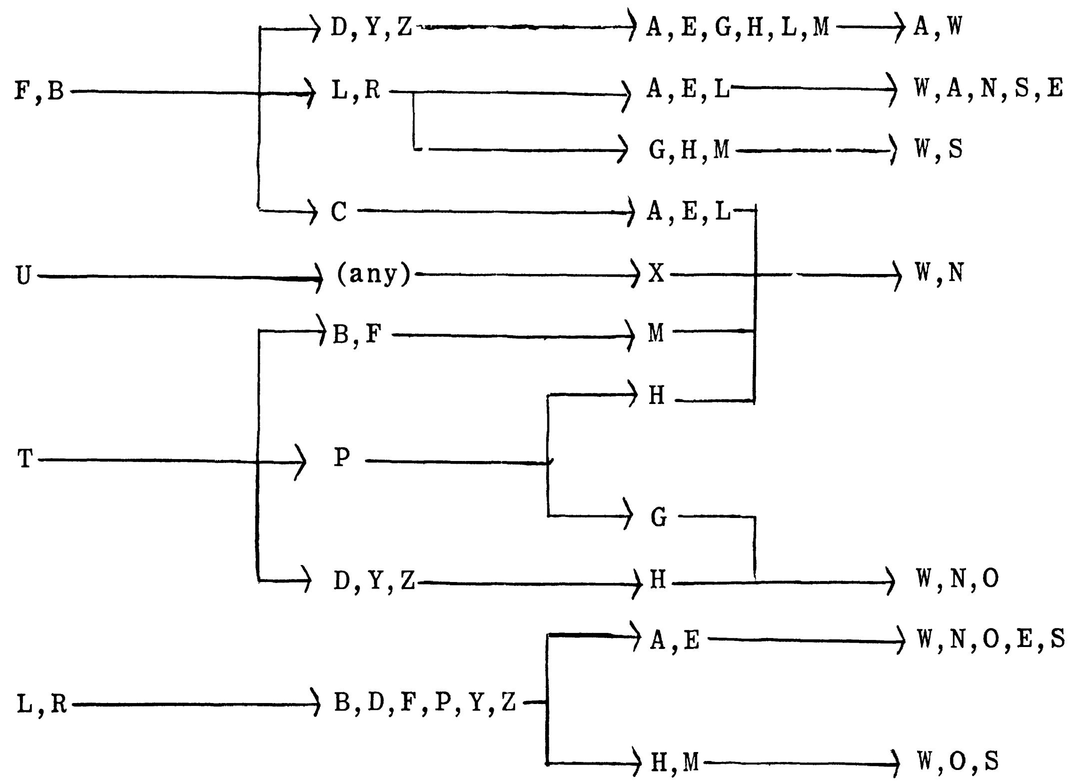
IBM 1800 Pre-Build Program Data Checks

Card	.Column(s)	Entry Check	
11	.27-29	≠(111,112,110,123,233)	ck lapbelt codes
11	.27-34	=(0,1,2,3)	wild code check
11	.31-33	≠(111,112,110,123,233)	ck upper belt codes
11	.37	=(0,3-6)	wild code check
11	.42	=(0,2,4,5)	wild code check
11	.45-46	=(00-10,98,99)	wild code check
11	.46	less than 12-26.22	overall AIS too low
11	.46	≠blank	keypunch check
90	.36	≠(1) and 90.67=blank	other CPIR #?
91	.12-43	=(0,1,2,3)	wild code check

IBM 1800 Pre-Build Program Data Checks

Card	.Column(s)	Entry Check	
94	.17	=(F) and 94.29-30=(00)	F crush?
94	.17	=(B) and 94.31-32=(00)	B crush?
94	.17	=(L) and 94.33-34=(00)	L crush?
94	.17	=(R) and 94.35-36=(00)	R crush?
94	.17	=(T) and 94.37-38=(00)	T crush?
94	.24	=(F) and 94.29-30=(00)	F crush?
94	.24	=(B) and 94.31-32=(00)	B crush?
94	.24	=(L) and 94.33-34=(00)	L crush?
94	.24	=(R) and 94.35-36=(00)	R crush?
94	.24	=(T) and 94.37-38=(00)	T crush?
94	.17-20	check prime VDI letters as below	
94	.24-27	check second VDI letters as below	
94	.46-49	check other VDI letters as below	

First Letter | Second Letter | Third Letter | Fourth Letter



APPENDIX C

Selected Bibliography of Accident Causation Literature

Introduction

The following is a selected bibliography of published and unpublished literature in the subject area of accident causation. The primary focus of the literature search was to form a sound knowledge base upon which to formulate a meaningful and systematic coding scheme of motor vehicle accidents in preparation for data analysis. The items cited are by no means to be considered a complete survey of the literature, but rather a broad sampling of thoughts of those in industry, academia and professional societies, concerned with interpretation of accident causation.

A wide variety of sources were used to find suitable references for the literature search. The most fruitful means of selection was provided by the University of Michigan Highway Safety Research Institute Library which has a very complete indexing of existing works in the subject area. The National Highway Traffic Safety Administration, Information Systems Division performed a computerized search of highway safety literature, which included an annotated bibliography of articles. The Highway Research Board, Highway Research Information Service also provided HSRI an automated bibliography with annotations.

The quantity of literature in traffic accident causation is generally limited. Many of the publications pertaining to traffic accident causation were written with the general classification "Accident" i.e., falls, industrial, etc., in mind rather than specifically motor vehicle mishaps.

There appears to be a very pronounced lack of literature addressing the purely theoretical aspects of traffic accident causation. The publications concerning case studies and specific causative mechanisms seem to be most abundant. Literature dealing with the role of alcohol has been intentionally omitted.

In outlining this bibliography the articles cited will be arranged according to six categories. The category in which an item is placed will be determined by the primary emphasis of the article. Some authors discuss issues which of course overlap the categories. In a case where this is evident there will be cross-referencing of the particular article.

The first of the six categories will include articles or papers addressing the theoretical issues involved in accident occurrence with particular emphasis on motor vehicle or traffic accidents.

A second category lists publications which relate to accident classification schemes, with particular emphasis on the nine-cell matrix now used in MDAI reporting.

The third category will include articles dealing with "causative mechanisms" or single component failures, i.e., the role of braking failures in traffic accidents, in vehicles, or component failures of the human, i.e., intentional crashes.

The fourth category will be comprised of articles, publications, and papers which evade specific classification due to generality of subject matter or by having only nominal relevance to traffic accident causation.

The fifth category will be reserved for articles which deal with case studies of accidents.

The sixth category will contain a listing of 12 HRB Library bibliographies.

1. THEORETICAL ISSUES

1. Baker, J. Stannard, Case Studies of Traffic Accidents, Traffic Safety (Research Review Supplement) December 1961, pp. 14-17.

2. Baker, J. Stannard and Laurence Ross, Concepts and Classifications of Traffic Accident Causes Part I, International Road Safety and Traffic Review, Summer 1961, pp. 11-18.

3. Baker, J. Stannard, Concepts and Classifications of Traffic Accident Causes, Part II, Analysis of Accident Causes, International Road Safety and Traffic Review, Autumn No. 4, 1961 pp. 17-24.

4. Baker, J. Stannard, What are the Causes of Traffic Accidents? Traffic Digest and Review, Vol. 9, No. 10, October 1961.

   The author defines a systematic scheme which may prove helpful in delineating factors involved in accident causation. A "factor" is defined as any circumstance without which an accident could not have occurred. A "cause" is a combination of simultaneous and sequential factors without which an accident could not have happened. A "crucial event" is an action (usually unintended) from which recovery is impossible. A "hazard" is a dynamic situation which will result in a "crucial event" if speed or direction remains unchanged. A "strategic action" is an adjustment of speed and/or position. An "evasive action" is an operation performed to avoid a "hazard".

   1. Trip → Hazard Detection → Successful Strategic Action → Trip Continues

   2. Trip → Hazard Detection → Unsuccessful Strategic Action → Successful Evasive Action → Trip Continues

   3. Trip → Hazard Detection → Unsuccessful Strategic Action → Unsuccessful Evasive Action → "Crucial Event" → Accident → Trip Terminates

5. Carroll, P.S., A Highway Safety Model for Research Planning, Highway Safety Research Institute, The University of Michigan, January 1970.

6. Cohen, John, Preston, Barbara, Causes and Prevention of Road Accidents, Faber and Faber, London, 1968.

   This book addresses various causative mechanisms which are thought to be related to accident causation in the British experience. Particular attention should be paid to chapter 6 of Part I; communication on the road, which attempts to analyze the reasons for communications failures and resulting crashes.

7. Driessen, Gerald J., Cause Tree Analysis: Measuring How Accidents Happen and the Probabilities of Their Causes, presented at the 78th annual Convention of the American Psychological Association, Miami Beach, Florida, September 1970.

The history of "fault tree" development is reviewed. The technique, developed in the aerospace industry is generalized to "cause tree analysis" and shown as applicable to any event/cause sequence producing an accident. A cause tree is determined by reasoning backwards from the accident through a multitude of possible events leading to the accident. Then probabilities of event occurrence are assigned beginning at the far ends of each branch.

While successfully applied to missile systems and hot water heating systems, this reviewer doubts the practicality of developing a "traffic accident cause tree" and questions the exercise of all the individual event occurrence probabilities. The article, itself, is a valuable review of fault tree analysis, clearly expressed to those not previously exposed to the technique.

8. Garwood, F., Starks, H.J.H., Comparison of Methods of Studying Accident Causation, Road Research Laboratory, Crowthorne, U.K., Report No. 3 presented at the Convention on Road Accidents of the Institution of Municipal Engineers, November 1965.

9. Gordon, John E., The Epidemiology of Accidents, American Journal of Public Health, April 1949, pp. 504-515.

This twenty-three year old study is considered a classic in accident epidemiology. The argument presented favoring an epidemiological approach to accident causation is convincing despite the use of now outdated concepts and case studies.

10. Haddon, William Jr., The Changing Approach to the Epidemiology, Prevention, and Amelioration of Trauma: The Transition to Approaches Etiologically Rather than Descriptively Based, Behavioral Research in Highway Safety, Vol. 1, No. 1, January 1970, pp. 43-53.

11. King, Barry G., Human Factors in Accidents Causation, National Safety Congress Transactions, Vol. 6., 1960, pp. 44-50.

This article describes the role of the physician and the safety engineer in accident prevention. The author cites the need for a safety philosophy to be instilled in designers and operators to effect a downward trend in accidents.

12. Klein, David; Waller, Julian.; Causation Culpability and Deterrance in Highway Crashes, prepared for the Department of Transportation Automobile Insurance and Compensation Study, July 1970.

This study contains some insightful concepts regarding socio-cultural norms which could be determinant in some types of accident occurrence.

13. Koornstra, Matthijs, Multivariate Analysis of Categorical Data with Applications to Road Safety Research, Accident Analysis and Review, Vol. 1, No. 3., pp. 217-221.

A multifactorial analysis of accident causation is stressed in this study, with an emphasis on multiple factor causation as opposed to single factor causation.

14. Litman, Robert; Tabachnick, Norman, Fatal One Car Accidents, Psychoanalytic Quarterly Vol. 36, Number 2, 1967, pp. 248-259.

The authors present a review of the psychoanalytic literature concerning accidental deaths and describe common symptoms expressed by fifteen individuals who died in auto accidents.

15. McFarland, Ross A., The Etiology of Automobile Accidents, with Special Reference to the Mechanisms of Injury, prepared for the Saturday Surgical Seminars, Department of Surgery of the Harvard Medical School, March 2, 1968.

The author presents an epidemiological study of traffic accidents and discusses at length injury production, suggesting means of ameliorating serious injury.

16. Peranio, Anthony, An Expanded Cybernetic Model for Analyzing Driver Behavior, International Symposium on Psychological Aspects of Driver Behavior, Noordwijkerhout, The Netherlands, August 1971.

The author concentrates on the physiological limitations of man as an operator of automobiles. Stressing the complexity of the perception-decision-action sequence in driving the author points to recommendations for lessening the existence of over-complex situations in the environment which will give even the physiologically degraded driver more time for successful completion of the sequence with a concomitant good outcome.

17. Perchonok, K. Accident Cause Analysis, Cornell Aeronautical Laboratory, Report No. ZM-5010-V-3, July 1972.

18. Tabachnick, Norman D., A Theoretical Approach to Accident Research, Bulletin of Suicidology, No. 6, Spring 1970, pp. 18-23.

This article concerns the psychological motivations behind accident causation. The motivation may or may not be volitional or purposive. Three motive areas are discussed. The "Death Instinct" and related theories are described as well as the concept of "Mental Illness" and "Adaptational Mishap" as accident causation factors.

The article makes some worthwhile theoretical inputs into human causation of accidents but offers little to the understanding of the more concrete and identifiable causes of accidents.

19. Thedie, J., Road Accidents and Probable Causation, International Road Safety Traffic Review, Vol. 6., No 2, 1958, pp. 35-38.

In discussing the concept of causality the author emphasizes the complexity of the issue and delineates between accident causality and accident responsibility.

20. Zeller, Anchard F., Accidents and Safety, Part 1, Chapter 4, in Systems Psychology,DeGreene, K.B. Editor, McGraw-Hill, 1970 pp. 131-149.

2. ACCIDENT CLASSIFICATION SCHEMES

1. Baker, J. Stannard, Ross, Laurence, Concepts and Classification of Traffic Accident Causes, Part I, International Road Safety and Traffic Review, Summer 1961 #3, pp. 11-18.

The author begins by delineating accident factors, "any circumstance connected with a traffic accident without which the accident could not have occurred" from accident causes, "a combination of simultaneous and sequential circumstances without any one of which the accident could not have happened" in this combination each factor is necessary but not sufficient by itself to cause an accident. Two factors are defined, "simultaneous" and "sequential". Simultaneous factors are those which must be present at the same time to cause an accident. Sequential factors emphasize the different time levels leading up to the accident - this idea recognizes that there are conditions which in combination increase the probability of an accident.

Baker's emphasis is on the immediate pre-crash and centers on evasive maneuvers as the critical variable in whether the accident will or will not occur.

The article is useful in that it offers the investigator a systematic scheme for reconstruction and analyzing the accident from the point of impact backward through the failure of evasive actions.

2. Baker, J. Stannard, Concepts and Classification of Traffic Accident Causes, Part II, Analysis of Accident Causes, International Road Safety and Traffic Review, Autumn #4 1961, pp. 17-24.

This article is a follow-up on Part I of an article of the same title. The author operationalizes the previously presented accident reconstruction of an analysis scheme and calls to attention five stages of evasive maneuvering which often occurs previous to an accident. The five stages run from 1) point of possible perception under normal conditions, 2) point of possible perception under existing conditions, 3) point of actual perception, 4) point of response to 5) point of no escape.

The initiation of evasive maneuvers goes through what the author describes as an "operational cycle" which includes

A. Performance - comparison of evasive action actually taken with that intended
B. Decision - comparison of evasive action intended with possible evasive action from point of perception

C. Recognition - the functioning of the sensing and perceptual apparatus of the driver.

An important point made by the article was that the normal driving "strategy" of an accident involved driver should be compared to the strategy used previous to the accident.

3. Baker, J. Stannard, Horn, L.R., An Inventory of Factors Suggested as Contributing to Traffic Accidents, Experimental Case Studies of Traffic Accidents, Traffic Institute, Northwestern University, Evanston, Illinois, 1960.

Over 850 possible contributing factors to accident causation are listed and defined using the author's systematic approach to accident reconstruction.

4. Beach, Dayle, Solving Knotty Accident Classification Problems, Traffic Safety, Vol. 71 No. 8 August 1971, pp. 14-16 and 37-38.

5. Beach, Dayle, Introducing the New Classification of Motor Vehicle Accidents, Traffic Digest and Review June/July 1970.

6. Haddon, William Jr., A Logical Framework for Categorizing Highway Safety Phenomena and Activity, the Journal of Trauma Vol. 12 No. 3, March 1972, pp. 193-207.

This article traces the rationale and development of the 9 cell matrix and describes the highway safety issue as a social problem. The author emphasizes that loss reduction, i.e., personal injury and property damage, should be the goal of highway safety research efforts rather than "accident prevention". The author believes that the efforts to prevent crash occurrence (and concomitant expenditure of countermeasure resources) is illogical when viewed from a loss reduction standpoint.

7. Kritz, Lars-Bruno, On the Classification of Accidents by Type, Presented at the OECD symposium on the use of statistical methods in the analysis of road accidents, Crowthorne U.K., April 14th-16th, 1969.

The author of this article emphasizes the need for developing a priority system of determining accident causes which would enable the investigator to determine the primary cause. The aforementioned statement was tempered and qualified by the author's realization that accidents are rarely caused by one single factor, but as a rule accidents are instead caused by such an intimate interaction between different factors that often, or perhaps most often, it is practically impossible to determine which factor was most important.

Road traffic is viewed as a man-milieu system in which the driver and his environment must be well adapted in order for the system to function without major problems. The author believes that the dysfunctions in the man-milieu adaptations must be looked at very closely to determine (and classify) situations in which adaptation breaks down.

A classification system utilized by different agencies in Sweden has as a leading principle: The classification of accident by type is determined by the position or intended courses of vehicles immediately before the accident and not the course after evasive maneuvers have been executed. In other words, the impact area and resulting damage and injury may be different after evasive action is taken and may obscure the situational mal-adaptation which may have occurred that initiated the accident, e.g., a head-on collision may result from a driver steering hard left to avoid rear impact with a stopped vehicle in front of him. This particular accident would not be classified as a head-on collision but rather as an "overtaking" accident since the primary path of the striking vehicle was leading toward a rear-end collision and only as a result of an evasive maneuver did the accident become head-on with the oncoming vehicle. The oncoming vehicle is viewed by this scheme as a "traffic disturbance". The search for "traffic disturbances" is essential to determining accident causation by this scheme.

All accidents are coded by a 5-number code. This classification method begins by categorizing the accident according to the road users who were fundamentally involved. It then classifies the accident by traffic situations in which it occurred, i.e., overtaking, etc. The third step is to classify the character of intended movement, i.e., while turning. The fourth level of classification would be to determine and code where the vehicle was coming from, i.e., turning from side road to main road. The fifth category designates the character of the "traffic disturbance" present in the situation, i.e., parked vehicle.

This scheme has some weaknesses but offers the investigator an opportunity to view more closely the accident situation in the immediate pre-crash phase and to gain a new perspective in assessing the interactional quality of the traffic situation.

8. Mathis, Betty, A. et. al., Stability Analysis of Term Similarities for Information Classification Theory, Ohio State University, Columbus, Ohio July 1970.

9. Nichols, F.P., Jr. et. al., Methodology of International Highway Research and Development Exchange, Massachusetts Institute of Technology, School of Civil Engineering, January 1965.

10. Northwestern University Traffic Institute, under the direction of Traffic Accident Data Project Steering Committee of the National Safety Council's Traffic Conference, Guide to Classification of Motor Vehicle Traffic Accidents, National Safety Council, Chicago, Illinois 1970.

11. Surveys and Research Corporation, Data Coding System for Highway Accident Reports, Surveys and Research Corporation, Washington, D.C. August 1969.

12. Traffic Accident Data Steering Committee, Instructor's Kit for Classifying Motor Vehicle Traffic Accidents, TAD Project, Training Manual No. 3, National Safety Council, Chicago, Illinois.

13. Treat, J.R., Joscelyn, K.B., A Study to Determine the Relationship Between Vehicle Defects and Crashes, Indiana University, Institute for Research in Public Safety, Report No. DOT-HS-034-2-263-71-A November, 1971.

14. Wright, Paul H., Multidisciplinary Accident Investigations Phase 5, Georgia Institute of Technology, School of Civil Engineering, Atlanta, Georgia, Contract No. FH-11-7400 September, 1971.

3. CAUSATIVE MECHANISMS

1. Adams, J.R., Personality Variables Associated with Traffic Accidents, Behavioral Research in Highway Safety, Vol. 1, No. 1, January 1970, pp. 3-18.

2. Baker, J. Stannard, McIlraith, G.D., Tire Disablements and Accidents on a High-Speed Road, Traffic Digest and Review, Northwestern University, Vol. 16, No. 4, pp. 3-8.

   A statistical study of the incidence of accidents on high-speed roads involving tire failure. A very small percentage (2.4) of accidents can be traced to tire disablements in the study sample of 1,486 accidents.

3. Buxbaum, Robert C., Colton, Theodore, Death by Mechanical Failure: An Epidemiological Study of Motor Vehicle Fatalities, presented at the 47th Annual Session of the American College of Physicians, New York City, April 19, 1966.

   The authors present a non-rigorous correlational study of mechanical failures and their relationship to fatal motor vehicle crashes. This should be read by students of research methodology in order to be exposed to faulty conclusions from scant data.

4. Fairchild Hiller, Experimental Safety Cars Study, Phase I Final Report, Volume One of Four, Prepared for the U.S. Department of Transportation under contract FH-11-6820.

   This is a report on the approach which Fairchild Hiller is taking in regard to highway safety and the development of an E.S.V. Fairchild Hiller views the "accident complex" from the standpoint that the driver is part of a "functional man-machine loop." The article cites a study of traffic accidents N=50 conducted by Harvard Medical School in which the investigators list the causal factors in the following order of importance: (1) vehicle failure, (2) street or highway failure, (3) driver incompetence, (4) deliberation, based on malice or physic depression.

   The question of where to direct countermeasures is answered by analyzing each element in the man-machine loop by the time it would take to invoke change. The vehicle, at least one-half of the vehicle population is changed every six years through condemnation and replacement. Equivalent highway change may take thirty years. The "human limitations seldom change". Fairchild Hiller proposes that the greatest cost effectiveness in countermeasures will occur as a result of improved vehicle design and performance.

5. Haber, Heinz, Brenner, Robert and Hulbert, Slade, Psychology of Trip Geography, Highway Research Board Bulletin 91, Thirty-Third Annual Meeting, January 1954.

   The authors present a deductive analysis of traffic accidents which occurred within what they term "Accident Focal Points" defined sections of selected roads where there is a high frequency of accidents. Using a case study method, they have developed a concept termed "Psychology of Trip Geography"

which simply stated is the interaction of known psychological-behavior patterns combining with the geography of an area to produce driver behavior conducive to an accident. The concept is best adapted to long journeys taken by drivers through unfamiliar areas.

Useful concepts derived from the article are the following:

1. The suspicion that a driver suffers a "performance letdown" and concomitant lowering of defenses when approaching his destination.
2. Any analysis of a trip plan must include the understanding of the driver's planning and the replanning which must occur following the occurrence of unexpected contingencies.
3. The interruption of the "biological time clock" or either diurnal or nocturnal cycle to which the driver is accustomed during an extended journey.
4. The effects of the geographical entities in the environment of the driver, e.g., hypoxia, monotony.
5. That efficiency lowering, tactile sense numbing which may occur when body position is unchanged for extended periods of time, may lead to misperception of orientation.

5. Haddon, William, Research with Respect to Fatal Accident Causes: Implications for Vehicle Design, Society of Automotive Engineers Summer Meeting, 1961.

This address calls to attention the role of vehicle interior design in promoting injury and death as a result of motor vehicle collisions. Haddon outlined four strategies for the reduction of crash-related injury and death. The first strategy was to modify vehicle use. This would involve sociocultural changes, i.e., rearranging the work day to stagger traffic loads on roadways and thereby relieve congestion and personal use modes, i.e., banning the use of vehicles by individuals when "partying". Haddon sees this strategy as having limited effectiveness given our societal dependence on private vehicle use.

A second strategy is to strengthen the countermeasures of law enforcement and engineering design in an attempt to reduce the rate of accident occurrence.

A third strategy would attempt to prevent and lessen the injuries sustained by the occupants in the "second collision" by improving vehicle interior design.

The fourth strategy, to improve the emergency services and aftercare of accident victims.

The author summarizes an important point in the following quote "In motor vehicle accident causation research it has to be realized that the problem is not so much one of finding new causes which might explain substantial fractions of accidents, but rather that of documenting the relative predominance of causes which have been known for a long time".

7. Institute for Research in Public Safety, The Study of Possible Influences of Licit and Illicit Drugs on Driver Behavior, Institute for Research in Public Safety, Indiana University, Bloomington, Indiana, December 1971.

This is a final report of an experiment conducted comparing accident involved drivers and a matched control group of drivers to assess the involvement of drugs as factors contributing to crashes. The findings were; 1. no evidence of the experimental group having a greater frequency of positive blood samples than the control group drivers. 2. No statistical relationship between the number of accidents of subjects and drug usage. 3. The driving history of subjects was more strongly related to accident involvement than drug usage.

8. Lee, Scott, Examining the Parameters of the Human Element in a Program Matrix for Highway Safety Research, NHTSA Department of Transportation, Washington, D.C., February 1972.

The author draws on much of the pertinent research literature in an attempt to weave the human involvement in accident causation with program responsibilities in countermeasures.

9. Ross, H. Laurence, Ignorance of Collision Course as a Factor in Traffic Accidents, Traffic Institute, Northwestern University, Evanston, Illinois, 1960.

The article discusses the common denominator of lack of awareness of collision course in 43 extensively studied accidents. Two main reasons accounted for the unawareness of a collision course; delayed perception and erroneous prediction.

10. Shingu, Iichi, The Contributing Factors to Accident Occurrences, Section Four, Part Four, International Technical Conference on Experimental Safety Vehicles, Second Report Stuttgart/Sindelfingen, Germany, October, 1971.

In this article the author points out the disproportionate number of studies addressing themselves to the topic of injury production as compared to the minimal number dealing with accident reduction. The driver is aptly characterized as the "Brain in the closed loop of the man-machine system."

The author describes a study conducted at the Toyota Motor Company in which employee traffic accidents were investigated in an in-depth manner. The reliability of the data was assumed to be greater using this population.

In an attempt to analyze the causative factors surrounding these accidents, the author developed a four-step procedure which was further subdivided into Direct Cause and Indirect Cause.

The four-step procedure:

Step 1 The Existence of Information to the Driver
- A. No Information
- B. Wrong Information
- C. Right Information

Step 2 The Perception of the Information
- A. No Perception
- B. Wrong Perception
- C. Right Perception

Step 3 Driver Judgment from Information
- A. No Judgment
- B. Wrong Judgment
- C. Right Judgment

Step 4 Action of the Driver
- A. No Action
- B. Inadequate Action

The analysis of a particular accident would begin with the employee reporting it to the Safety Division of the Company. Following an in-depth survey of the vehicles and the environment involved, the employee was interviewed and given a series of psychological tests. The tests were a mix of personality and motor skill measurement devices yielding scores in such broad and diverse characteristics as "humanity," "Mental switching ability," and "night vision."

The accident-involved group was compared with a group (N=100) of individuals who had not been involved in an accident in five years and a group (N=50) who had been arrested for traffic violations in the past year (there was no mention as to whether these three groups were "matched" as to such critical variables as age, sex, socioeconomic status, "exposure", etc.).

The results displayed a significant difference between the non-accident group and those who were accident involved, with the accident-involved group scoring lower on forecast-ability, positiveness for work, humanity, observance of rules, and self-controllability. Physiologically, the non-accident group scored higher on complex reaction time and sensibility to depth vision.

The accident-involved employee and the investigator would jointly discuss the accident occurrence and trace the causative elements using the four-step matrix. The accident-involved driver would decide which of the causes were direct and which were indirect.

Results

It was determined that in terms of Direct Causes 96% were due to human error, 2% vehicle malfunction, 2% environment causes.

Indirect Causes were accounted to be 76% the result of human error, 11% the result of vehicle malfunction, 13% environmental factors.

Highlighted as an important component in two-vehicle or multiple-vehicle accidents was the "lack of mutual communication" of intentions which resulted in the majority of the causal factors (92%) falling into Step 2 "No perception" and Step 3 "Wrong judgment," of the four-step matrix.

The author concludes that the four-step method offered clarification of the causes of some accidents, but speculated that 60% of all accidents are caused by unconscious psychological processes while only 40% can be attributed to conscious behavior.

11. The Highway Safety Foundation, Vehicle Factors and Traffic Accident Causation: An Interim Report, The Highway Safety Foundation, Mansfield, Ohio, December 1971.

To clearly analyze the input of any particular element (human, vehicle, environment) into accident causation, a definition of, and general agreement over, the terms which will be used in the analysis is of first priority importance. The Highway Safety Foundation interim report begins with a statement and definition of terms which are to be used in conjunction with understanding the study results presented. The terms and definitions are systematically produced and many prove beneficial in more generalized use by investigators.

The authors of this article present a detailed analysis of vehicle factors present and termed "causative" in 390 multidisciplinary accident investigations conducted by the Highway

Safety Foundation and other investigation groups within the years 1968-70. One or more vehicle factors were judged to be involved in the causation of 9.5% (37) of the 390 accidents. The methodology of analysis carefully discriminated between those vehicle factors which were causative and those which suggested a capacity for causation and in reality may have only been coincidental to the accident event. Each vehicle factor was dichotomized into whether the "failure" or "accident productive feature" was "foreknowable" or unforeknowable". "Foreknowable" factors are a subset wherein the capability for manifestation can be recognized by either: (1) Analysis of vehicle design, manufacture, or use; or (2) Formal or informal vehicle inspection. Examples of "foreknowable" factors in the brake system would be: low fluid level, maladjustment, or glazed linings. "Unforeknowable" factors are defined as "a subset of vehicle factors not contained in the 'foreknowable' vehicle factors." An example of an "unforeknowable" factor in the brake system would be a ruptured hose.

If the HSF analysis of vehicle factors were presented graphically, it would appear as a 2 x 3 table.

The column variables would be "foreknowledge" and "unforeknowledge" and the row variables would be "Intrinsic Vehicle Factors," Emerging Vehicle Factors," and "Instantaneous Vehicle Factors."

	Foreknowable	Unforeknowable
Intrinsic	Mirror System / Blind Spot	None Identified
Emerging	Suspension System / Worn Shocks	None Identified
Instantaneous	Steering System / Tie Rod Separation	Brake System / Ruptured Hose

Figure 1

Intrinsic Factors are defined as: "The subset of vehicle factors containing element characteristics wherein the capability for assuming the role of a vehicle factor is found uniformly throughout the life of the vehicle."

Emerging Factors are defined as: "The subset of vehicle factors containing element characteristics wherein the capability for assuming the role of a vehicle factor is nonuniform throughout the life of the vehicle and where the degree of capability changes in a continuous rather than discrete manner to the extent that indicative measurements are possible within present technology.

Instantaneous Factors are defined as: "The subset of vehicle factors not belonging to either the subset of emerging vehicle factors or the subset of intrinsic vehicle factors; a subset of vehicle factors containing element characteristics wherein the capability for assuming the role of a vehicle factor fully develops after the vehicle is in use and essentially in an instant of time.

Using these three "classifications of capability" for a vehicle element (a component) to be translated into a vehicle factor (which either directly or indirectly may be causative) allows for the investigator to better analyze the causative aspect of any vehicle factor in accident production. Examples of cell entries are provided in Figure 1.

The authors use this developed system of analysis of vehicle factors to suggest the cost-benefit of particular countermeasures aimed at reduction of accidents judged to be caused by vehicle factors.

The possible use of this system by investigators may warrant further study and discussion.

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14. Will, Donald P., Sells, S.B., Prediction of Police Incidents and Accidents by Meterological Variables, Group Psychology Branch, Office of Naval Research, Technical Report No. 14, Texas Christian University, Institute of Behavioral Research, March 1969.

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The author emphasizes the need to investigate the precrash social-emotional factors in determining the causes of accidents. There is a lengthy discussion on the effect of negative emotional states on driving skills and critical maneuvering.

4. GENERAL ACCIDENT CAUSATION STUDIES

1. Baldwin, David M., Accident Causes and Countermeasures, Traffic Engineering, Vol. 36 No. 5, March 1966, pp. 31-33.

2. Brainard, Calvin H., The Psychological Aspects of Highway Safety, Trial, August-September 1968.

This article discusses what the author believes to be the degraded interest in the "Psychological Aspects" of accident causation since the advent of the highway safety act of 1966. In sum, the article builds a case for continuation of the tort liability insurance system and the defeat of "creeping no-fault insurance".

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4. Campbell, M.E., A Countdown for Highway Safety, Traffic Quarterly, Vol. 24, No. 1, pp. 147-159.

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6. Crancer, Alfred Jr., Quiring, Dennis L. Jr., Driving Records of Persons Hospitalized for Suicidal Gestures, Behavioral Research in Highway Safety, Vol. 1, No. 1, January 1970.

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10. Haddon, William Jr., On the Escape of Tigers: An Ecologic Note, Technology Review, Volume 72, Number 7, May, 1970.

11. Hall, William K, O'Day James, Causal Chain Approaches to the Evaluation of Highway Safety Countermeasures, Journal of Safety Research, Vol. 3, No. 1, 1971, pp. 9-20.

12. Miles, Stanley, Accidents and Society, International Journal of Environmental Studies, Vol. 1, 1970, pp. 53-58.

This article approaches the problem of accidents with the point of view of the epidemiologist and carries through with a discussion of "chance" factors and environmental causes as well as human factors in accident initiation.

13. Mills, John M., Cost and Data Considerations in Traffic-Accident Investigation Design, unpublished masters thesis, Massachusetts Institute of Technology, February 1969.

14. Orme, J.S., et. al., Factors Contributing to Road Accidents: Roads, Vehicles, People, British Road Federation, Bulletin Number 346, December 1965, pp. 218-221.

15. Perkins, S.R., Harris, J.I., Traffic Conflict Characteristics, General Motors Corporation Automotive Safety Seminar Proceedings, 1968.

16. Plummer, D., The Need for Reporting "Non-Involved" Vehicles and "Driver Intent" in Accident Data, Traffic Digest and Review, Northwestern University Traffic Institute, March 1972.

This article explains the need for the investigation of non-contact but perhaps causation-contributing vehicles in accident configurations. The intentions of drivers, and/or pedestrians involved or "non-involved" should also be looked at carefully to assess their input into causation of crashes.

17. Poole, Robert W., Cost Effectiveness Analysis of Traffic Safety Proposals, unpublished masters thesis, Massachusetts Institute of Technology, June 1967.

18. Raymond, A. and Day, D.H., Causes and Prevention of Traffic Accidents in Australia.

19. Ross, H. Laurence, Schematic Analysis of the Driving Situation, Traffic Institute, Northwestern University, Evanston, Illinois, 1960.

The author introduces the "social model" (the interaction of competing goals of drivers) into the analysis of the vehicle, roadway, driver system. The discussion of the "social model" is enlightening and allows the reader a new perspective.

20. Wilson, David G. Transportation Resource Allocution Based on New Methods of Accident Reporting, Engineering Projects Laboratory, Department of Mechanical Engineering, M.I.T., Cambridge, Mass. August 1969.

This report utilizes analytic methods to determine cost-benefit ratios of various countermeasures. In a discussion of accident causation the authors relate to the "interaction effects" of various causes of accidents and how isolation of a single cause is particularly difficult.

5. CASE STUDIES

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Report of a Level "1½" study done for the period of June 1 to October 31, 1964 on single car accidents on the entirety of Route 66. Contains some interesting categories for accident causation.

2. Baker, J. Stannard, Case Studies of Traffic Accidents, Traffic Safety (Research and Review Supplement) December, 1961, pp. 14-17.

This article points up the need for interdisciplinary research by trained individuals into accident causation from an after-the-fact reconstructive standpoint.
Three methods or approaches were discussed.

1. The implementation of an interdisciplinary team of professionals.
2. The analysis of published concepts of accident causation and the compilation of an "inventory of factors suggested as contributing to accidents" containing over 850 failures or conditions believed to contribute to accident causation.
3. The development of an experiment to test the hypothesis

that technically trained people such as engineers, insurance adjustors and police would be more successful in concluding how an accident occurred. It was found that the technically trained individuals were not significantly more successful than laymen in determining accident causes. Special investigator training is needed and reliance on technical training is not enough.

3. Baker, J. Stannard, Single Vehicle Accidents, Automotive Safety Foundation and Northwestern Traffic Institute, 1968.

This pamphlet draws on research into single vehicle case studies and suggests causes for this type of accident.

4. Bureau of Motor Carrier Safety, Analysis and Summary of Accident Investigations, 1970, U.S. Department of Transportation, Federal Highway Administration, December 20, 1971.

5. Clayton, A.B., Road-User Error and Accident Causation Presented at the XVIIth International Congress of Applied Psychology, Liege, Belgium, July 1971.

This paper is a description of an in-depth accident investigation program conducted in Worcestershire, U.K. The staff was multidisciplinary and included a mechanical engineer, a surgeon, a traffic engineer, and a psychologist. A sampling plan was devised to draw accidents from each hour of the day between 0800 and 2400 hours each day of the week. Utilizing many of the techniques similar to M.D.A.I. teams in the U.S.A., the British team investigated 210 accidents involving N=348 drivers. Two hundred and six of the drivers (59.2%) were judged to have committed errors that were contributory to the causation of the crash.

The author describes the results by developing a set of error groups which fall into three stages of a decision-making model. The decision-making model had the familiar components of perception and decision with each subdivided into error groups.

In conclusion the author offers that "accidents cannot be regarded as a homogeneous body of events but rather as a collection of events with widely different causative processes." Therefore, the concept of accident rate loses psychological significance when analyzing accidents by number versus per unit of risk exposure without understanding and potentially classifying the types of individual errors made in every accident.

6. Kolbuszewski, J., Causes and Effects of Road Accidents, Birmingham University, Department of Transportation and Environmental Planning, Vol. 1, 1969.

The results of M.D.A.I. type accident investigations are described for a sample of 425 and subsample of 210 accidents.

7. Perchonok, K., Multidisciplinary Investigations to Determine Accident Causation, A Descriptive Analysis of Individual Accidents, Cornell Aeronautical Laboratory, Report No. VJ-2224, V-5, October, 1969.

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1. Accident-Proneness of Drivers, February, 1968.

2. Accident Studies Involving Military Personnel; HRB Publications, July, 1970.

3. Accidents and Shoulders; Selected References, October, 1967.

4. Age in Relation to Accidents; Selected References, February, 1968.

5. Alcohol and Accidents; Selected References, January, 1968.

6. Boredom and Accidents; Selected References, November, 1967.

7. Drugs and Drivers, January, 1968.

8. Effect of Traffic Safety Campaigns on Drivers; Selected References, Revised, 1971.

9. Emotions and Traffic Accidents; Selected References, February, 1968.

10. Relationship Between Accidents and Geometric Design; Selected References from HRB Publications, September, 1961.

11. Suicide or Accident? Selected References, January, 1968.

12. Traffic Speeds as Related to Accidents; Selected References, April, 1969.

Appendix D

Occupant Injury Classification Scheme

The following paper was presented to the American Association for Automotive Medicine, Sixteenth Annual Conference, October 19, 1972, at Chapel Hill, North Carolina. The paper documents the Occupant Injury Classification (OIC) and proposed coding format.

Existing Traffic Accident Injury Causation Data Recording Methods and the Proposal of an Occupant Injury Classification Scheme

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ABSTRACT

Injury causation data on twenty-five hundred traffic accident victims has been recorded on the Collision Performance and Injury Report, Long Form, Revision 3, and processed by the Highway Safety Research Institute into time shared computer files for analysis via remote terminals. The current injury causation recording system is described in order to demonstrate the potential for and the problems with analysis of this data. Currently two separate face lacerations and the corresponding contact areas that caused them--cannot be recorded. A proposed Occupant Injury Classification--is outlined following an approach similar to the Collision Deformation Classification (SAE J224a). Four dimensions or facets are described: Body Region, Aspect, Lesion and Body System/Organ. The OIC is terminated with an Abbreviated Injury Scale severity code. Injury causation information is readily available and widely needed. The proposed scheme is one effective way of making this information available for analysis.

THE REDUCTION OR PREVENTION of occupant injury and mortality has been and will remain one of the primary thrusts of automobile safety. Research in crashworthiness, vehicle aggressivity, people packaging, occupant kinematics, and injury mechanics has resulted in vehicle design changes that reduce the severity and likelihood of occupant injury in automobile accidents. In order to confirm the success of design changes, document new accident injury patterns and provide guidelines for future research and design changes, over a dozen field accident investigation teams across the country conduct clinical accident investigations. The Motor Vehicle Manufacturers Association (MVMA) and the Department of Transportation, National Highway Traffic Safety Administration (NHTSA) are sponsoring over two thousand investigations a year.

In order to provide an interface between field accident reports and the data analyst, the Highway Safety Research Institute has developed an extensive information bank of computerized accident data files. Both the automobile industry and NHTSA analysts are provided simultaneous access to the data through the privacy of their own computer terminals. Access to the Institute's Statistical Research System (1)* is also provided to users through the University's Michigan Terminal System, a timeshared IBM 360/67.

The Collision Performance and Injury Report (CPIR) (2) data files are the most detailed in the data bank. Over eight hundred variables (questions or items of information) are recorded for each case vehicle investigated. Close to 3300 vehicles and over 5300 case vehicle occupants have been processed into computer storage, under the sponsorship of the MVMA and NHTSA.

The utilization of the CPIR file has grown phenomenally in just the last year, due in part to the growth in data file size, but also due to an increasingly larger community of users and analysts. This increase in file size and user exposure has brought into clearer focus several problems with the current methods for recording the results of clinical accident investigations for computer storage and analysis.

What components cause injury? This question is frequently asked yet always left unanswered. The adequate recording of occupant injury causation data is seen as possibly the most critical problem area. The current Collision Performance and Injury Report form, besides being cumbersome to encode and analyze, has no provision for recording which area of contact or energy transfer caused a specific injury.

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* Numbers in parentheses designate References at end of paper.

The Occupant Injury Classification described in this paper, was developed under NHTSA sponsorship (Contract number DOT-HS-031-00-1-037). The OIC is proposed as an improved scheme for recording injury causation in an easy format for coding, storing and analysis. The precise level of detail and definition of categories still requires refinement to best fit the needs of the automotive medical profession. Hence the purpose of this paper: to solicit comments and suggestions on the form and particularly the contents and application of the OIC.

The description of the Occupant Injury Classification and each of the dimensions, follows a review of the current injury causation coding scheme.

CURRENT INJURY CAUSATION CODING SCHEME - The CPIR Revision 3 records occupant injury detail according to the scheme shown in Figure 1. Abbreviated Injury Scale (AIS) severity codes (3) are entered in the right hand side of the table (columns 23 to 31) to indicate the type of injury, severity, and body region injured. The Overall Injury to Body Region is coded in Column 22 and is at least equal to the highest AIS to the right. For each body region sustaining an injury, at least one area of possible contact is being recorded in the left half of the table. A list of over forty areas of occupant contact is provided including for example (13) for "armrests" and (00) for "area contacted unknown". Up to four contact areas are recorded per body region. There is no consistency to the order that the four objects are recorded. Five different sequences are currently used.

(1) Sequence contacted:first contact first
(2) Likelihood:definite, probable, possible
(3) Injury type:fracture contact before laceration contact
(4) Injury severity:worst injury producing contact first
(5) No order

In the course of preparing CPIR data for data processing and conducting analysis, several general observations were made:

(a) Frequently, essential injury details were documented yet we had no way to code this information in the data files.

(b) Injury details that were coded (as described above) were cumbersome if not impossible to analyze using the computer storage format as defined.

The following specific observations of the Occupant Injury Detail page of Revision 3 CPIR can be made:

(1) No provision is made to relate specific injuries to specific contact areas in one body region, e.g., no record is kept of which facial injury is related to which contact area.

FIGURE 1. CPIR REVISICN 3 OCCUPANT INJURY DETAIL PAGE

DUPLICATE* FROM PRECEDING CARD

1-9	CARD NUMBER 10-11	OCCUPANT NO. 12 13	BODY REGION	★ ENTER COD (S) FOR AREA(S) O= POSSIBLE CON TACT 14 15	16 17	18 1)	20 21	ENTER SEVERITY CODES: OVERALL INJURY TO BODY REGION 22	FRACTURE 23	LACERATION 24	CONTUSION 25	COMPLAINT OF PAIN 26	ABRASION 27	CONCUSSION 28	BURN 29	HEMORRHAGE 30	OTHER 31
	12		INTERNAL ORGANS														
	13		BRAIN														
	14		FACE														
	15		HEAD														
	16		NECK (CERVICAL REGION)														
	17		SHOULDER GIRDLE														
	18		RIGHT UPPER LIMB														
	19		LEFT UPPER LIMB														
	20		CHEST & UPPER BACK (THORAX)														
	21		LOWER BACK (LUMBAR REGION)														
	22		ABDOMEN														
	23		PELVIC GIRDLE														
	24		RIGHT LOWER LIMB														
	25		LEFT LOWER LIMB														
	26		WHOLE BODY														

(2) Two distinct injuries of the same type and in the same body region cannot be recorded independently, e.g., a facial laceration from the steering wheel and a second laceration from windshield contact must be recorded as one injury.

(3) No way is provided to record the specific body organs or systems affected, except for Internal Organs (card 12) and Brain (card 13). Body regions are appropriately defined as "geographical" areas of the body (except cards 12 and 13 as noted). While lung and heart trauma are often specifically documented they cannot be distinguished in coding or later analysis.

(4) Recognizing the need for more body region detail, several new and proposed reporting forms have more than doubled the number of regions (Figure 2). But in the process body regions and body organs have been mixed in one dimension of the table like "apples and oranges". No longer can chest region injuries be retrieved unless lung injury is also coded as chest trauma or the analyst looks for each organ he considers as chest trauma. The same observation can be made of the CPIR Revision 3 where only internal injury and brain are provided. Both Body Region and Body System/Organ are essential but different dimensions of any injury coding scheme.

(5) Injury types/diagnosis and injury consequences are mixed in a similar fashion along the top of the right hand table. For example hemorrhage can be a consequence of a laceration.

(6) Recording the correct AIS severity codes in the proper horizontal and vertical position places can be cumbersome and error prone - particularly if the expanded version (Figure 2) were to be generally adopted.

(7) Computer storage of all 210 boxes or cells (595 cells in expanded version) for every occupant is wasteful as every cell must be stored, injury or not. In the current HSRI data files each occupant receives an average of 3.2 injuries (Table 1). Thus an average of 96.8 percent is blank storage.

These observations provide insight into the current accident recording practices and act as the background for the proposed Occupant Injury Classification (OIC) scheme.

FIGURE 2. EXPANDED OCCUPANT INJURY DETAIL PAGE

	CARD NUMBER	OCCUPANT NO	BODY REGION	★ENTER CODE(S) FOR AREA(S) OF POSSIBLE CONTACT			
1-9	10-11	12-13		14-15	16-17	18 19	20 21
DUPLICATE FROM PRECEDING CARD	13		Head				
	14		Brain				
	15		Face				
	16		Neck & Cervical Spine				
	17		Thoracic Spine & Area				
	18		Chest Wall				
	19		(a) Lungs				
	20		(b) Heart & Mediastinum				
	21		(c) Chest-Other Internal				
	22		(d) Chest Internal Unspecified				
	23		Abdominal Wall				
	24		(a) Liver				
	25		(b) Spleen				
	26		(c) Kidneys				
	27		(d) Abdominal-Other Internal				
	28		(e) Abdominal-Internal Unspecified				
	29		Lower Back				
	30		Pelvis				
	31		R Shoulder, Arm				
	32		R Elbow				
	33		R Forearm				
	34		R Wrist Hand				
	35		L Shoulder, Arm				
	36		L Elbow				
	37		L Forearm				
	38		L Wrist-Hand				
	39		R Hip-Thigh				
	40		R Knee				
	41		R Leg				
	42		R Ankle-Foot				
	43		L Hip-Thigh				
	44		L Knee				
	45		L Leg				
	46		L Ankle-Foot				
	47		Whole Body				

ENTER SEVERITY CODES

OVERALL INJURY TO REGION	CONCUSSION	LACERATION	ABRASION	BRUISE	SPRAIN-STRAIN	FRACTURE	DISLOCATION	AVULSION	HEMORRHAGE	BURN	COMPLAINT OF PAIN	OTHER
22	23	24	25	26	27	28	29	30	31	32	33	34

Table 1 - Number of Injuries Per Occupant

Number CPIR Injuries	Number Occupants
0	1148
1	581
2	597
3	359
4	375
5	236
6	196
7	161
8	97
9	79
10	70
11	40
12	31
13	23
14	23
15-86	83
	4169

OCCUPANT INJURY CLASSIFICATION SCHEME

The Occupant Injury Classification is a scheme for recording individual occupant injuries in much the same manner as the Collision Damage Classification (CDC), SAE J224a, records vehicle damage. A series of independently defined classification facets are combined as a sequence of letters to describe an injury in terms of Body Region, Aspect, Lesion/diagnosis and Body System/Organ. As with the CDC (or VDI) a numerical severity code terminates the OIC. The four main facets or dimensions of the OIC were developed directly from the CPIR Occupant Injury Detail page. Instead of recording AIS codes in a large table, the OIC records the "position in the table" along several dimensions. It is analogous to the difference between storing a map of the USA with a few points plotted, vs. simply storing the latitude and longitude of the few points. Each of the OIC facets can be expanded to any level of specificity desired. Both a one letter and two letter scheme have been explored. Figure 3 displays the proposed scheme using single letter codes.

In practice the accident investigator would record one Occupant Injury Classification for each significant injury he decides to document. The areas of contact related to each OIC would also be coded in order to record a complete picture of injury causation. A simple example preceeds a more detailed OIC discussion.

OIC EXAMPLE - To demonstrate the potential effectiveness of the proposed scheme, facial injuries are coded under the existing system and the proposed OIC.

(a) Laceration of left eye from contact with broken windshield, AIS-2.
(b) Several facial contusions from impact with instrument panel, AIS-1.
(c) Minor lip laceration from teeth during instrument panel contact, AIS-1.

Existing scheme:

Contact Areas	Region	Laceration	Contusions
Windshield, Instrument Panel, Other	Face	AIS-2	AIS-1

Proposed Scheme:

Contact Areas	Occupant Injury Classification	AIS
Windshield	Face:Left:Laceration: Nervous System-Eye	2
Instrument Panel	Face:Bilateral:Contusion: Intequmentary	1
Instrument Panel or Other	Face:Inferior:Laceration: Digestive System	1

Proposed Scheme Coded:

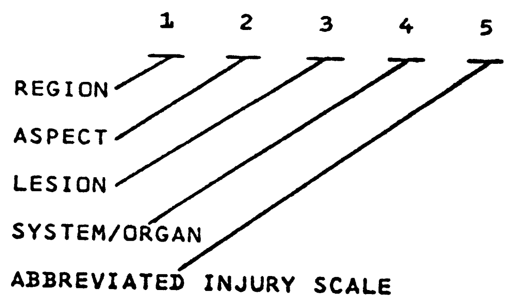
Contact Areas	OIC
12	FLLE-2
05	FBCI-1
05,38	FILD-1

Several observations can be made from the example. The existing scheme throws away much of what we often know as outlined earlier. This contrasts with the proposed OIC scheme which permits the investigator to record his findings freely and transmit them to the data analyst. Second we have opened the pandoras' box concerning the amount of detail one should include in an OIC. We have not recorded all the detail possible through expansion of code letters in the OIC facets. The four letters encode much information yet are simple to record, read, and remember. Although specific organs are not detailed in the four letters they can often be inferred from the body region and body system as in the third example injury, FILD-1, the Face Inferior/Lower region and Digestive system combined infer "mouth". Similarly CRFS-3 (Chest Right Fracture Skeletal) indicates a simple rib fracture on the right side.

A more detailed explanation of each facet of the OIC will help clarify its potential application. This will be followed by a prototype coding format for recording the OIC.

BODY REGIONS - Initially we started with the eleven body regions defined in the current CPIR Revision 3 (Figure 1). Since body regions were interpreted as subsets of the body's surface, Internal Organs and Brain were not included.

FIGURE 3. OCCUPANT INJURY CLASSIFICATION SUMMARY



1 BODY REGION

- H HEAD - SKULL
- F FACE
- N NECK - CERVICAL SPINE
- S SHOULDER
- E ELBOW
- R FOREARM
- W WRIST-HAND
- C CHEST
- M ABDOMEN
- B BACK - THORACOLUMBAR SPINE
- T THIGH - HIP
- K KNEE
- L LEG
- A ANKLE - FOOT
- O WHOLE BODY
- X EXTREMITIES (ARMS-LEGS)
- Y TRUNK
- U UNKNOWN, UNCLASSIFIED

2 ASPECT

- R RIGHT
- L LEFT
- B BILATERAL
- C CENTRAL
- A ANTERIOR/FRONT
- P POSTERIOR/BACK
- S SUPERIOR/UPPER
- I INFERIOR/LOWER
- M MEDIAL/MIDLINE
- W WHOLE REGION
- U UNKNOWN

3 LESION

- F FRACTURES
- D DISLOCATIONS
- L LACERATION
- V AVULSION
- R RUPTURE
- M AMPUTATION
- C CONTUSION
- A ABRASIONS
- K CONCUSSION
- B BURN
- P PAIN
- X ASPHYXIA
- S SPRAINS
- O OTHER
- U UNKNOWN

4 SYSTEM/ORGAN

- S SKELETAL
  - V VERTEBRAE
  - J JOINTS
- D DIGESTIVE
  - L LIVER
- N NERVOUS SYSTEM
  - B BRAIN
  - C SPINAL CORD
  - E EYES, EARS
- CARDIOVASCULAR
  - H HEART
  - Q SPLEEN
- U UROGENITAL
  - K KIDNEYS
- R RESPIRATORY
  - P PULMONARY, LUNGS
- M MUSCLES
- I INTEGUMENTARY
- U UNKNOWN, UNCLASSIFIED

5 ABBREVIATED INJURY SEVERITY

- 0 NO INJURY
- 1 MINOR
- 2 MODERATE
- 3 SERIOUS
- 4 SEVERE
- 5 CRITICAL
- 6 FATAL
- 8 PRESENCE UNKNOWN
- 9 SEVERITY UNKNOWN

Body Regions in 1969 CPIR

H Head
F Face
N Neck
S Shoulder Girdle
U Upper Limb
T Thorax
B Lower Back, Lumbar
A Abdomen
P Pelvic Girdle
L Lower Limb
W Whole Body

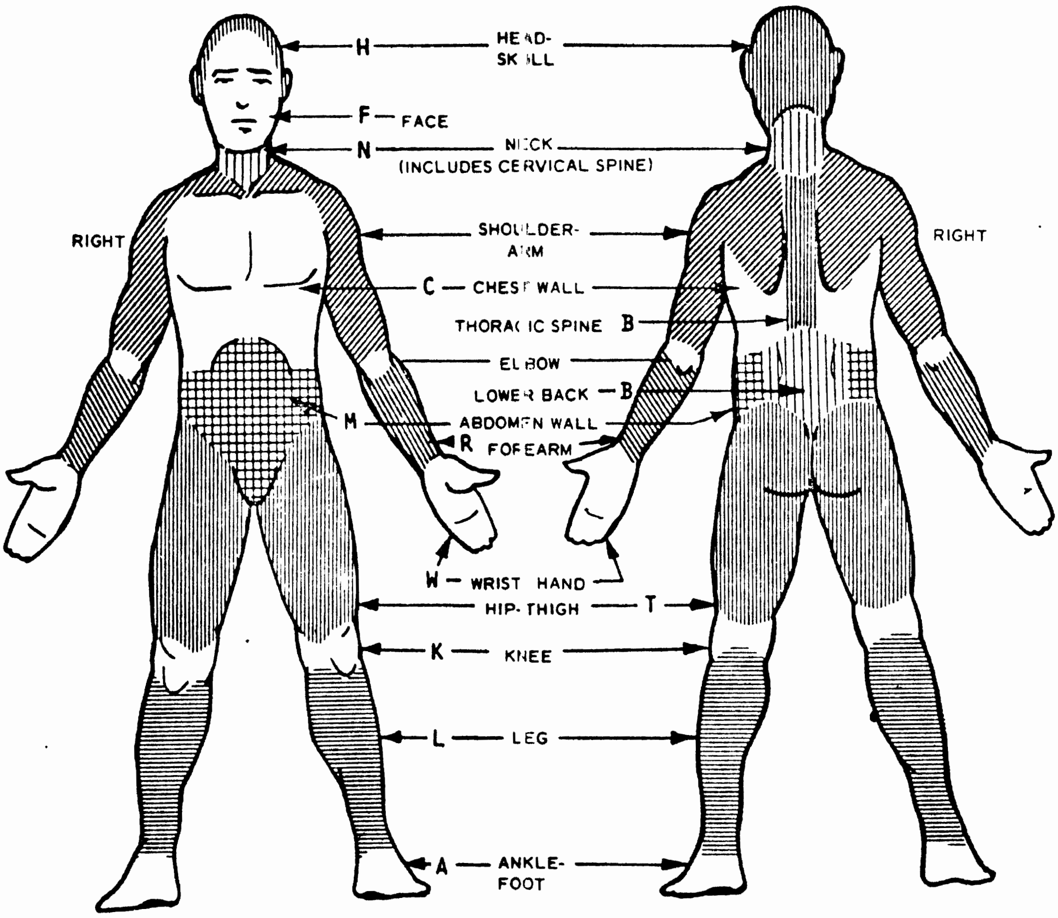
The newer NATO Collision Analysis Report Form (4) expands the list to thirty-two body regions while dropping the "whole body" as a region. Many of these categories are organs, such as liver and spleen not properly body regions. This expanded list confounds the concept of body region for field investigators and data analysts.

In order to provide for increased specificity in recording injuries and still conserve on coding and storage, two coordinate coding dimensions are provided: Body Region and Body System/Organs (discussed later). Recent revisions by the General Motors Proving Ground (GMPG) and MVMA provide more specific regions that are, in some sense, more anatomically based (Figure 4) These were used as a foundation for the OIC. While similar to the NATO version, significant differences occur in the shoulder and hip regions.

OIC Body Region Codes

H Head (Skull, Scalp, Ears)
F Face (Forehead, Nose, Eyes, Mouth)
N Neck (Cervical Spine, C1-C7)
B Back (Thoraco-Lumbar Spine, T1 - T12, L1-L5)
C Chest
M Abdomen (below diaphragm)
S Shoulder - Upper Arm (Brachium)
E Elbow
R Forearm
W Wrist-Hand
T Thigh-Hip
K Knee
L Leg (below knee)
A Ankle-Foot
O Whole Body
X Extremities (Arms, Legs)
Y Trunk (Chest, Abdomen, Legs)
U Unknown, Unclassifiable

FIGURE 4. OCCUPANT INJURY CLASSIFICATION BODY REGIONS



The broader regions (whole body, extremities and trunk) have been provided to aid the description of an injury occurrence that involves more than one region, such as a burn.

ASPECT - The aspect codes provide a fairly specific means of locating an injury in a body region e.g., EP for Elbow Posterior. The coding of the arms and legs depends on the use of R, L, and B for distinguishing which extremity region or both was injured. Likewise, superior and inferior are required for distinguishing between the thorax and lumbar spine regions. The aspect codes can find interesting uses with the broader region codes 0, X, and Y. For instance, XR could be used in classifying an injury sustained by both the right arm and leg from contact with side interior.

OIC Aspect Codes

R Right
L Left
B Bilateral
C Central
A Anterior/Dorsal/Front
P Posterior/Ventral/Back
S Superior/Cranial/Upper
I Inferior/Caudal/Lower
M Medial Mesial/Midline
O Whole Region
U Unknown, Unclassifiable

Usually the desire to use two aspect codes can be resolved by selecting the more representative aspect - the one that best characterizes the injury. Thus, CS better describes the location of a four inch horizontal laceration in the upper left chest wall than CL.

The aspect code is the second letter of the OIC. It is a refinement of the first letter, i.e., a suffix to the body region. Therefore, it has meaning only in relationship to the body region to which it is applied. It cannot be used independent of the first letter for coding or analysis.

DIAGNOSIS OF LESION - The diagnosis of injury or lesion categories are basically the ones provided for in the expanded CPIR injury detail page (Figure 2). The one significant addition is "asphyxia". While fairly rare, no provision exists currently for encoding this information when it occurs.

OIC Lesion Codes

- F Fractures (all Skeletal)
- D Dislocations
- L Laceration (Open Wounds)
  - V Avulsion (Torn Away From)
  - R Rupture (Herniation)
  - M Amputation
- C Contusion (Bruise, Crushing, Hematoma, Ecchynosis)
- A Abrasions (Superficial, Scratch, Blister)
- K Concussion
- B Burn
- P Pain
- X Asphyxia (Suffocation, Anoxia, Obstruction)
- S Sprains
- O Other
- U Unknown

Although grossly simplified, this dimension of the OIC parallels the Morphology Index of the "Systematized Nomenclature of Pathology" (5). This facet is primarily intended to code diagnostic information concerning pathological changes and not the signs and symptoms. Pain is the one exception, as it is useful for encoding those painful but vague abnormalities that are not specifically diagnosed. While not emphasized in the OIC the classification of signs and symptoms does play a significant role in recording a patient's medical history (6) and in emergency medical service studies.

BODY SYSTEMS/ORGANS - The fourth and final letter of the Occupant Injury Classification is the specific Body System or Organ affected. As with the other dimensions of the OIC the number of categories could be expanded, by using more than one letter. Rather than list all the organs, the categories were based upon the major body systems. The combination of body system and body region categories work together to define specific tissue areas. Thus Face region and Digestive system coordinate to describe the mouth.

OIC System/Organ
S Skeletal, Bones, Ligaments
V Vertebrae
J Joints, Articulations
D Digestive
L Liver
N Nervous System
B Brain
C Spinal Cord
E Eyes, Ears
Cardiovascular (Use H or Q)
H Heart
Q Spleen
U Urogenital
K Kidneys
R Respiratory
P Pulmonary, Lungs
M Muscles
I Integumentary (e.g., Skin, Hair)
U Unknown, Unclassified

There are a number of specific organs of special interest to the automotive medicine and engineering professions. The organs of greatest interest are indicated in the propcsed expansion of the CPIR occupant injury detail page (Figure 2): lungs, heart, liver, spleen and kidneys. These along with vertebrae, joints, spinal cord, eyes and ears, have been provided with specific codes.

ABBREVIATED INJURY SEVERITY - The Occupant Injury Classification is terminated with the Abbreviated Injury Scale (AIS) severity code in the same manner that the vehicle Collision Damage Classification ends with a numeric extent code. The AIS has received wide acceptance and application. It provides a scaling of tissue damage that is consistent with the intent of the OIC. Because injuries to one body region are being coded only severity codes 0 through 6 are used. This is the same convention currently used for encoding the CPIR injury detail page (Figure 1).

Abbreviated Injury Severity
0 No Injury
1 Minor
2 Moderate
3 Serious
4 Severe
5 Critical
6 Fatal
8 Presence of Injury Unknown
9 Severity Unknown

The maturity of a science can, in part, be measured by its measures. The science of automotive medicine has progressed from the rough categories of K-fatal, A-bleeding, B-bruises, C-complaint of pain; through its rating scales of DeHaven, Nahum, GMC, States, Mackay, Robertson, Campbell, Schwimmer, Wolf, Brass and AMA as reviewed in reference 3. With reasonable confidence and reliability injuries can now be placed into rank ordered categories of increasing severity. In fact some consider the Abbreviated Injury Scale (AIS) as a continuous or interval scale, like temperature in Centigrade. Just the fact that this issue is debated, is a measure of the maturity of the science of automotive trauma.

While not part of the OIC development, the future evolution and sophistication of injury scaling cannot be overplayed. Attempts have been made to evolve ratio severity scales so that a level 4 severity is twice that of a level 2 severity (7). Perhaps current computer based AIS prediction models will help establish the reliability and validity of the AIS scale. Another dimension of sophistication is manifested in the AMA Comprehensive Injury Scale (8), which separates the criteria used in injury scaling into five categories: energy dissipation, threat-to-life, permanent impairment, treatment period and incidence.

The utilization of the CIS opens the door to a whole host of multivariate analysis, clustering techniques and multidimensional scaling methods and might even permit the analyst to synthesize his own injury scale base on the five components of the Comprehensive Injury Scale.

PROPOSED RECORDING FORMAT - In the proposed format, OIC's would be recorded in pairs for distinct contact areas (Figure 5). The four areas of possible contact would be recorded in likelihood order: definite, probable, possible, using the currently available contact area codes (although possible this list should be extended). Only cards with encoded data would be keypunched. (If necessary, to save on the number of cards, up to three sets of contact areas and OIC pairs could be punched on one card). The computer will then format this information into one logical record per injury so analysis can be conducted on injury-by-injury basis.

With a proper coding format the OIC facilitates the description of many specific types of tissue damage and permits the recording of injury causation or injury sources on an injury-by-injury basis. The critical problem, then, is defining what an "injury" is. What level of detail should be recorded? An operational definition of an "injury" is needed to provide boundaries of the level of detail to be

FIGURE 5. OCCUPANT INJURY CLASSIFICATION CODING FORM

	CARD NUMBER	OCCUPANT NO.	★ ENTER CODE(S) FOR AREA(S) OF POSSIBLE CONTACT			
1-9	10-11	12-13	14 15	16 17	18 19	20 21
	12					
DUPLICATE* FROM PRECEDING CARD	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					

BODY REGION	ASPECT	LESION	SYSTEM/ORGAN	SEVERITY	BODY REGION	ASPECT	LESION	SYSTEM/ORGAN	SEVERITY
22	23	24	25	26	27	28	29	30	31

encoded. This is accomplished by default in the CPIR form, as an injury is defined as one box in the CPIR occupant injury detail table. For example, only one laceration per body region is permitted.

One body region can hit several different vehicle interior (or exterior) areas, causing distinct injuries. In order to link injuries with injury sources (contact areas), an OIC should be established for each separate injury to a body region due to distinct contact areas A driver sustaining two facial lacerations one from contact with the steering wheel and a second from the windshield should have two separate Occupant Injury Classifications, each with a different associated contact area.

The recording of two injuries in a single body region that resulted from contact with one area is a particular problem. Is the rib fracture and associated pneumothorax from steering column loading, one injury or two injuries? Fron an injury causation point of view only unique points of injury producing energy transfer should be recorded, but this approach might limit the recording of some significant traumatic conditions resulting from the dissipation of energy.

Campbell's Traumatic Tissue Damage Record (9) is in part "based upon the recognition that as the energy passes through various layers or structures it may leave some evidence of its effect in the tissue. Damage may therefore be described and assessed for all of the major tissues through which the force passes at whatever level they occur". To keep the number of details to be coded to a manageable level he further suggests "that only the damage at greatest depth in the body needed to be described in any one particular injury".

This conceptualization of injury is the approach suggested for the recording trauma with one exception - the injury classifier will be permitted two OIC for each force application or contract point (Figure 5). The first OIC would be the diagnosis of damage at the deepest level or the most important deepest structure. The second OIC can be used to describe other significant or associated traumatic conditions. Using the earlier example, the pneumothorax would receive the first OIC and the rib fracture the second OIC. The use of the second OIC for recording "induced injury" or indirect injury is also being explored. This concept (as suggested by D. Huelke) recognizes that, for instance, the forces producing knee injury during contact with the instrument panel can be transmitted through the femur and cause further trauma in hip region.

SUMMARY

An Occupant Injury Classification scheme is proposed that will facilitate the computer processing of injury causation data. The OIC follows an approach similar to Collision Deformation Classification, by using four letters to encode Body Region, Aspect, Lesion and Body System/Organ, followed by the numeric Abbreviated Injury Severity code. The OIC can be used to link specific injuries to their causes or contact areas, in an easy and flexible manner.

The OIC was developed under NHTSA sponsorshi and will begin being used on a trail basis, in parallel with existing reporting protocol. Again those interested in the future evolution of the OIC are urged to forward their comments and suggestions.

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