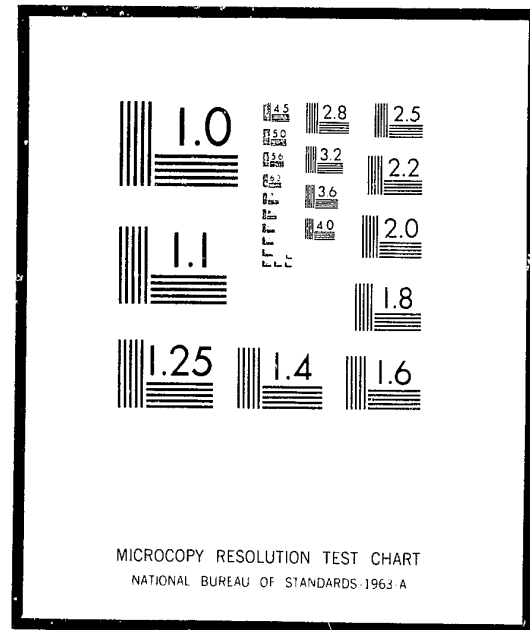


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RESEARCH

REPORT

An Inventory of Factors Suggested as Contributing to Traffic Accidents

by
J. Stannard Baker and Leroy R. Horn

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AN INVENTORY OF FACTORS SUGGESTED AS CONTRIBUTING TO TRAFFIC ACCIDENTS

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Introduction

Background

In a project to explore possibilities of finding out by studying individual accidents how and why traffic accidents happen, thought ought to be given to prevailing ideas about accident causes. There are two reasons for this:

1. What to look for. Many people have suggested factors that may contribute to traffic accidents. But those who set out to study accidents more intensively than has been done before may want to postpone study of these suggestions so as to make their first observations without benefit of preconceived ideas. This was done in the Case Studies of Traffic Accidents. But eventually the investigator will want to know what others might have expected him to look for so that he may thereby learn of phenomena that he may be overlooking.
2. Evaluating extent of discoveries. By studying a few accidents intensively, one cannot expect to find examples of more than a few of the great number of factors which contribute to accidents; some of these factors may be extremely rare. Then, one needs to know about how many of some conceivable total number of factors were encountered in the cases studied and what factors were discovered, if any, that had apparently not been noted before.

Hence, in conjunction with Experimental Case Studies of Traffic Accidents, two special studies were made:

1. Concepts and Classification of Traffic-Accident Causes¹¹
2. Factors Suggested as Contributing to Traffic Accidents¹³ of which this is the report.

Neither was undertaken until data collection for Case Studies was complete.

This inventory is not limited to factors which have been proved, by one

means or another, to contribute to accidents, but includes as many suggested possible causes as could be readily collected.

Ideas that people have about factors which contribute to accidents may be thought of as hypotheses about causes of accidents although they are almost never expressed formally as hypotheses. Hence the inventory of accident factors is also a listing of hypotheses about accident causation.

Sources of Ideas

To compile a satisfactory inventory of ideas about accident causes, fifteen major sources were consulted. These represented varied viewpoints. Some are "classics" which first appeared decades ago; others are developments of the last few years. The fifteen are noted and abstracted in the Appendix of "Concepts and Classification."¹¹ Some of the same ideas about causes appeared in nearly all of these sources. A few ideas not represented in any of the sources came to light in articles of one kind or another and were added for the sake of greater completeness.

To try to list all ideas that have been offered about causes of accidents would take years of searching the journals of a dozen disciplines and talking to hundreds of people. It is unnecessary for the present purpose. Although an exhaustive search of the literature was not made, this list of accident factors is believed to be the most extensive ever compiled.

Number and Kinds of Factors

Number of Factors Listed

This inventory consists of approximately 850 items, many of which were suggested by two or more sources. For example, "drunk drivers" were cited as a cause by 6 sources, "fatigue" by 5 and "slow reaction time" by 5. "Driver inexperience" appeared in 3 sources and was noted in 6 of the Case Reports studied.

Sometimes the wording of the same idea in different sources is identical. In other instances there were minor differences in wording, but the ideas presented were obviously the same. For instance, "following too closely causes accidents," and "followed vehicle ahead too closely" both appear in this listing as "followed too closely."

The ideas, "tunnel vision" and "side vision" are consolidated with "narrow field of vision," while "inadequate law enforcement" is included with "poor law enforcement" instead of being given a separate listing. The statements "drunk drivers cause accidents," and "driving under the influence," can both be summarized as "drunk drivers."

Duplications appear most frequently in sections dealing with driver attributes. Many sources apparently focused their attention in this area.

Factors from Case Studies

Of the 850 factors catalogued approximately 180 appear in Derived Factors in Traffic Accidents²², many of them being encountered in several Case Reports. This redundancy is obvious from the multiple accident numbers which appear after some of the factors.

Of the 180 factors from Case Studies, 50 were essentially the same as factors which had already been suggested by other sources and hence were not given a separate listing. Thus 130 appeared to be different at least to a degree. Nearly half of these merely represented different aspects of the same general idea. For example two outside sources listed "tempoarry illness". In the Case Studies an instance of "week long toothache" was found. This was clearly a special variety of temporary illness. Again, "unfamiliar with automatic transmission" is a specific instance of "unfamiliar with operation of vehicle or its equipment."

Factors listed in Case Studies but not elsewhere in the literature do not necessarily represent things that are new and startling. Such things as inadequate street signs and poorly marked entrance to parking lots, etc., can be observed almost daily. But they may not have been noted previously as contributing factors in a particular accident.

The contribution to accidents made by non-contact vehicles is cited repeatedly in Case Studies but does not appear conspicuously elsewhere in the literature. This may be an indication that inadequate attention has been paid to the part played by non-contact vehicles.

An analytical review of what people think causes traffic accidents is the subject of a separate report, Concepts and Classification of Traffic Accident causes.¹¹ The purpose of the present discussion is not primarily to discuss factors which contribute to traffic accidents but rather to attempt to list them in a more or less systematic manner so that their extent and variety may be apparent.

Factors and causes. The term "factor" is used here as it has been by others in a very broad sense:

Factor (which contributes to a traffic accident) - (definition) Any circumstance connected with a traffic accident without which the accident would not have occurred.

Some factors are conditions which contribute in varying degrees to the probability of an accident happening. Other factors are behavior or actions which appear to be essential elements of specific accidents. Factors are not causes in the sense that a cause inevitably leads to an effect. Factors combine to cause accidents. This is discussed more fully in Concepts and Classifications of Traffic Accident Causes.¹¹

Forms of Statements in which Factors Appear

Many of the factors listed represent a restatement of a complex set of circumstances from different points of view. For example, the statement "motor-cycle afforded rider poor protection against snow and wind," focuses attention on a shortcoming of the vehicle. "Snow and wind blowing in rider's face reduced visibility" focuses on a modifier of the trafficway. It would be possible to go back a step further and say that the driver made a mistake when he chose to make the trip despite inadequate protection from the unfavorable weather and hence trip planning was at fault. Thus, the number of factors which may be thought of as contributing to an accident is dependent upon the number of different points of view from which the accident is studied.

Descriptions. Some statements offered as explaining how or why an accident happened are only brief descriptions of a number of circumstances. For example "exceeded safe speed on intersection turn and skidded, crossed lane or left road." This is the kind of information which might be found in the "Describe Accident" section of an accident report. These descriptions include elements that are true but of doubtful relevance as contributing factors. They may state time and place, year, make and model of vehicle, race and sex of persons, and such data without regard for its significance. Such data may, indeed, be useful in studying accidents on a mass-data basis, but as an indication of contributing factors are often indeterminate. For classification purposes such descriptions must be broken into parts.

The example given has several elements.

1. "Intersection" only locates the turn and is contrasted with non-intersection turns. Equally we could specify that it was a truck, that it was dark, in a residential district, and so on.
2. "Crossed lane or left road" is the crucial event, namely leaving available path.
3. "Skidded" is an aspect of evasive action and may or may not relate to performance depending on whether skidding was necessary in the emergency to maximum brake performance or whether it was due to unnecessary over-steering.
4. "Exceeded safe speed" is one of two things:
 - a. Faulty evasive action by failure to slow to a speed at which curve could be negotiated after the curve was sighted.
 - b. Poor strategy by driving, before curve could be sighted, at a speed such that when curve was sighted or decision to turn was made, speed could not be reduced to controllable entry speed before turn had to be started.

This description could be represented by four codes, one for each of the

items listed. The first item of this description would not be classified for inclusion in the inventory. It serves only to locate the event in the road network. The other three items would be classified, and perhaps the fourth item would appear in two places because it is not clear from the description whether speed represents faulty evasive action or poor strategy.

Purely descriptive circumstances often appear among factors mentioned as contributing to accidents. These may, indeed, be related to frequency of accidents but not in a direct way. The descriptive circumstance most likely to be mentioned as an accident factor tells what the traffic units were attempting to do when the accident happened. Sometimes time of day, kind of district, occupation of driver and other information gleaned from accident reports are considered "factors" contributing to traffic accidents. These descriptive circumstances are useful in some aspects of accident prevention. Because they serve to indicate when and where attention is needed they guide selective enforcement, indicate high-accident locations and drivers who are accident repeaters. However, they will not be included in the inventory, because they are descriptive material rather than true contributing factors.

Relationship of Factors

When considering classifications of factors relating to accidents, it is important not to infer that factors classified separately also function separately. Quite the contrary is the case. Some illustration of this is warranted here to emphasize the point.

Concurrent factors. Accident-producing situations always involve factors of several kinds. For example, at night in fog headlights permit following a road with difficulty. To avoid accident, the driver must travel at a speed such that he can stop after detecting an object in his path. The speed he drives at depends, therefore, on:

1. The distance at which he can detect hazard
2. The rate at which he can slow in stopping
3. The margin of safety which his judgment allows

The first item enumerated in the example chosen, "distance at which he can detect hazard," depends on the following factors and probably others not mentioned.

These factors exist concurrently and they represent attributes or qualities rather than actions. Hence they would be classified as condition factors rather than operational factors. Definitions of these two major groupings appear later. Note that the attributes in the following list may apply to the trafficway, the vehicle, and the driver.

1. Degree of natural illumination.
2. Headlamp ability to penetrate fog

- a. Brightness
 - b. Mounting height
 - c. Color
 - d. Concentration and focus of source of light
 - e. Aim of beam
3. Road surface
- a. Color
 - b. Texture
 - c. Reflectance
 - d. Temperature
 - e. Deposits on surface such as moisture, dirt, etc.
4. Air
- a. Humidity
 - b. Temperature
5. Delineation of roadway by center and edge markings
- a. Color
 - b. Texture
 - c. Reflectance
 - d. Width
 - e. Height compared to road surface
 - f. Pattern or design
 - g. Position with respect to road surface (center or side)
 - h. Deposits on road surface (moisture, dust, etc.)
6. Driver's seeing ability
- a. Visual acuity
 - b. Color vision
 - c. Sensitivity in low illumination
 - d. Depth perception
7. Driver's knowledge (conscious or unconscious)
- a. Nature of road surfaces
 - b. Nature of delineation
 - c. Distance required to stop from speed traveled
8. Driver's skill
- a. In distribution of attention
 - b. In resisting distractions
 - c. In manipulating controls
9. Driver's willingness to work hard at detecting hazards

- a. Interest
- b. Motivation

If any of these factors becomes less favorable for any reason, the distance at which the road ahead may be detected diminishes unless other factors compensate by varying in a favorable direction. For example, if the centerline were reduced from 4 inches to $\frac{1}{4}$ inch wide, with all other factors remaining constant, the driver would not be able to detect changes in direction so far ahead. However, if its reflectance were increased by beading or if his visual acuity could be increased with glasses, the alignment of the road ahead might be detected again at the original distance. We may say, therefore, that width of centerline is related to visual acuity, reflectance, and, indeed, many other factors.

The rate at which a vehicle can slow in stopping has another list of factors relating to it probably as long as the list for detecting the alignment of the road. The driver's margin of safety also has a list of factors contributing to it.

Classification

Classification Plan

To make an inventory of suggested factors, a classification plan is needed, otherwise the same factor may be listed more than once under different names. A classification plan is, of course, no guarantee that some item will not be listed a second time in slightly disguised form, but by classifying according to subject rather than listing alphabetically, similar ideas will be brought together and excessive and obvious repetition can be eliminated. Numerous classification systems have been published but most of them accommodate only a special group of factors or arrange them for some special purpose. Because a completely ready made classification was lacking one had to be devised for the purpose, adapting such parts of others as may be useful. The classification plan used here is that developed in "Concepts and Classification of Traffic Accident Causes." 11

Two main kinds of factors. In examining the whole collection of suggested factors which come within the scope of our definition of this word, two major kinds are recognized:

1. Operation factor contributing to a traffic accident - (definition) An operation which was not performed or which was performed in a wrong manner when proper performance of the operation would have prevented an accident on a trip.
2. Condition factor contributing to a traffic accident - (definition) A quality of a trafficway, vehicle, or a person making a trip; nature of the physical environment; and character of the social or cultural "climate." Condition factors can be described in a static context as

Exhibit 1

CRUCIAL EVENTS

Only one is applicable to each traffic unit involved in an accident.

-
11. Left available path (Path is not the same as road)
 - 111 Off road to right (Road includes shoulder)
 - 112 Off road to left without opposing traffic
 - 113 Into occupied lane for opposing traffic crossing barrier line
 - 114 Into occupied lane for opposing traffic without barrier line
 - 115 Into occupied parking lane to right
 - 116 Into occupied parking lane to left

 12. Falling or turning over in path without collision

 13. Other non-collision event in path
 - 131 Occupant fell or jumped from vehicle
 - 132 Load or part of vehicle detached
 - 133 Mechanical failure only
 - 134 Fire only

 14. Collision with non-traffic object in or adjacent to path
 - 141 Restraining devices (such as unmountable curbs and guardrails)
 - 142 Roadside objects (such as walls, poles, trees)
 - 143 Overhead structures and trees
 - 144 Holes
 - 145 Unattended animals
 - 146 Objects detached from other traffic units
 - 147 Objects from roadside (fallen trees, rocks, etc.)
 - 148 Construction or repair materials or equipment
 - 149 Railroad train

 15. Collision with other traffic unit in path (not parked)
 - 151 Truck with or without trailer
 - 152 Passenger motorcar with or without trailer
 - 153 Motorcycle
 - 154 Bicycle
 - 155 Animal drawn vehicle
 - 156 Ridden or herded animal
 - 157 Street car
 - 158 Pedestrian
-

existing at a given time and place. They do not necessarily derive from a specific accident.

With a few exceptions, it is possible from the name or description of a suggested factor to determine which of these two major kinds it is.

Operation factors are failures of operations which interrupt a trip with an accident. They are classified, according to their proximity to the final events of the accident that result in damage or injury, into four major groups:

1. Crucial event, which leads directly to damage or injury.
2. Evasive action, which precedes crucial event.
3. Strategy which increases or decreases the likelihood of successful evasive action.
4. Preparation which lays the groundwork for successful or unsuccessful strategy.

A classification of crucial events is given in Exhibit 1. Each of the last three is divided into three main phases of the operational cycle which are also listed according to proximity to final events:

1. Performance
2. Decision
3. Recognition

These operational factors are shown diagrammatically in Exhibit 2.

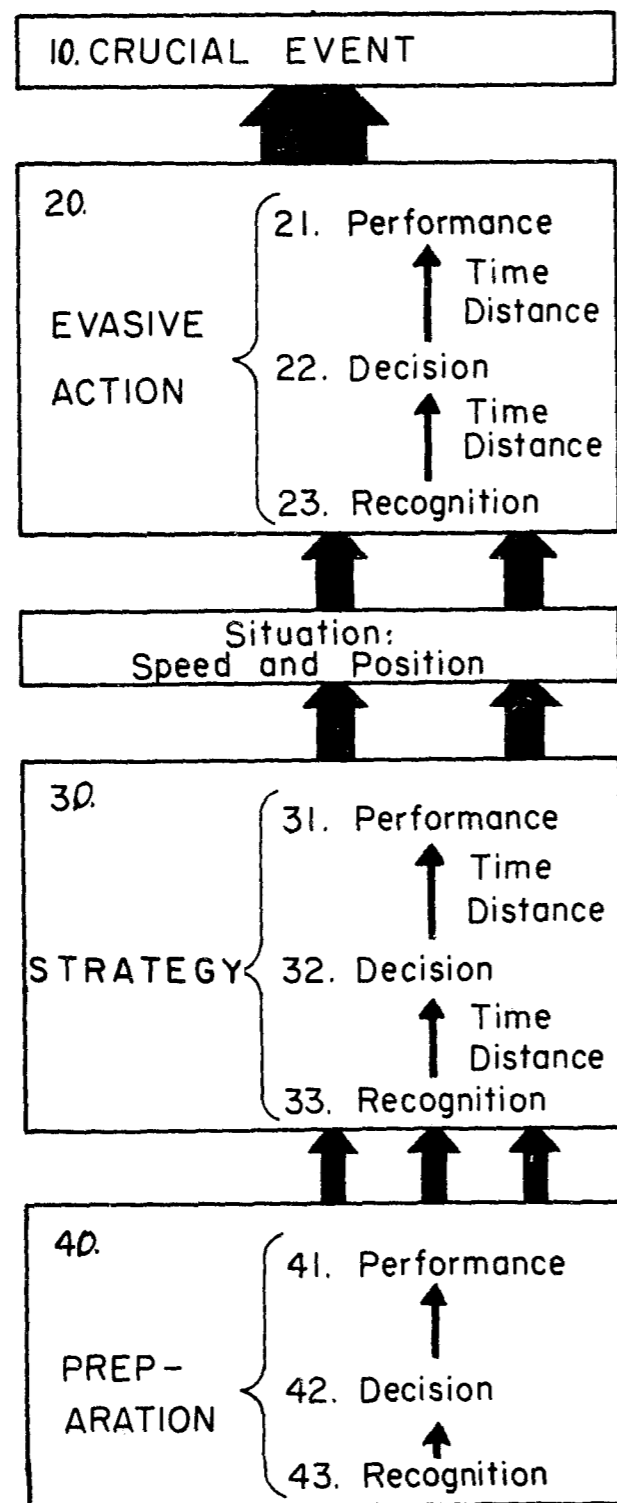
Condition Factors relate to:

1. Trafficway, including atmospheric environment
2. Persons using the trafficway for travel
3. Vehicles on the trafficway.

Condition factors are either attributes of these three elements of highway transportation or they are modifiers of these attributes. The principal classes of attributes and modifiers are shown in Exhibits 3, 4, and 5. Definitions for the more important attributes are given at the appropriate places in the listing of attributes.

A much simpler classification system could be devised if the only purpose were to group factors in such a way that they could be identified when described in several different ways. Thus all kinds of, "failure to recognize" could be combined without trying to determine whether this related to evasive action. But one purpose of the classification, as explained in Concepts and Classification of Traffic Accident Causes¹¹ is to show what operational failures contributed to the accident and, so far as practical, why. In other words, the classification is more than a pegboard on which to hang ideas; it is also a guide to systematic analysis of individual accidents, to discover possible contributing factors. This latter aspect of the classification is not, of course, particularly significant for the purposes of an inventory of factors, but it seemed un-

Exhibit 2. Operational Factors



wise to use one system of classification for analytical and another for cataloging purposes. Using the same classification for both is less confusing. The more refined classification stimulates more discriminating thinking on the part of the user; it makes one aware of ambiguities and, in investigation, sharpens reporting.

The classification used here is complicated by the fact that many statements "describing" factors or hypotheses about accidents are not sufficiently specific to permit classification without assumption as to how the factor mentioned is supposed to function. Lack of judgment, for example, might refer to judgment of special relationships such as speed, or it might refer to assessment of risk. These are two quite different ideas, but to separate them, one needs to know more of the circumstances under which "lack of judgment" contributed to an accident. Non-specific statements about factors usually arise from thinking about accident factors in terms of general personality traits. They are the kinds of characteristics which might be considered in comparing tests of drivers with driver accident records to determine which characteristics are associated with high or low accident experience in general without determining how they apply. More specific statements about accident factors generally arise from thinking about them in terms of specific accidents in which combinations of factors are sought to explain behavior. Then how these factors operate becomes extremely important. Perhaps these differences are essentially those between the statistical and the clinical approach to the problem of getting at the factors which in combination cause accidents.

More complex classification systems could be devised. Such a system would attempt to bring out the combinations of factors. In this inventory, such combinations have been broken into component parts, but endless elaborations suggest themselves. For example, lack of manipulative skill on the part of the driver is usually combined with many factors associated with the road such as slippery pavement, unspiraled curves, and bumps or ruts. It is also associated with characteristics of the car such as arrangement of controls, braking performance, and turning radius. Provisions for all such combinations of two, three, four, or more factors could be provided. Such combinations often appear in statements about causes, for example, in Derived Factors in Traffic Accidents.²²

Statements to be classified may appear in many forms. Some are mentioned in general articles and others appear in lists of one kind or another. In the latter they may be mere words or phrases, in the former whole paragraphs of discussion. Among these some obviously fall within the basic classifications, but others must be studied carefully to discover what is meant. Two main causes of difficulties arise:

1. No category seems to fit the action described. In this case two courses are possible:
 - a. Omit the factor as not classifiable. Example: "Driver purposely bumped the rear end of the car ahead." The fact that the action was intended means that it was not accidental; hence it cannot fit into a classification of accident factors.

Exhibit 3

CONDITION FACTORS OF TRAFFICWAYS

| ATTRIBUTES | | MODIFIERS | |
|---|-----------------------------------|------------------|------------------------------------|
| Generally relating to <u>Recognition</u> | T11 Light | <u>Temporary</u> | 11 Weather, Atmospheric conditions |
| | T12 Visibility | | 12 Natural light |
| | T13 View obstructions | | 13 Temporary warning devices |
| | T14 Recognizability | | 14 Temporary roadside activities |
| | T15 Recognizability aids | | 15 Roadside Objects |
| | T16 Distractions, Monotony | | 16 Objects on the road |
| | T17 Confusion, Standardization | | 17 Loss of adjustment, Alignment |
| | T18 Warning signs | | 18 Social and legal symbols |
| | T19 Guide signs | | 19 Surface deposits, Ruts |
| Generally relating to <u>Decision</u> | T21 Signals | | 20 Road damage, Holes |
| | T22 Traffic signal controls | | |
| | T23 Regulatory signs and markings | | <u>Permanent</u> |
| Generally relating to <u>Performance</u> | T31 Alignment | | 41 Wear |
| | T32 Surface character | | 42 Deterioration, Age |
| | T33 Dimensions | | |
| | T34 Restraining devices | | |

b. Rephrase the statement. Example: "Low Snellen score contributes to accidents." When "Snellen score" has been identified, the statement may be rewritten "visual acuity" which is a sensory ability of people. (Code P12)

2. Several categories fit. In this case it is usually possible to break the statement into two or more parts. Example: "rain making the surface slippery and obscuring the windshield contributes to accidents" may be separated at once into "slippery surface due to rain" and "obscured windshield due to rain;" the first is an attribute of the road modified by surface deposits (Code T32.19) and the second an attribute of the vehicle with a similar modifier (Code V14.13).

The codes appearing on the foregoing paragraphs and in the remainder of the text will enable the reader to locate the factors in the listing. They were derived from Exhibits appearing in this report. Exhibits 1 & 2 deal with operation factors in their various stages and Exhibits 3, 4, and 5 refer to condition factors of trafficways, people, and vehicles respectively. A brief study of these exhibits may be helpful in understanding the coding of examples which appear in the text. A detailed explanation of the coding procedure appears in a later section "Steps in Classifying and Coding".

Many factors listed here were originally stated in combination with others and had to be broken into their component parts for proper classification in the inventory. For example "low blood pressure and preference for a low tempo of activity" can be broken into its two parts. Low blood pressure is a physical attribute which may relate to any phase (recognition, decision, performance) and therefore takes code P00. It also represents a chronic illness modifying driver condition (.42). Hence the complete code is P00.42. "Preference for a low tempo of activity" is a mental condition relating primarily to alertness (P24).

The statement "pavement marking worn away; obscured by ice, snow or mud" separates easily into "pavement marking worn away" which is an attribute of the highway relating to recognizability aids (T15) as modified by wear (.41) while "pavement markings obscured by ice, snow, mud" takes the modifier (.19) because these are "surface deposits" on the road.

The statement "driver panic stricken when accelerator stuck and engine roared," can be broken into two parts-- "driver panic stricken" which is a reflection of emotional stability (P23) and "accelerator stuck and engine roared" which is an attribute of a vehicle related to malfunctioning of controls (V31.17).

In a few instances it seemed desirable to combine factors which represented varying degrees of a particular attribute. For example, "daylight, darkness, dusk or dawn can all be embraced by the statement: "degree of natural light as affected by time of day." The more inclusive statement seems more meaningful than a separate listing of the items.

In many cases, just what the statement means cannot be determined. Then either the statement must be omitted or best judgment used to put it into comprehensible language.

Exhibit 4

CONDITION FACTORS OF PEOPLE

| ATTRIBUTES | | MODIFIERS | |
|---|--|-----------------------------|------------------------------|
| Generally relating to <u>Recognition</u> | P11 Observing habits | <u>Temporary</u> | 11 Sun exposure |
| | P12 Sensory abilities | | 12 Glasses, etc. |
| | P13 Signalling habits | | 13 Emotional upset |
| | P14 Recognizability (mainly pedestrian) | | 14 Pressure, Stress Hurry |
| | P15 Knowledge | | 15 Preoccupation |
| Generally relating to <u>Decision</u> | P21 Intelligence, Judgement | 16 Weather | |
| | P22 Attitudes | 17 Irritants | |
| | P23 Emotional stability | 18 Ingestion, Inhalation | |
| | P24 Alertness, Concentration | 19 Fatigue, Boredom | |
| | | 20 Temporary illness | |
| Generally relating to <u>Performance</u> | P31 Operating skill Habits | <u>Permanent</u> | 21 Injury |
| | P32 Size, Weight Strength | | 22 Clothing |
| | P33 Freedom of movement | | 23 Things carried |
| | | | 24 Prosthetic devices |
| | | | 41 Deterioration, Age |
| | | | 42 Chronic illness |
| | 43 Permanent injury | | |
| | 44 Experience, Training | | |
| | 45 Customs, Tradition | | |
| | 46 Authority, Enforcement | | |

Throughout the classifying process a constant effort was made to take the statements at face value without risking reading in meanings which the author might not have intended. Nevertheless, it was necessary in some instances to make certain assumptions to fit certain factors into the system adopted or, for that matter, any other system of which we can conceive. For example, "reached over to shut door" is an action factor which tells us nothing about the results of such action. In this instance we assume that this act resulted in inadvertent steering. It is then possible to code it as a performance item in the strategic stage (Code 31).

Or consider the statement "parked on road opposite obstruction." As the statement stands one cannot tell whether this is a problem in recognition (the driver failed to see the obstruction or to realize that parking in that spot would create a hazard) or whether it is a bad decision--(he recognized the situation but decided to park there anyhow). In this instance we have made the assumption that he recognized the situation and this factor becomes a problem in decision at the strategic level (Code 32).

The statement "extremes of temperature and humidity are factors" is difficult to classify as it stands because even though we can identify temperature and humidity as modifiers we cannot tell from the statement if they apply to trafficway, vehicle, or driver. Hence the assumption has been made that driver vitality, strength, and judgment, were effected, which seems to be what the author intended in this instance. This leaves the operational phase indeterminate but it is now possible to assign the code P00.16--weather acting as a modifier on the general condition of the driver.

Combinations of factors are commonly suggested. For example "driver's inability to cope with icy pavement." This is a specific attribute of the driver and also one of the road surface which together produce difficulty, neither by itself being sufficient to produce an accident. Nearly every accident has such combinations. The networks of possible relationships among factors are so vast and complicated that it is impossible to begin to list them. Consequently the factors contributing are listed separately in this inventory. Special combinations in connection with specific accidents are noted in Derived Factors in Traffic Accidents.²²

Remote factors not related to the trip may be offered for classification. This would include such things as improper legislation, insufficient appropriations, and lack of public support. The category "Earlier Events" which appears at the bottom of Exhibit 2 has been provided to cover such items.

Steps in Classifying and Coding

Some examples of the procedures used in coding and classifying have already been given in the foregoing. A more detailed explanation of these procedures will now be undertaken to demonstrate in detail how the classification system can be used.

For the inventory the whole collection of suggested factors must be listed systematically according to classifications. To do this it is useful to

Exhibit 5
CONDITION FACTORS OF VEHICLES

| ATTRIBUTES | | MODIFIERS | |
|---|----------------------------------|------------------|---------------------------------|
| Generally relating to <u>Recognition</u> | V11 Recognizability | <u>Temporary</u> | 11 Glare |
| | V12 Recognizability aids | | 12 Weather |
| | V13 Road illumination | | 13 Surface deposits |
| | V14 Sensory aids | | 14 Cargo |
| | V15 View obstructions | | 15 Passengers |
| | V16 Distractions | | 16 Social and legal symbols |
| | V17 Instruments | | 17 Adjustment loss Defective |
| | V18 Signalling devices | | 18 Damage, Contamination |
| | V19 Control feedback | | |
| Generally relating to <u>Decision</u> | V21 Comfort | <u>Permanent</u> | 41 Deterioriation Age |
| | V22 Symbolism | | 42 Irreparable damage |
| | V23 Automatic controls | | 43 Wear |
| Generally relating to <u>Performance</u> | V31 Control arrangement Function | | |
| | V32 Operating space | | |
| | V33 Dimensions | | |
| | V34 Weight | | |
| | V35 Performance | | |
| | V36 Stability | | |

code the classifications so that each factor considered may be assigned a number by which it may be expeditiously arranged in the list. Numbers for the basic classification arrangement are given in Exhibits 1 through 5.

Task of Classification. To classify a suggested factor, study the statement concerning it carefully and compare it with definitions given for various classes of factors. Decide first whether it is action or condition.

If the factor to be classified is action:

0 Is it merely a descriptive circumstance? If so omit as irrelevant.

1. Is it a Crucial Event according to the following definition:

An action of a traffic unit, usually unintended by that unit, from which the unit cannot regain control by maneuvering and which leads, directly or indirectly to damage or injury.

If so, classify it as follows:

- 11. Left available path
- 12. Overturned in path without collision
- 13. Other non-collision event in road
- 14. Collision with non-traffic object in or adjacent to path
- 15. Collision with other traffic unit in path (not parked)

2. Is it Evasive Action according to the following definition:

Any action required of a traffic unit to escape a hazard or to mitigate results of the accident. This action may or may not actually be taken by the traffic unit.

If so, classify it as follows:

- 20. Is it of a general nature, not related to a particular phase? (Example: Did not yield right of way)
- 21. Is it evasive action performance failure? (Example: Foot slipped of brake)
- 22. Is it wrong or delayed decision? (Example: Tried to turn instead of braking)
- 23. Is it wrong or delayed recognition? (Example: Did not see other unit until a few feet away)

3. Is it Strategy according to the following definition:

Any action while a traffic unit is on a trip which increases or decreases the probability of successful evasive action by that unit if a hazard develops. Any dynamic situation preceding appearance of a hazard results from previous strategy.

If so, classify as follows:

30. Is it a dynamic situation which made successful evasive action impossible? (Example: Speed too great)
31. Is it a strategic performance failure? (Example: Signalled right turn instead of left)
32. Is it a strategic decision failure? (Example: Decided not to slow for blind corner)
33. Is it a strategic recognition failure? (Example: Did not realize that bridges get slippery in cold weather)

Continue as outlined in Exhibit 2 through preparation failures and if necessary classify as an early factor with the general classification code 5 and indicate, if possible, whether it relates to trafficway, person or vehicle.

For example, the factor "inadequate highway maintenance," is neither behavior nor a condition of the road. It is antecedent to some road condition. Therefore it is an early cause with classification code 5 followed by T for Trafficway giving the code 5T.

If the factor to be classified is a condition, decide whether it is a condition of a trafficway, a vehicle, or a person. Then consider whether an attribute or modifier or combination of both according to definition or classification in Exhibits 3, 4 and 5. Definitions of attributes and other terms have been incorporated into the list of classified factors whenever it was felt that definitions were necessary.

A few examples should be useful in illustrating how the coding system can be used. "Visual Acuity" is an attribute of a person (P) and is in the recognition phase of the cycle (1). It is a sensory ability (2), hence it would be coded P12. (See exhibit 4). If the statement indicates that the attribute has a modifier add the modifier code to the attribute. For example, "slippery road surface" is an attribute of the trafficway concerned with the performance phase (3) and related to surface character (2). Code thus far (T32). If we add the phrase "due to snow" we have a modifier--(.19--surface deposit); hence the code would be T32.19 (See Exhibit 3).

If phase, attribute, or element (trafficway, person, vehicle) cannot be surmised, substitute zeros. Example: "Weather" might relate to all 3 elements and it might apply to more than one phase. Hence weather would be coded 000 unless more specific information was available as to how the statement was meant to apply. Now take the statement "drunk drivers cause accidents." Clearly this deals with the condition of the driver (P) but does not specify any particular phase. Presumably, recognition, decision and performance could all be affected. Hence the code P00. Drink involves ingestion, hence the modifier .18 is applicable and the complete code becomes P00.18.

In other cases the phase may be clear but the exact attribute difficult to determine. For example, "boy riding bicycle of other child contrary to recent instruction of mother." The problem here stems from the boy's decision to borrow the bicycle. This decision is a reflection of attitude as well as judgment and perhaps of emotional stability as well. Rather than make an arbitrary choice from among these attributes we assign the code P20 which in-

cludes them all. The fact that the child was in defiance of his mother justifies the modifier .46--authority--enforcement.

We may now proceed with the actual listings. The meaning and scope of the various categories will be clarified by studying the type of factors which have been placed under each heading.

List of Operational Factors

In the following list are operational factors which have been suggested by various sources as indicated by source numbers given in parenthesis. The number of items under many of the categories could be increased by inclusion of additional hypothetical items. Operational factors have been defined earlier in this report. The classification system is schematically outlined in Exhibits 1 and 2.

1 Crucial event

Definition: An action of a traffic unit, usually uncontrolled by that unit, from which the unit cannot regain control by maneuvering and which leads, directly or indirectly to damage or injury.

11 Left available path. (definition of path) The part of a road or sidewalk on which a traffic unit can maneuver and not interfere with stationary objects or traffic units occupying space intended for their use outside of intersections, crosswalks or speed change lanes.

110 General examples

On left or right turn at intersection (204)
Entered pedestrian safety zone (204)
Failed to remain in lane on curve (204)
Failed to remain in lane at intersection (204)

111 Off road to right. (definition of road) "The part of a trafficway which includes both the roadway which is the paved or traveled portion and any shoulder alongside the roadway." (122)

Drove off pavement, (no shoulder) overtaking on right (107)
On right curve (204)

112 Off road to left without opposing traffic

Right turn too wide (204)

113 Into occupied lane for opposing traffic crossing barrier line

114 Into occupied lane for opposing traffic without barrier line

Right turn too wide (107, 204)
Left turn too sharp (107, 204)

- 115 Into occupied parking lane to right
- 116 Into occupied parking lane to left
- 12 Falling or turning over in path without collision
- 13 Other non-collision event in path
 - 131 Occupant fell or jumped from moving vehicle (204)
 - 132 Load or part of vehicle detached
 - Load falls off (115)
 - 133 Mechanical failure only
 - Hood or door flew open (and damaged hood or door, but no other event) (204)
 - 134 Fire only
 - Vehicle caught fire (no other event) (204)
- 14 Collision with non-traffic object in or adjacent to path
 - 141 Restraining device.
 - Unmountable curb, barrier, railing, guard rail, island buffer (204)
 - 142 Roadside object (such as walls, poles, trees)
 - Culvert head wall, bridge pier or abutment (204, 208)
 - Center pedestal of railroad overpass (208)
 - Underpass abutment (208)
 - Bridge (208)
 - Underpass center support (208)
 - Hugged road edge and struck lighting or sign standard (204)
 - 143 Overhead structures and trees
 - 144 Holes
 - 145 Unattended animals
 - 146 Objects detached from other traffic units
 - 147 Objects from roadside (fallen trees, rocks, etc.)
 - 148 Construction or repair materials or equipment
 - 149 Railroad train
- 15 Collision with other traffic unit in path (not parked)
 - 151 Truck with or without trailer
 - 152 Passenger motorcar with or without trailer
 - 153 Motorcycle
 - 154 Bicycle
 - 155 Animal drawn vehicle
 - 156 Ridden or herded animal
 - 157 Street car
 - 158 Pedestrian

2 Evasive action

Definition: Any action required of a traffic unit to escape a hazard or to mitigate results of an accident. This action may or may not actually be taken.

20 General

- Did not yield right of way (107, 120, 421)
- Failed to yield to emergency vehicles (107, 204)
- Exceeded safe speed on curve and skidded (204)
- Skidded sidewise (due to extreme intended evasive action) (204)
- Failed to straighten out on right turn, leaving road (204)
- Failed to straighten out on left turn, leaving road (204)
- Passed to left of vehicle with insufficient clearance (204)

21 Relating to performance

- Lost control of car during evasive maneuver (50.1)
- Foot slipped off brake or clutch pedal causing vehicle to leap forward (204)
- Foot slipped off brake at traffic stop causing vehicle to roll (204)
- Mistook gas pedal for brake causing car to leap forward or backward (204)
- Applied brakes excessively causing vehicle to skid (unintentionally) (204)
- Stopped in intersection, in line of travel of vehicles having right of way (evasive action) (204)
- Attempted physically to stop driverless rolling vehicle (204)
- Swerving away from a car when passing (sometimes) causes cars to go off the road at high speeds (204)

22 Relating to decision

- Poor choice of action when danger was noticed (129.2)
- Vacillation in applying brakes (44.2)
- Chose to squeeze through when traffic lanes became narrowed (110.2)
- Elected to speed up and swerve to avoid hitting opening door of parked vehicle (50.1)
- Did not stop quickly because of concern for safety of wife as right front seat passenger (26.3)
- Attempted (decided) to pass to left of vehicle which signalled or was making a left turn (204)
- Attempted (decided) to pass in lane of approaching vehicle, without safe distance (204)
- (Decided) to pass to right of vehicle which veered or turned (204)
- Overtook and passed on a 2-lane road with vehicles coming in opposite direction (204)
- Stopped after pulling away from curb and halfway into traffic lane to permit another car to pass (81.3)
- Assuming the other driver will take evasive action (205)
- Entered curve ignoring slow sign (204)
- Drove through funeral or moving procession (107)
- Overtook streetcar on left (107)
- Overtook vehicle on right (107)
- Overtook standing streetcar (107)
- Overtook or passed stopped school bus (107)

Failed to exercise care toward pedestrian (107)
 Failed to give way when overtaken (107)
 Cut in front of vehicle with insufficient clearance (107, 204)
 Left marked lane when unsafe (107)

23 Relating to Recognition

Did not swerve, thought there was car on right when actually there was not (132.2)
 Misperceived stop sign (57.2)
 Underestimated stopping capability of car (24.3)
 Change in speed of vehicle ahead not perceived early enough (57.2)
 Failed to lower headlight beam (to increase illumination on right or in fog with hazard) (204)
 Insufficient attention to fixed road features. (failed to recognize hazard) (204)
 Did not perceive vehicle in lane ahead in time to avoid it at speed travelling (204)
 Failed to perceive that vehicles might be hidden by view obstruction (24.3)
 Failed to perceive correctly the rate of closure or intentions of approaching car (12.2)

3 Strategy

Definition: Any action while a traffic unit is on a trip which increases or decreases the probability of successful evasive action by that unit if a hazard develops. Any dynamic situation preceding appearance of a hazard results from previous strategy.

30 General

Taking blind bend at high speed (207)
 Approached 'yield, right of way' sign too fast (138.2)
 Speeding (421, 402)
 Exceeded safe speed (204)
 Exceeding safe speed not stated limit (120)
 Exceeded safe speed on street car or railroad tracks (204)
 Too fast for conditions (107, 204, 206)
 Too slow for conditions (107, 206)
 Unsafe speed for road requiring repair or under repair (204)
 Unsafe speed when road temporarily unsafe due to weather (204)
 Exceeding speed limit (and also safe speed) (107, 120)
 Drove too fast to avoid unexpected pedestrian (204)
 Drove too fast to avoid vehicle entering or crossing road (204)
 Driving errors are magnified as speed increases (209)
 Failure to decrease speed before hazard when blow out occurs (209)
 Drove through safety zone (107)
 Failed to keep right on mountain road (107)
 Drove to left of rotary intersection (107)
 Did not use designated slow lane (107)

Drove on wrong side, divided highway (107, 120)
 Shifted course suddenly while walking in road with traffic (204)
 Improper turns (120, 204, 421)
 Turned right from wrong lane (107)
 Turned left from wrong lane (107)
 Turned at intersection without signal in path of vehicle entering from opposite direction (204)
 Turned without signal, in front of vehicle in adjacent lane (204)
 Followed too closely (107, 120, 204, 421)
 Failed to leave sufficient distance between trucks for overtaking (107)
 Bicyclist rode wrong way on road (204)
 Drove wrong way on one-way street, alley or road (204)
 Failed to use proper headlight beam (107)
 Failed to sound horn, mountain road (107)
 Failed to signal (107, 206, 92.2, 121.2, 112.3)
 Stopped too rapidly (206)
 Did not stop emerging from alley or driveway (107)
 Failed to make boulevard stop (204)
 Backed so as to interfere, etc. (107)
 Obstructed roadway unnecessarily while parking (204)
 Started improperly from parked position (107)
 Improper parking (120, 204)
 Left door open, parked (204)
 Parked too far from curb (after recognizing) (204)
 Opened door into moving lane of traffic (107, 204)
 Stopped in traffic lane on busy street (49.2)
 Passenger opened door while vehicle in motion (204)
 Unsafe actions by horse-riders (204)
 Failed to dim lights for approaching vehicles (107, 204)
 Caused death through negligent operation-reckless homicide (107)

31 Relating to performance

Pulled wheel sharply to one side when reaching to close door or to handle other objects (204)
 Attempted to straighten out load or other objects while driving. (Inadvertant steering) (204)
 Set brake hand improperly (204)
 Shifted into reverse instead of forward gear. Vice versa (204)
 Hands slipped off wheel causing vehicle to veer off course (204)
 Abrupt jamming on brakes on icy roads cause skids. (Not as evasive act) (209)
 Gave wrong signal (107, 204)
 Gave right turn signal but made left turn in path of vehicle on left. Vice versa (204)
 Passenger shifted load while vehicle in motion (204)
 Passenger jostled or shoved driver (204)
 Passenger attempted to change gears (204)
 Passenger grabbed wheel (204)
 Passenger jammed on brakes (204)
 Reached over to shut door. (causing inadvertant steering) (204)

Leaned over to obtain object from glove compartment (resulting in inadvertant steering) (204)
 Misjudgment of speed because adapted to higher speeds and tend to forget the rate at which travelling (209)

32 Relating to decision

Chose not to slow down at potentially hazardous corner (19.2, 21.2)
 Pedestrian jaywalking (421)
 Drove onto or from controlled access highway where prohibited (107)
 Disregarded train whistle (107)
 Failed to stop at railroad, bus or explosives carrier (107)
 Crossed RR with heavy equipment without notice or caution (107)
 Coasted out of gear, down grade (107)
 Disregarded hand or warning signal (107)
 Disregarded police officer (107)
 Disobeyed police officer (107)
 Disregarded traffic control signal (107)
 Disregarded pedestrian control signal (107)
 Made turn where prohibited (107)
 Disregarded speed zones (107)
 Disregarded crossing gate (107)
 Walked in roadway with traffic, no sidewalks (107, 204)
 Took curve in left lane or in center of road (204)
 Drove down straight and level road in left lane or in center of road (204)
 Approached hillcrest in left lane or in center of road (204)
 Passed or attempted to pass vehicle which was also passing (204)
 Passed on hill or curve, in lane of unseen approaching vehicle (204)
 Disregarded stop sign (120, 204)
 Disregarded warning signal (120, 107, 204)
 Disregarded signal or officer (107, 120)
 Entered intersection or traffic circle, ignoring signal or stop sign (107, 204)
 Ignoring caution or slow sign (presumably recognized sign) (204)
 Engaged in racing, stunting, cutting in and out of traffic (204)
 Used vehicle to scare pedestrian by pretending to run him down (204)
 Hitched on vehicle (107, 204)
 Parked on curve or hill (204)
 Parked too close to, or in intersection (204)
 Double-parked (107, 204)
 Parked on bridge, in tunnel, etc. (204, 107)
 Parked on road opposite obstruction (after recognizing) (204)
 Traffic moving in adjacent lane misled driver into starting up (125.2)
 Swing to left before making right turn (204)
 Failure to turn in the direction of the skid (209)
 Cut in behind vehicle with insufficient clearance (204)
 Pushing or working on vehicle on road with traffic in motion (204)
 Drove with headlights off (204)
 Bicyclist rode in center of road (204)
 Drove on shoulder of road (204)

Child darted across street
 Cutting across curves (204, 209)
 Boarded or left vehicle in motion (107)
 Made U-turn on curve or hill (107)
 Disregarded turn marks at intersection (107)
 Overtook left of center, hill (107)
 Overtook left of center, curve (107)
 Overtook where prohibited (107)
 Drove three abreast on two lane road (107)
 Drove on sidewalk (107, 204)
 Drove on median (204)
 Walked in roadway where sidewalks provided (107)
 Pedestrian walking 3 abreast in roadway (207)
 Riding on running board of moving vehicle (207)
 Crossed between intersections where prohibited (107)
 Drove in middle lane when unnecessary (107)
 Crossed between intersections where prohibited (107)
 Disregarded safety of persons or property--reckless driving (107)
 Taking risks (115, 135)

33 Relating to recognition

Attempted to turn left at wrong intersection (67.2)
 Came upon section of icy pavement unexpectedly (81.3)
 Drifted unknowingly into other lane of highway (204)
 Cutting corner at blind bend (207)
 Pedestrians crossing road at blind bend (207)
 Passenger turned lights off (204)
 Failure to turn on lights (107)

4 Preparation

Definition: What is done before or during a trip to chose routes, schedule time, and put the pedestrian or driver and vehicle in condition for travel. Preparation may either increase or decrease probability of completing the trip without accident; it is based on the purpose and nature of the trip and effects trip strategy.

40 General

Trip plan changed because of disorganization at home (67.2)
 Allowed vehicle to run out of gas or oil (204)

41 Relating to performance

Motor vehicles in caravan too close (107)
 Pushed in a dangerous manner (107)
 Towed in a dangerous manner (107)

42 Relating to decision

Driver "killing time" (92.2)
 Child had to cross street unassisted (115.2)
 Failed to remove ice from windows and windshield (81.3)
 Decided it was safe to proceed without headlights
 Failure to replace worn tires increases likelihood of skids resulting in accidents (209)
 Drove vehicle with knowledge of unsafe condition (204)
 Entered road section, bridge or tunnel closed to pedestrians (204)
 Drove on road closed to traffic for repair or construction (204)
 Attempting to cover too great a distance in day (208, 214)
 Time (allowed for trip) (402)
 Hitch-hiking in roadway (107)
 Drove in prohibited area (107)
 Stood in road to solicit business or ride (107)

43 Relating to recognition

Purpose of trip was to visit sick mother of wife and this was emotionally upsetting (but extent of upset was not recognized) (12.2)

5 Earlier Events

Definition: Act or negligence on the part of some person or organization that causes or permits the existence of conditions which may lead to accidents.

Own parent instability (127)
 An insecure childhood (130)
 Type of driving instruction (208, 214)
 Poor driver licensing procedures (205)
 Examination for license: none, superficial, complete (208)
 Driver's license: kind and place (208, 214)
 Support from an informed public (402)
 Education in schools and colleges (402)
 Coordination and analysis of accident records (402)
 Research (402)
 Legislation (402)
 Enforcement of traffic laws (402)
 Motor vehicle administration (402)
 Accident and violation record appeared to deviate from the norm (73.2)
 Driving history contains number of violations and accidents which subject attributes to own poor behavior. (55.2)

List of Condition Factors

In the following listing are condition factors which have been suggested by various sources. These are divided into three groups depending on whether they apply to trafficways (T), people (P), or vehicles (V) and each is further subdivided according to attributes and modifiers listed in Exhibits 3, 4 and 5. Categories 00, 10, 20, and 30 are for attributes of a general nature which do not fit well in any specific category provided.

Items are numbered in the listing to identify categories of classifications referred to above. Individual items within a category are not numbered, but may be roughly grouped by topics. For example in Category "T14. Recognizability of the Trafficway" appear two unnumbered items: "Color of pavement" and "Inadequate contrast between pavement and shoulder." If these individual items were to be used for classification purposes, further grouping, standardized phraseology and additional identifying numbers would be necessary. Until a more exhaustive list of possibilities can be developed, such further classification would be premature.

Numbering in modifiers is not consecutive. There are two reasons for this: first, as may be seen from Exhibits 3, 4, and 5, permanent modifiers begin numbering with 41 and temporary modifiers do not require all the numbers up to 41; and second, there are no suggested factors for many possible modifiers. Most of the modifiers for which no suggested factors appear would be inappropriate for the particular attribute, but lack of a suggested modifier does not necessarily imply that the modifier would not apply.

The numbers in parenthesis following individual items refer to source documents in list of references if they have no decimal point. Those with decimal points refer to cases in Derived Factors in Traffic Accidents.²²

T. Related to Trafficway

TOO. GENERAL (Not related to specific phase)

Road design (402)
 Road condition (402)
 Road under construction or repair (204)
 Complexity of traffic environment (36.2)
 High traffic density (67.2, 115.2)
 Other drivers and pedestrians (402)
 Traffic making frequent changes in velocity and track (67.2)
 Weather (402)

T10. RECOGNITION, GENERAL (Not related to specific attribute listed in Exhibit 3)

Absence of "cues in close proximity" by which to judge speed (209)
 Road configuration presented large area to scan (121.2)

T11. LIGHT

Light from other sources than headlights, for example abutting buildings, flares, floodlights (208, 12.2)
 Glare at night from street lights (115, 120)
 Inadequate lighting (207, 108.2)
 Reduced visibility under low illumination (205, 67.2)
 Good modern lighting (208)
 Good lighting of a particular hazard (204, 208)
 .11 Weather and atmospheric conditions

- Cloudy weather (120, 208)
- .12 Natural light
 - Degree of natural light as affected by time of day (208)
 - Light contrast very sharp with deep shadows under viaduct and bright sunlight beyond (21.2)
 - Bright afternoon sun tended to high-light stop sign intended for intersecting alley (57.2)
 - Bright sunlight casts obscuring shadows (21.2)
 - Dark surfaces on unlighted highways reduces perception of silhouettes (205)
 - Dark pockets between lighted areas (115)
 - Sun glare (as it affects visibility of road) (115, 120, 204, 73.2)
- .19 Surface Deposits
 - Reflection from road surfaces in wet weather reduces visibility (115, 205, 12.2)
- T12. VISIBILITY (definition) An attribute of the trafficway situation especially the atmosphere which determines the amount of light emitted or reflected by an object to reach a traffic unit for sensual stimulus. Visibility is used in the aviation sense and is not to be confused with light or view obstructions.
- .11 Weather and Atmospheric Conditions
 - Snowing (120, 208)
 - Snow and wind blowing in driver's face reduced visibility (132.2)
 - Rain reduced visibility (120, 208, 26.3, 55.2, 101.2, 108.2, 125.2)
 - Foggy weather (120, 208)
 - Clear weather (120, 208)
 - Dust storm (as it affects visibility of road) (208)
 - View obscured by dust or smoke (204, 208)
- T13. VIEW OBSTRUCTIONS
 - Sight obstructed by embankment (115, 120, 204, 208)
 - Perceptual illusion created by crest (3.2)
 - Blind curve (115)
 - Blind intersection (115, 207)
 - Hill crest (view obstruction) (208, 115)
 - Sight obstructed by advertising signs (120, 208)
 - Sight distance to intersection inadequate (204)
 - Sight distance on vertical curve (204, 208)
 - Minimum sight distance of curve (208)
 - View of traffic from ramp terminal inadequate (204)
- .15 Roadside objects
 - Parked vehicles (204, 3.2, 24.3, 26.3, 33.2, 36.2, 86.2, 108.2, 109.2, 129.2, 134.2, 138.2)
 - Sight obstructed by buildings (120, 208, 19.2)
 - Gas station blocked driver's view (132.2)

- Sight obstructed by trees, brush, hedge, etc. (120, 204, 208, 24.3, 33.2, 49.2, 55.2, 67.2, 87.2, 129.2, 138.2)
- Street viaduct posts (21.2)
- .16 Objects on the Road
 - Non-contact vehicles in traffic stream obstructed vision (26.3, 49.2, 67.2, 101.2, 109.2)
- T14. RECOGNIZABILITY (definition) An inherent attribute of the trafficway, especially the roadway which enables a driver, pedestrian, or other highway user to perceive its dimensions, alignment and other characteristics. Do not confuse with recognizability aides.
 - Color of pavement
 - Inadequate contrast between pavement and shoulders
 - .19 Surface Deposits
 - Edge of the road indeterminate because of snow (209)
 - Icy pavement dirty and blended with color of street (81.3)
- T15. RECOGNIZABILITY AIDS (definition) Attributes of trafficways which are provided in part to assist in perceiving alignment of the path to be followed and obstructions to travel on or adjacent to the path.
 - Lack of well defined lane markings (115, 204, 92.2)
 - No center line marking (115, 204)
 - No crosswalk markings for pedestrians at major intersections (204)
 - Raised center line (208)
 - No diagonal pavement markings to warn of fixed roadway obstruction (204)
 - No nose-or funnel-marking at exit or entry ramps (204)
 - Reflectorized center line (208)
 - No turn marking or stop line marking
 - .13 Temporary warning devices
 - No flares or flags set out for disabled vehicle (204)
 - .19 Surface deposits, ruts
 - Pavement marking obscured by ice, snow or mud (115, 204)
 - .41 Wear
 - Pavement marking worn away (115, 204)
 - Painted center line worn away (115, 208)
- T16. DISTRACTIONS, MONOTONY
 - Signals (as distractions) (208, 214)
 - Advertising signs (204, 208, 214)
 - Sudden distraction (bee sting, etc.) (208)
 - Road Distractions (prevent observation) (204)
 - Monotonous road conditions (209)

- .11 Weather, Atmospheric conditions
Lightning flash (as distractions)
- .14 Temporary roadside activities
Young children screaming beside road (65.2)
People on sidewalks (204, 208, 214)
- .16 Objects on the road
Other automobiles (as distractions) (204, 208, 214)

T17. CONFUSION, STANDARDIZATION

- Inadequate contrast between signal and other lights in vicinity (204, 109.2)
- Stop sign post not removed although sign had been removed (87.2)
- Stop sign facing alley which intersected street at acute angle appeared fully visible from the street. (57.2)
- Standard or non-standard STOP sign (208)
- Standard or non-standard warning signs (208)
- Non-uniform traffic signs (205, 134)
- Standard or non-standard type of traffic signals (208)
- Standard or non-standard sequence of phases of traffic controls (208)
- Standard or non-standard location of traffic signals (208)
- Overhead traffic signal (87.2)
- Sign poorly placed--too low, too high (204)
- Too many signs are confusing (204)
- Sign legend components confusing (204)
- Sign or letters too small (204)
- Insufficient differentiation between major and minor signs (204)

T18. WARNING SIGNS

- Painted warning signs (115, 204, 208)
- Warning signs missing, inadequate or obscured (115, 204)
- Reflectorized warning signs (208)
- Inadequate advance warning of approaching traffic intersection or interchange, curve or bridge (204)
- Inadequate advance warning of change in trafficway alignment--islands, narrowing, expanding, no passing zone, etc. (204)
- No pavement width transition marking (204)

- .13 Temporary warning devices
Warning devices for road repairs not at sufficient distances to enable drivers to adjust speed (204, 209)

T19 GUIDE SIGNS

- Inadequate street signs (49.2)
- Entrance to parking lot poorly marked (32.2)

- .20 Road damage
Sign down (115, 204)

T21 SIGNALS

- Busy intersection needed traffic signals to control flow but had only stop signs (115.2)
- Traffic signal too small, too high, too low, too dim (204)
- Traffic signals in working order or otherwise (204, 208)
- Type of railroad grade crossing protection (gates, watchman, wigwag, etc.) (208)
- Railroad grade crossing protection functioning properly or otherwise (208)
- Flashing stop sign (208)

- .19 Surface deposits
Traffic signal obscured by mud, dirt (115, 204)

T22 TRAFFIC SIGNAL CONTROLS

- Traffic flow controls (402)
- Yellow light supposed to come on in conjunction with green and this was not a "fail-safe" design. (109.2, 67.2)
- Yellow light in conjunction with red gives mistaken impression that green light is about to come on. (109.2)
- Cycle length of traffic signal too long or short for traffic volume (204)
- Traffic signal not coordinated with railroad crossing signal (204)

- .17 Loss of adjustment, Alignment
Yellow light of green-yellow overlap signal phase was inoperative (67.2, 109.2)

T23 REGULATORY SIGNS AND MARKINGS

- Regulatory Sign too wordy to be read quickly (204)
- Yellow line (no crossing) (115, 208)
- Regulatory Signs are not constructed with large enough safety margins for those with below normal vision (205)
- Reflectorized STOP sign (208)
- Painted STOP sign (208)
- Low discriminability between a circle and octagon (205)
- Regulatory Signs which are not clearly visible (419)

- .19 Surface deposits
Sign obscured by mud, dirt (204)

T30 PERFORMANCE GENERAL-(Not related to specific attribute listed in Exhibit 3)

- Intersection or interchange design features hazardous (204, 208)
- Expressway design features hazardous (204)
- No crossing provision for high volume of pedestrians (204)

T31 **ALIGNMENT** (definition) Horizontal and vertical changes in direction of the path available to a traffic unit as an attribute of the trafficway related to performance of the traffic unit in changing speed or position in the path. Turns in the path at junctions to leave one road and join another and turns to avoid stationary objects are included.

Downgrade (208)
 Incline due to crown of intersecting street (46.2)
 Steep down grade of minor road at junction (207)
 Upgrade (208)
 Road grade excessively steep (204)
 Ramp grade too steep (204)
 Grade of straight section (208)
 Curve--turn, reverse, hairpin or compound (208)
 Direction of curve (right or left) (208)
 Length of curve (208)
 Radius of curve (208)
 Rate of change of vertical curve (as affecting bounce) (208)
 Length of spiral (208)
 Length of vertical curve (as affecting bounce of vehicle)
 Sharpness of curve (205, 208)
 Entering ramp curve not fitted to roadway curve (204)
 Turning radius too short causing cars to change lanes (204)
 Narrowing of road (21.2)
 No interchange, or traffic separation at busy intersection (204, 415)
 Village on major road with no bypass (207)
 Traffic circle acts as hazard for high-speed through traffic (204)
 Blind and direct cross roads (207)
 Blind and unbanked bend (207)

.12 Natural light
 Unlighted obstructions (115)

.15 Roadside Objects
 Constriction of road resulting from viaduct supports in center (21.2)

.16 Objects on the road
 Obstruction (unspecified) in roadway (115, 204, 208)
 Non-contact vehicle interfered with desired movement. (3.2, 81.3, 86.2, 92.1, 101.2, 105.2, 110.2, 121.2, 122.3, 134.2)

T32 **SURFACE CHARACTER** (definition) Attributes of the surface of the road related to performance of the traffic unit in changing speed or position in the path including objects on the road which are ordinarily run over rather than around.

Approximate coefficient of friction (208)
 Material in shoulder (204, 208)
 Dense, impervious road surfaces are more slick when wet (205)

Road surfaces offering insufficient traction when wet (205)
 Texture of road--fine, open, hard, polished, etc. (208)
 Tar ridges between pavement blocks cause skids (209)
 Uneven road surfaces cause skids (209)
 Road well maintained, resulting in smooth riding (208)
 Superelevation (204, 208)
 Type of surface: Earth, gravel or slag, bituminous, concrete, brick, block other than brick (208)

.17 Loss of adjustment, Alignment
 Manhole cover or other fixed installations loose (204)
 Pavement dip or bump (208)

.19 Surface deposits, ruts
 Sleeting weather (slippery surface) (208)
 Foreign material on road surface (208, 115, 49.2.2)
 Ice on road (85.2, 204, 208)
 Snow on road (204, 208)
 Ice covered street topped with snow (79.2)
 Water on road (115, 204, 208)
 Coefficient of friction reduced due to wet pavement (12.2, 55.2, 67.2)
 Ruts in snow or ice cause skids (209)
 Sleet, slush on road (204, 208)

.41 Brick surface was polished and slippery (50.1)

.42 Deterioration, Age
 Road cracked, uneven, washboarded, rutted, etc. (115, 204, 208)

T33 **DIMENSIONS** (definition) Attributes of the road relating to performance of the traffic unit in avoiding objects or structures on the roadside or overhead, and in avoiding other traffic units on adjacent paths.

Narrow roads, narrow pavement, narrow lanes (50, 67.2, 204, 208)
 Bridges narrower than approaching roads (205)
 Ramp shoulders too narrow (204)
 Shoulder too narrow for emergency use (204)
 Median too narrow for emergency use or to minimize headlight glare (204)
 Insufficient maneuvering distance between ramps (204)
 Extra widening at curve (208)
 Width or depth of ditch (208)
 Width of shoulder (208)
 No left-turn median lane in high traffic volume intersection (204)
 Left-turn median lane too short to store volume of left-turning traffic (204)
 Exit and entry lanes too narrow for traffic volume (204)
 Length of weaving section in interchange insufficient for traffic (204)
 Insufficient maneuver distance between entry terminal and exit (204)
 Entry lane too short to permit safe merging of traffic in interchange (204)
 Overhead clearance inadequate (115)
 No footpath in urban area (207)

- .15 Roadside Objects
 - Side-of-the-road hazards (obstacles) (134)
 - Trees, poles, etc., on side in ditch or more than 8 feet from edge of road. (204, 208)
 - Trees, poles, etc., on shoulder or within 8 feet of roadway (204, 208)
- .16 Objects on the road
 - Narrow street with cars parked on both sides so only one narrow lane was available for traffic (85.2)
- T34. RESTRAINING DEVICES (definition) Attributes of trafficways, usually in the form of structures, intended to prevent a vehicle or other conveyance or a pedestrian from leaving the path provided or from striking an object in the road.
 - Inadequate channelizing of traffic at oblique intersection, 3-leg junction, multi-leg intersection (204)
 - Railroad barrier (208)
 - Guard rail (115, 204, 208)
 - Traffic channelizing islands (208)
 - Barricades
 - Unmountable curb
- P. Related to People
 - POO. GENERAL (Not related to specific phase)
 - Physical condition of driver (402)
 - Slow reaction time (130, 203, 208, 214, 423)
 - Inconsistency in reaction time (134)
 - Men have a higher accident rate per driver than women (120)
 - Little ability to compensate for psychophysical limitations (134)
 - .14 Pressure, Stress, Hurry
 - Haste to keep an appointment (driver hurry) (208, 214, 12.2)
 - Hurry because of emergency (real or imaginary) (208, 214)
 - Haste to arrive at home, office, resort, etc. (115, 208, 115.2, 138.2, 214)
 - Work stress, generally social stress (130)
 - Anxious to complete errand (109.2)
 - Driver under pressure from husband to drive (44.2)
 - .16 Weather
 - Poor weather conditions affect driver's strength and vitality (205)
 - Extremes of humidity affect driver vitality, strength, judgement (205)
 - Extremes of temperature effect driver's vitality, strength, judgement, etc. (205)
 - .18 Ingestion, Inhalation

- Medication (115, 204)
- Drunk drivers (115, 120, 204, 205, 208, 214)
- Chronic alcoholic forced to drive by sudden request from husband (22.2)
- Physiological adjustment after excessive use of dexedrine (67.2)
- .19 Fatigue, Boredom
 - Fatigue causes accidents. Lowered effectiveness at the wheel after long hours of driving increases liability to accidents (115, 120, 204, 205, 208)
 - Fatigue resulting from evenings of labor (132.2)
- .20 Temporary illness
 - Week long toothache (138.2)
 - Temporary illness (120, 204)
 - Sudden illness (115, 208, 214)
- .21 Injury
 - Brain injuries (415)
- .41 Deterioration, Age
 - Aging increases the likelihood of accidents (130)
 - The age of the driver has a bearing on the type of accident (120)
- .42 Chronic illness
 - Serious mental disease (or disease of central nervous system) (204, 214, 208)
 - High blood pressure, rapid pulse and large GSR (205)
 - Low blood pressure (205)
 - Chronic fatigue (67.2)
 - Chronic alcoholism (22.2, 208, 214)
 - Addiction to drugs (115, 204, 208, 214)
 - High blood pressure (205, 208)
 - Blood pressure variability (203)
 - Low systolic blood pressure (127, 203, 208)
 - Epilepsy (208, 214)
- .44 Experience, Training
 - Driver inexperience (204, 208, 214, 26.3, 44.2, 50, 57.2, 79.2, 81.3)
 - Number of years in school (age at leaving) (208, 214)
 - Highest class reached in school (208, 214)
 - Length of time Driver's License held (208, 214)
 - Number of times Driver's License revoked and suspended. Length of revocation or suspension (208)
 - Previous industrial or home accident experience (208, 214)
 - Previous motor or traffic accident experience (208, 214)

Source of instruction as driver--1) automobile dealer, 2) friend or relative, 3) self-taught (208, 214)
 Period of time over which driving instruction extended (208, 214)
 Kind of experience 1) country or suburban roads, 2) City streets (208, 214)
 Type of driving instruction - formal course of instruction to form proper driving habits (208, 214)

.46 Authority, Enforcement

Poor law enforcement increases accidents. (205, 421)
 Traffic behavior patterns force driver to make left turns on yellow or red lights (26.3)
 Pedestrian unable to cross safely without crossing guards. (115.2)

P10. RECOGNITION GENERAL.- (not related to specific attribute listed in Exhibit 4)

Lack of skill to recognize road situations (115)
 Unable to perceive fact that southbound traffic had green light while northbound had red light (22.2)
 Psychological constriction of the road resulting from proximity of viaduct supports (21.2)

.42 Chronic illness

Perceptual judgment reduced by chronic fatigue (33.2)

P11. OBSERVING HABITS

Inattention (423)
 Failure to make use of entire visual field (422)
 Failure to keep the eye level sufficiently high (422)
 Failure to observe signs and signals (421)
 Faulty seeing habits (701)
 Expectancy of finding stop signs not met because signs had been replaced with overhead signal (87.2)
 Using tail lights of vehicles ahead as direction cues rather than scanning road edges and dividers (209)
 Attention focused on older driver in old vehicle whose actions appeared uncertain (32.2)
 Scanning pattern to rear inadequate (86.2, 105.2)
 Conversing with companions (208, 214)
 Use of mirror (208)
 Unable to scan entire traffic situation (101.2)
 Attention directed to traffic signal and not traffic situation (125.2)
 Attention directed to non-contact car (110.2)
 Driver habitually peers between door and door frame before alighting on left side (105.2)
 Habit pattern of giving only a fleeting glance to rear before pulling away from curb (118.2)

Poor habit pattern for scanning view to rear (129.2)
 Directed primary attention to instruments on dash board (204)
 Directed primary attention to rear view mirror (204)

.14 Pressure, Stress

Hurry caused inadequate scanning pattern (122.3)

.16 Weather

High temperature reduces visual vigilance

P12. SENSORY ABILITIES (definition) Attributes of drivers, pedestrians or cyclists which help or hinder them in perception by seeing, hearing, feeling or otherwise sensing the alignment of the path to be followed, obstacles in the path, and conditions of the vehicle and road which might affect the ability of the traffic unit to follow the path provided and avoid events which would result in accidents. Sensory abilities include the effects of sensory aids, such as eyeglasses, which may be attached to or worn by the person.

Narrow field of vision (203, 205, 208)
 Poor visual acuity (115, 120, 208, 208)
 Monocular vision (129.2)
 Poor vision (205, 108.2)
 Color blindness (203, 208, 214)
 Depth perception (203, 205)
 Sensitivity to glare (208)
 Dark adaptation (203)
 Impairment of vision in night driving (120)
 Astigmatism (208)
 Anisekonia (208)
 Ocular dominance (208)
 Scotoma (208)
 Stereoscopic vision (208, 214)
 Phoria (208)
 Slow perceptual speed relative to motor speed (205)
 Unable to find desired destination due to heavy traffic (32.2)
 Unable to perform difficult perceptual task (26.3)
 Speeding at night reduces vision (421)
 Poor hearing (120)
 Poor distance judgment (115, 205)

.11 Glasses, etc.

Eye glasses (208, 214)

.12 Sun exposure

Exposure to sunlight reduces night vision (115, 120, 205)

.16 Weather

Lowered environmental temperature reduces the driver's feel of the vehicle leading to steering difficulties (420)

High altitude decreases oxygen and decreases sensitivity in touch and muscle senses (205)

- .18 Ingestion, inhalation
Perceptual judgment affected by blood alcohol (33.2, 36.2, 22.2)

Continued exposure to small concentrations of carbon monoxide result in loss in night vision and in drowsiness (205)
High alcohol level in the blood decreases visual acuity (205)

- .41 Deterioration, Age
Visual acuity of older drivers is less (421, 73.2)
Ocular muscle imbalance (127, 203)

P13. SIGNALLING HABITS

Improper signals (120, 208)
Failure (by driver) to signal (120)

- P14. RECOGNIZABILITY (definition) A group of attributes of pedestrians and also sometimes other highway users, which helps or hinders visual or other perception of their positions or movements. Included are such things as size, color of clothing and contrast of parts and any recognizability aids such as lights carried but not attached to a conveyance.

Pedestrians in light colored clothing are less likely to be in accidents.
Light carried by pedestrian

- P15. KNOWLEDGE (definition) The collection of information that a driver, pedestrian, or cyclist has accumulated about trafficways, vehicles and people, including himself, by which he may comprehend what his senses detect concerning the situations with which he has to cope in traveling on a trafficway.

NOTE: This category could be expanded almost indefinitely. The items listed below are those which have been suggested by various sources.

Driver knowledge (203, 402)
Lack of knowledge of traffic rules (130)
Lack of knowledge of laws (115, 208, 214, 421)
Lack of knowledge of safety rules not in laws (115)
Knowledge of effect of speed on stopping distances (208, 214)
Knowledge of effect of surface conditions on stopping distance (208)
Knowledge of effect of surface on passing distances, etc. (208)
Knowledge of effect of speed on curves; braking on curves, accelerating on curves (208)
Knowledge of penalties for violations (208, 214)
Knowledge of power of car (214)
Knowledge of mechanics involved in driving (208, 214)
Knowledge of effect of lighting (natural or artificial) on passing distances (208)

Knowledge of effect of lighting (natural or artificial) on safe driving speeds (208)
Knowledge of effect of speed on severity of accident (208, 214)
Knowledge of weight of car in relation to its kinetic energy (214)
Knowledge of significance of traffic control devices (208)
Not familiar with actual driving practices (26.3)
Not familiar with practices when leaving parking place (44.2)
Responsibilities toward pedestrian when crossing sidewalk not recognized (36.2)
Responsibility for maintaining safe distance when following not recognized (65.2)
Lack of mechanical ability (130)
Lack of skill to judge and anticipate other traffic (115)
Understanding of the traffic problem in general (208, 214)
Unfamiliar with automatic transmission (120.1)
Amount of rotation of steering wheel required not perceived by driver (3.2)
Unfamiliarity with road (115, 49.2, 57.2, 67.2, 87.2, 138.2)
Unfamiliar with operation of vehicle or its equipment (115, 204, 36.2, 50.1)
Speaking, understanding or reading of English (208, 214)
Speaking, understanding or reading of other language than English (208, 214)

P20. DECISION GENERAL (Not related to specific attribute listed in Exhibit 4)

Anticipating action of other drivers (208)
Expectations concerning behavior of other traffic units not met (3.2, 7.2, 24.3, 26.3, 33.2, 36.2, 44.2, 49.2, 53.2, 57.2, 65.2, 81.3, 87.2, 92.2, 105.2, 108.2, 109.2, 110.2, 121.2, 122.3, 129.2, 132.2)

- .13 Emotional upset
Distressed prior to accident over failure to accomplish purpose of trip (57.2)
- .15 Preoccupation
Not expecting anything to happen (208, 214)
- .46 Authority, Enforcement
Boy riding bicycle of other child contrary to recent instruction of mother (36.2)

- P21. INTELLIGENCE, JUDGMENT (definition) A decision attribute of pedestrians, drivers, and other highway users which includes reasoning, memory and learning, particularly as related to evaluation of perceptual impressions in terms of knowledge and experience for the purpose of selecting appropriate action for trip preparation, strategy and evasive action.

Below average intelligence (130, 36.2)
Lack of proper judgment (421)
Momentary loss of judgment and loss of fear of consequences causes accidents (700)
Overcautiousness and indecision (108.2)

Slow judgment and reactions to new situations (26.3)
 Choice of reaction (203)
 Seeing other vehicles traveling at unsafe speeds without trouble incites driver to follow. (social facilitation) (209)
 Low traffic density increases risk taking (205)
 Failure to allow for errors of others (208, 214)
 Child pedestrian given false sense of security by driver stopped at stop sign who motioned for him to cross in front of his car (21.2)
 Reinforcement of idea that high speeds are safe on icy and wet roads is a function of how long higher speed operation is uninterrupted by skid or other indication of danger (209)
 Over-estimation of own driving ability in handling adverse road situation (209)
 Clear-cut definitions of what conditions can and cannot be handled are lacking when road conditions are wet or icy (209)
 Drivers with little ability to estimate speed are more prone to have accidents (130)
 Ability to make decisions rapidly (208, 214)
 Feeble mindedness, imbecility, etc. (214)

.44 Experience, training
 Lack of intelligence in applying knowledge to situations (115)

P22. ATTITUDES (definition) Decision attributes of drivers, pedestrians, or other highway users consisting of an enduring organization of perceptual, motivational, and intellectual factors, which effect perception, judgment, values, and interpersonal behavior.

Improper attitudes (402, 421)
 Social maladjustment (130)
 Deviation from social norms (130)
 General personal adjustment (205)
 Poor psycho-social adjustment (205)
 Lack of social cohesion (130)
 General irresponsibility in jobs, family and education (127)
 Carelessness (207)
 Willingness to take risks (115, 205, 208, 214)
 Habitual haste (120, 208, 214)
 Habitual speeding (208, 214)
 (Knowing and willful) violations of the road rules (134)
 Poor attitude toward law enforcement (115, 208, 214)
 Feeling that because others do it, it's all right (208, 214)
 Poor attitude toward the pedestrian and toward other drivers (134)
 A non-cooperative attitude (134, 208, 214)
 Too great a sense of security about driving ability (115, 208, 209, 214)
 Overgrown ideas of rights (208, 214)
 Lack of interest in preventive maintenance (209)
 Casual "sports car" attitude toward driving (3.2)
 Over-cautiousness (209, 3.2, 126.2)
 Underestimation of importance of good driving (208)

Felt others were responsible for accident (7.2)
 Attitude that accidents occur impersonally and are inevitable if one drives enough (44.2)
 Attitude that driving is a way to impress others by unusual behavior (118.2)
 Attitude that traffic laws apply more to others than self (55.2)
 Attitude that she was above arrest (53.2)
 Driver and companion each tried to impress the other (118.2)
 Driver especially aware of his oversized car (101.2)

.13 Emotional upset
 Driver impatient with behavior of other vehicle (3.2)
 Driver irritated by slow moving truck ahead (65.2)

.14 Pressure, Stress
 Driving under adverse road conditions generates impatience (209)

.16 Weather
 Rain made driver over cautious

.46 Authority, Enforcement
 Presence of motorcycle policeman made driver overcautious (57.2)

P23. EMOTIONAL STABILITY (definition) A decision attribute of drivers, pedestrians, or other highway users which inhibits tendencies to impulsive or irrational actions or may unduly delay decisions because of worry, depressed states, or exuberance.

Emotional instability (130, 205)
 Emotional immaturity (115, 127)
 Neurotic traits (127)
 Personality adjustment (203)
 General nervousness (208, 214)
 Nervousness prevented action (208, 214, 120.1)
 Worry (208, 214)
 Temperamental immaturity (205)
 Impulsiveness (115, 130, 205)
 Excitability (208, 214)
 Claustrophobia (209)
 Irrascibility (208, 214)
 Aggressiveness (130, 134)
 Badly integrated aggressiveness motivates the driver to commit aggressive acts toward other drivers (416)
 Competitiveness (127)
 Low frustration tolerance (209)
 Unconscious guilt feelings (130)
 Psychological need for self-punishment for guilt (205)
 Psychological need to have accidents (205)
 Need to secure attention (205)
 Low morale with regard to job satisfaction (205)

Childhood socio-emotional instability (127)
 A revengeful attitude toward superiors and toward rules in general (130, 208, 214)
 Individuals with large GSR (205)
 Diffuse anxiety (55.2)
 Residue of psychoneurotic breakdown (67.2)
 Driver ego-defensive in his reactions (67.2)
 Child pedestrian had psychological need to assert independence from mother (21.2)
 Driver annoyed by horn blowing (49.2)
 Driver panic stricken (120.1)

.13 Emotional upset

Driver flustered when rear of car hit a concrete retaining wall. (120)
 Emotional stress due to recent quarrel (67.2)
 Near plane accident previous day caused fright and emotional reaction (73.2)
 Personal relationship between driver and daughter-in-law was strained (passenger was son of daughter-in-law) (73.2)

.14 Pressure, Stress

Adverse emotional climate induced by important research project driver would soon terminate (55.2)

P24. ALERTNESS, CONCENTRATION (definition) An attribute of drivers, pedestrians, and other highway users which helps decision making by keeping the mind cleared of irrelevant preoccupations and inhibiting attention to irrelevant external situations outside or inside the vehicle. Concentration includes the ability to resist distractions so that sensory faculties may be directed continually to detect cues for precautions and hazards requiring evasive action, and the mind is continually free to make decisions related to following the path and avoiding hazards.

Driver distracted by passengers (12.2, 24.3, 57.2, 73.2, 81.3, 87.2, 121.2, 122.3, 125.2, 129.2, 122.3)
 Distracted by speedometer (24.3)
 Distractibility (prevent thinking) (204)
 Primary attention directed to map or other reading material in lap or seat (204)
 Primary attention directed to pipe, cigarette, etc., which had fallen to floor of vehicle (204)
 Lack of attention maintaining habits to resist distractions (115)
 Attention directed to adjusting car, clothing or load (208, 214)
 Attention focused on smoking (208, 214)
 Preference for a low tempo of activity (205)
 Distracted by conversing with companion (208, 214, 115.2)
 Driver startled (distracted) by passenger (204)

.15 Preoccupation

Daydreaming (208, 214, 132.2)
 Distracted by car in rear view mirror "hugging his tail". (92.2)
 Distracted by boy friend pulling away from curb on opposite side of street (118.2)
 Personal conversation permitted to take precedence over driving task (125.2)
 Thinking about other things (115, 208, 214)
 Driver preoccupied (109.2)

.16 Weather

High environmental temperature reduces alertness (420)

.19 Fatigue, boredom

Familiarity with the road (boredom) contributes to a sense of security and complacency leading to lack of alertness (209)
 When curves are scattered infrequently on straight roads, the rates of accidents on curves increases (205)
 Falling asleep at the wheel is caused by monotonous background conditions (115, 120, 204, 208, 209, 214)

P30. PERFORMANCE GENERAL (Not related to specific attribute listed in Exhibit 4)

Incorrect position on road (206)

P31. OPERATING SKILL, HABITS (definition) Performance attributes of drivers, pedestrians, or other trafficway users enabling them to perform various maneuvers and operational sequences promptly and properly. Operating skills are based on muscular coordination abilities and practice.

Faulty driving habits (115)
 Poor driving skill (115, 130, 203, 402)
 Poor coordination (115, 130, 208, 214)
 Right or left handed (208)
 Tendency to hug the inside of the pavement when negotiating a curve despite the direction of travel (204, 209)
 Method of making stops: 1) 'brake' driver, 2) 'accelerator' driver (208, 214)

.13 Emotional upset

Skilled reactions tend to become disorganized under emotional stress (205)

.16 Weather

Low temperature affects manual dexterity (205)
 High temperature has adverse effects on skill (205)

.18 Ingestion, inhalation

Alcohol impairs performance in more complicated and less frequently performed tasks (205)

- .44 Experience, training
 - Lack of experience driving on ice and snow (79.2)
 - Lack of experience in high density traffic (26.3)
 - Inadequate driver training (205)

P32. SIZE, WEIGHT, STRENGTH

Strength of grip (203)
 Lack of physical strength to hold steering wheel firmly in blow out causes car to get out of control (115, 209)
 Handicapped by stature (115)
 Since cars are designed for the average driver, individuals extreme in size (small or large) may be involved in more accidents (205)
 Handicapped by weight (115)

- .16 Weather
 - Lowered environmental temperature reduces hand-grip strength (420)

P33. FREEDOM OF MOVEMENT

- .21 Injury
 - Temporary injury (120, 204)
- .42 Chronic illness
 - Paralysis (208, 214)
- .43 Permanent injury
 - Loss of leg or foot (115, 208)
 - Loss of arm or hand (115, 208)

V. Related to Vehicles

V00. GENERAL Not related to specific phase

Vehicle design (402)
 Condition and maintenance of vehicle (402)
 Defects in cars cause accidents (205)

- .18 Contamination
 - Carbon monoxide at dangerous levels (115, 205)
- .41 Deterioration, Age
 - The age of the car (older cars are in poorer condition) (209)
 - Car generally decrepit (208)

- .42 Irreparable damage
 - Previous accidents or breakdowns resulting in weakening of some vehicle part (209)

V11. RECOGNIZABILITY (definition) A group of intrinsic attributes of vehicles or other conveyances which help or hinder visual or other perception of their positions, movements, or dimensions. Included are such things as size, shape, color, contrast of parts and sound or noise but not recognizability aids or sensory aids.

Low color contrast between road and vehicle (67.2)
 One headlight out (208, 204)

V12. RECOGNIZABILITY AIDS (definition) A group of attributes of vehicles or other conveyances which are provided, in part at least, to aid visual or other perception of their position, movement or dimensions. Attributes which assist vehicle recognizability include such things as tail lights, parking lights, limit lights, reflectors, special colors and striping.

Taillight improperly located (208)
 Ineffective or no clearance light on trucks (208)
 Tail light failure (107, 115, 120, 204, 208)
 Special colors and striping

V13. ROAD ILLUMINATION

Headlight failure--burnt out, broken, etc. (115)
 Both headlights out (120, 204, 208)
 Head lights too high (glaring) (208)
 Headlights too low (insufficient vision) (208)
 Insufficient candlepower in headlights--in focus, out of focus (208)
 Headlight beam indicators (418)
 Four headlight system (418)
 Defective lighting equipment (107)
 Sealed beam headlights (418)
 No lights (on car) (208, 204)
 Spotlight (208, 418)

- .11 Glare
 - Glaring headlights (115, 120, 205, 209)

- .12 Weather
 - The inability of headlights to pierce fog (209)

- .17 Adjustment loss, ineffective
 - Blown out fuse (204)

V14. SENSORY AIDS (definition) A group of attributes of vehicles or other conveyances which help or hinder the driver in seeing or otherwise perceiving the trafficway situation.

Wrap-around windshields distort vision (205)
 Vision field increased by wrap-around windshield, narrow pillars and increased area of side and rear windows (418, 122.3)
 Tinted windshields reduce visual acuity (205)
 Windshield, side glass, or rear window discolored, cracked or patched. (204, 208)
 Heat absorbing and glare reducing glass reduces eye strain and does not impair night visibility (418)
 Inefficient windshield wipers is a factor in poor visibility (120, 204, 209, 55.2)
 Windshield wipers halted on acceleration (67.2)
 Dual automatic windshield wipers (418)
 Windshield washer and defroster (418)
 No side view mirror (204)
 No rear view mirror (120, 204, 208)
 Inside sun visors (418)
 Windshields are placed too high so that the driver is unable to ascertain where his wheels are and thus veers away from the right shoulder of the road (209)
 Curb feelers lacking

- .11 Glare
 Sun glare (as it affects vehicle's ability to transmit stimuli (115, 120)
- .12 Weather
 Motorcycle afforded rider poor protection against snow and wind blowing in his face (132.2)
- .13 Surface deposits
 Moderate amount of ice on windshield (81.3.2)
 Rain on windshield and/or side windows reduced visibility (55.2, 101.2, 108.2, 132.2)
- .17 Adjustment loss, defective
 Window defects that cause confusing or blinding light reflections (120, 204, 208)

V15. VIEW OBSTRUCTIONS

Part of vehicle obstructs driver's view from within (115)
 Sun visor reduced forward visibility (73.2)
 Rear view mirror masked approaching vehicle (19.2)
 Hood partially masked from view smaller car immediately ahead (125.2)
 Windows replaced with cloth, cardboard, etc. (208, 120)
 Placement of fenders so that the driver is unable to see them, and is unable to ascertain where his wheels are (209)

- .13 Surface deposits
 Windows covered with snow or sleet (120, 204, 208)

Tendency for windshield to steam up when not ventilated is a factor is visibility reduction. (209)
 Windshield covered with stickers, pennants, etc. (120, 208)
 Using windshield wipers on slush-splattered windshield often reduces visibility (209)
 Windows dirty, dusty, wet, foggy, etc. (204, 208, 73.2)

- .14 Cargo
 Load obstructs view (115, 120)
- .15 Passengers
 Passengers partially obstructed driver's view (107, 204, 24.3)

V16. DISTRACTIONS

Radio (208, 55.2)

- .15 Passengers
 Passenger distractions (12.2, 24.3, 57.2, 73.2, 81.3, 87.2, 121.2, 122.3, 125.2, 129.2, 122.3)
 'girl friend' distraction (208)
 Backseat driving (208, 214)

V17. INSTRUMENTS (definition) A group of attributes of vehicles or other conveyances usually in the form of devices attached to the vehicle which help or hinder the driver in perceiving the motion, position or condition of the vehicle.

Car equipped with speedometers that provide speedwarning (418)

- .17 Adjustment loss, defective
 Fuel gauge not accurate

V18. SIGNALLING DEVICES (definition) A group of attributes of vehicles or other conveyances, usually in the form of vehicle equipment, which is intended to assist the driver in communicating his intentions or other information to other traffic units in the vicinity. Signalling devices include such equipment as horn, turn signals, and brake signals, but not recognizability aids.

Turn indicator improperly designed (121.2)
 Turn signal of approaching vehicle presented misleading message (33.2)
 Stop signal not operating when vehicle slowed suddenly (204)
 Directional signals (418)
 Dual stop lamps (418)
 Brake lights, turn signals (120, 204, 208)
 Horn failed (120, 204)

V20. DECISION-GENERAL-(Not related to specific attribute listed in Exhibit 5)

Vehicles producing carbon monoxide

V21. COMFORT

. 12 Weather

Air conditioning decreases driver fatigue, wind noise, and prevents entry of insects (418)

V22. SYMBOLISM (definition) Attributes often stereotyped, of the vehicle which signify to its driver or other highway users status, privilege, or possible behavior because it indicates, use, kind of person driving, or special purpose of trip and so influences decisions, especially expectancies. Symbols are cues to behavior.

An ambulance makes its driver think speed is necessary

Fire equipment can be expected to run red lights

A customized car suggests that its driver may do risky things

The big truck and trailer will block the road because of slow speed on an upgrade.

Post office trucks make the driver feel he can stop in crosswalks or intersections to pick up mail.

V23. AUTOMATIC CONTROLS

Car equipped with automatic transmission crept forward while engine idled (125.2)

Speed governor (418)

Automatic headlight beam control (418)

V30. PERFORMANCE GENERAL (Not related to specific attribute listed in Exhibit 5)

. 17 Adjustment loss, defective

Leaky carburetor contributing to fire (208)

Faulty electrical system contributing to fire (208)

. 41 Deterioration, age

Leaky exhaust pipe or muffler contributing to fire (120, 208)

V31. CONTROL ARRANGEMENT, FUNCTION

Closeness in height and lateral separation of brake and accelerator confused driver (50.1, 120.1)

Foot brakes hard or slow to operate (208)

Automatic transmission facilitates driving on grades and slippery surfaces (418)

Automatic transmission allows driver to devote fuller attention to steering, braking or accelerating (418)

Car equipped with power brakes and power steering (418)

Free wheeling and automatic clutch (208)

Hard steering: parts too tight (208)

Smooth pedal surfaces cause foot to slip (205)

Accelerator jammed (204)

Clutch pedal jammed (204)

Uneven pedals in the car lengthen braking time and thus cause accidents (205)

Non-standard shifting sequence (208)

Recessed control knobs (418)

Recessed steering wheel (418)

Operating levers placed to minimize injury in accidents may be inaccessible and thus take driver's attention off the road (701)

Poorly shaped operating controls result in operating errors (205)

Poorly located operating controls result in errors (205)

Poor control for lights, dimmers, etc. (208)

Car equipped with head light dimmer switches (418)

Starter failed (204)

V32. OPERATING SPACE

Incorrect position in vehicle (206, 208)

Car equipped with adjustable front seats (418)

V33. DIMENSIONS

Dimensions of vehicle too great (115)

Farm equipment too wide for single lane (being towed on highway) (204)

Trailers too long (204, 208)

Too many trailers (208)

. 14 Cargo

Load projects and collides with other traffic unit (115)

Parts of passenger projected from vehicle (107)

V34. WEIGHT

Overweight vehicles

Weight too great for condition of tires

V35. PERFORMANCE

Poor condition of brakes or steering mechanism (209)

Inadequate brakes (115, 207, 46.2, 46.2)

Failure of trailer brakes (208)

Insufficient trailer brakes (208)

Four wheel brakes (418)

No individual brakes on trailer (208)

Insufficient emergency brakes (208)

Insufficient foot brakes (208)

Hydraulic brakes (418)

Two wheel brakes (418)
 Power failure (115)
 Mechanical failure of steering (107, 115)
 High speed capacity of car creates emergency reserve, reduces engine strain (418)
 Increased horsepower increases maneuverability (418)
 Increasing number of power-consuming accessories and soft-riding tires require increased horse-power (418)
 Water in fuel system (204)
 No snow tires or chains (204)

- .13 Surface deposits
 - Hydraulic fluid baked on brake lining (204)
 - Oil strainer clogged (204)
 - Grease seal leaked on brake lining (204)
- .17 Adjustment loss, defective
 - Low hydraulic fluid level (204)
 - Mechanical failure of brakes (115)
 - Defective ratchet in emergency brake (208)
 - Water hose failed (204)
 - Water pump leak (204)
 - Engine stalled because of vapor lock (204)
 - Fuel pump defective (204)
 - Carburetor defective (204)
 - Distributor and points defective (204)
 - Generator defective (204)
 - Ignition coil defective (204)
 - Condenser defective (204)
 - Foot brakes not in adjustment (204, 208)
 - Trailer brakes not in adjustment (208)
 - Defective brakes (107)
 - Transmission system failure (204)
- .18 Damage, contamination
 - Steering system damaged by severe blows to front tires in striking curbs (50.1)
 - Broken spring (208)
 - Broken spring clip (208)
 - Engine block leak (204)
 - Radiator clogged (204)
 - Fuel line broken (204)
 - Oil pan leaking or broken (204)
 - Burned valves (204)
 - Oil line (to brakes) broken (204)
 - Brake hydraulic line failed, clogged or bent (204)
 - Air or vapor in brake line (204)
- .41 Deterioration, Age
 - Exhaust pipe rusted out (204)

Muffler rusted out (204)
 Fan belt broke (204)
 Sludge accumulation in valve chambers (204)
 Crankcase dilution (204)
 Broken shorted, corroded or loose electrical wires (204)
 Water jacket rusty (204)
 Defective or discharged battery (204)
 Spark plugs fouled (204)

- .42 Irreparable damage
 - Damaged bearings (204)
 - Cracked cylinder heads (204)
- .43 Wear
 - Worn parts of steering mechanism (204, 208)
 - Brake lining worn (204)
 - Worn master or wheel hydraulic cylinder (204)
 - Scored cylinders and pistons (204)
 - Slick tires (120, 204, 208)

V36. STABILITY

Coupling or trailer hitch failure (115, 204, 208)
 Flat tires (120, 204)
 Wheel wander due to under-inflated tires (204)
 Improper tire pressure increases the likelihood of blow-out accidents (208, 209)
 Imperfection in tire construction is a factor in blow-out accidents (209)
 Tire failure, blowouts before collision (115, 204)
 Wheel broke off (204)
 Wheel drum not concentric (204)
 Shimmy in steering mechanisms (120, 204, 208)
 Failure of any part of kneeaction (208)
 Whipping of trailer (208)
 Car equipped with independent front suspension. (418)
 Car equipped with air suspension (418)
 High center of gravity (208)
 Axles--front, rear (208)
 No safety chain on trailer (208)
 Narrowing of front corner pillars (to increase visibility) may not provide adequate support for top (418)
 Welded all-steel car body (418)

- .14 Cargo
 - Load shifts (and causes turn over) (209)
- .17 Adjustment loss, defective
 - Defective tires (107)
 - Improper wheel alignment (204)
 - Steering alignment is a factor in tire wear and is related to blow-out accidents (209)

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- .18 Damage, contamination
 - Frame of car broken (208)
 - Frame of car warped or sprung (208)
 - Tire casing patched (208)
- .43 Wear
 - Spotty wear on tires (208)

END