EVIDENCE IN TRAFFIC CRASH INVESTIGATION AND RECONSTRUCTION

ABOUT THE AUTHOR

R. W. (Bob) Rivers is a graduate of Northwestern University Traffic Institute's traffic accident investigation and police management training programs. He completed training with the Canadian Institute of Science and Technology in technical mathematics and areas of physics, studied psychology at the Okanagan Regional College, completed police administration training programs through the Canadian Police College and the University of Minnesota, and patrol management with the IACP. He developed the traffic accident investigation and traffic law enforcement training programs of the Royal Canadian Mounted Police and course training standards for the Canadian Police College, University of Alberta, and the British Columbia Institute of Science and Technology in technical traffic accident investigation. During his 33 years service with the Royal Canadian Mounted Police, Inspector Rivers was employed extensively in general police work, highway patrol, accident investigation, research and planning, and training and development. Since his retirement, Inspector Rivers has authored various internationally-recognized textbooks, acted as a consultant and has assisted in traffic accident investigation training and research studies on an international basis. Since its establishment, he worked for many years as an adjunct faculty member and director of correspondence training with the Institute of Police Technology and Management (IPTM), University of North Florida (<http://members.shaw.ca/mudrivers>).

EVIDENCE IN TRAFFIC CRASH INVESTIGATION AND RECONSTRUCTION

Identification, Interpretation and Analysis of Evidence, and the Traffic Crash Investigation and Reconstruction Process

By

R. W. RIVERS

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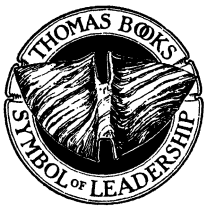

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To Dr. R. C. (Dick) Hodge
A true friend of the entire traffic crash investigation and reconstruction profession

FOREWORD

R. W. (Bob) Rivers needs no introduction to those in traffic crash investigation and reconstruction. Since the early1980s, he has written an impressive number of comprehensive training and reference works in this field as well as a host of shorter manuals on related topics. All have been widely read and many of them used in setting up training programs in the United States and Canada and around the world. Not only has he continued to write, he has also kept abreast of new developments and techniques in the discipline and has earned a reputation for accuracy and dependability from practitioners and technical experts alike.

Bob's latest book, published by Charles C Thomas, is titled *Evidence in Traffic Crash Investigation and Reconstruction* and subtitled *Identification, Interpretation and Analysis of Evidence, and the Traffic Crash Investigation and Reconstruction Process.* It has ten chapters providing detailed information on every aspect of this very important part of working a crash. Many sections draw on specialized expertise of other recognized authorities. This new book also gives the reader a keen sense of why the proper handling and recording of evidence is even more basic to a thorough crash investigation and reconstruction than the ability to apply formulae derived from the principles of physics and requiring the use of math, vital though this ability certainly is.

As Director Emeritus of the Institute of Police Technology and Management, I wish to acknowledge the great contribution Bob has made to IPTM from its founding in 1980 to the present. Traffic crash investigation and reconstruction was one of the first kinds of training this new organization offered and Bob wrote several of the early works that IPTM published in this subject area, including his monumental *Training and Reference Manual for Traffic Accident Investigation.* Over the years, he has not only continued to provide IPTM with relevant manuscripts for publication, but has also designed the array of IPTM plastic traffic templates that have proven so popular. He introduced correspondence training in traffic crash investigation to IPTM and for many years personally conducted this training for our institute. He has represented IPTM at many international conferences and given selflessly of his time to all persons seeking information about traffic crash investigation and reconstruction.

Bob Rivers retired from the RCMP in 1985 as Officer in Charge of Traffic Branch for the Province of British Columbia. During the course of his 33 years of service with the RCMP, Bob performed nearly every phase of police work–highway patrol, traffic accident investigation, general police work, training and development, to name just a few–often in a hands-on but also in a supervisory or managerial capacity. It is noteworthy that even with his breadth of experience in law enforcement, Bob eventually chose traffic as his specialty. Those in traffic crash investigation and reconstruction the world over can be glad that he did.

RUSSELL AREND
Director Emeritus, Institute of Police Technology
and Management, University of North Florida
May 2005

PREFACE

This manual begins with a detailed description of the entire investigation process, outlining the internationally recognized series of events that go into making up the crash investigation process. The material then graduates into the various phases and levels of investigations, showing the levels of training and education normally associated with the levels of investigations and consequently the duties and responsibilities of the investigator and reconstructionist. The manual is intended to place on record the material that will not only lead to good sound investigations and crash reconstruction, but also to outline the evidence expectations of police, lawyers, private investigators, and others who are involved in traffic crash investigation and reconstruction, through proper identification, interpretation, and analysis of evidence that can be encountered in an investigation.

The at-scene area, before vehicles and bodies are removed, holds considerable evidence for crash reconstruction and cause determination. Most importantly are skid marks, other tire marks, and vehicle and roadway damages, all of which can show vehicle placement before and at the time of the crash. For obvious reasons, many persons involved in determining cause or other findings, including attorneys and insurance claims adjusters, must rely on photographs and measurements taken by at-scene investigators, most often the police. This manual covers in detail how to identify, interpret, and analyze such evidence when photographs and measurements are presented.

Using narrative, schematics, and photographs, the mechanical inspection process is described in detail by identifying various vehicle parts, explanations of their functions, and methods of identifying failures.

Human-related factors in traffic crash investigations are discussed at length, including the traffic crash viewed as a systems failure. Looming vulnerability, a recently developed theoretical construct that helps to describe and understand social, cognitive, organizational, and psychological mechanism is described. Errors and tolerances in the investigation process, and how human error may have been made more likely to occur by an error made by the unser/maintainer, trainer, or system designer–or by the negligent action of the victim–are explained. Discussed also is the role of vision in driver performance;

perception as a four-way process; perceptions and reactions; driver's reaction to stress; and the roles of pathologists, medical examiners, and coroners in traffic crash reconstruction.

Who is an expert and expert evidence are described in detail. Errors that can occur in the investigation process and the tolerances that should be considered or allowed are explained.

Often overlooked by the frontline investigator is the importance of calling upon the skills and advice of occupational specialists to assist in the investigation and reconstruction of a crash. The manual covers in detail those professional services. They include senior, experienced, well-trained reconstructionists; lawyers; professional traffic engineers; pathologists; medical examiners and other medical professionals; and bloodstain pattern technologists, who can be called upon at any time during the initial investigation or during the compilation of evidence at or near the end of an investigation, that will ensure that the objectives of a thorough and complete investigation will be satisfied.

The manual explains how an examination of the trafficway, including special photographic techniques and scene measurements, can produce and document considerable evidence on how and why a crash occurred. It is explained how engineering, environmental, and similar other trafficway factors can often explain the action or lack of action by a trafficway user who is either directly or indirectly involved in a crash. Of particular importance are traffic control devices, daytime and nighttime weather and roadway conditions, and their effects and influences on or contribution to crashes. Considerable effort has been made in the manual to explain how to identify, interpret and analyze all forms of highway marks and damages, which can be used in the reconstruction of a vehicle-related crash, very often establishing vehicle placement and the path followed by the vehicle leading up to the crash site, all of which can be related to visibility issues.

Speed analysis is introduced with an explanation of Newton's Three Laws of Motion and terms and definitions, leading into the solving of various acceleration problems; how to calculate drag factors; determine speeds from skid marks, yaw, falls, flips and vaults, and by combining speeds. Many examples are included. As with other published works by this author, all mathematical references are worked out in both the English (U.S.) and SI (metric) measurement systems.

Various appendices covering symbols of interest to the student and investigator, mathematical conversions and speed and velocity problems already calculated to assist the user in his or her work, are included.

Finally, there is a comprehensive quick-find index that takes the reader directly to any topic, formula, or subject matter–or any combination of these.

R.W.R.

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I wish to acknowledge my gratitude to Charles C Thomas Publisher and the Institute of Police Technology and Management (IPTM), University of North Florida, for authority to reproduce at my discretion various excerpts from the primary references shown below, authored by myself and published by them, for inclusion in this manual. I wish also to acknowledge with thanks the following traffic crash investigators and reconstructionists for their contributions of photographs, as well as to the following professional, occupational specialists, for their kind contributions to this manual.

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NOTE

Throughout the manual, various items, components, and situations that should be considered in evidence gathering and in legal presentations are discussed and explained. Many of these are accompanied by conveniently-placed checkboxes that the investigator or attorney can use as prompters or guides in ensuring that various points of topical evidence, which can be considered as the possible or probable collision cause, or as a contributing factor, are covered in a proceeding. These should not, however, be considered restrictive–but to be used only as a guide. While some checkboxes may apply, others may not. Also, in some cases, depending upon the circumstances, additional points should be considered in an examination.

As and where applicable, for each checkbox, questions that should be asked by the investigator, attorney, or the examiner, should be: What about this? Was it examined? What were the results, findings, and/or conclusions of the examination? If it was not examined, why not?

DISCLAIMER

Many published books and technical papers have been studied and participation in many field tests made in the preparation of this manual. The information and practices set out herein are, to the best of the author's knowledge, experience, and belief, the most current and accurate in the traffic crash investigation and reconstruction profession. However, the author, publisher, editors, and contributors expressly disclaim all and any liability to any person, whether the purchaser of this publication or not, as a consequence of anything stated, done or omitted to be done, whether in whole or in part by such person in reliance upon any part of the contents of this publication. Every acceptable procedure may not be presented herein, and some of the circumstances of any given case may require additional or substitute procedures. Also, since statutes, ordinances, and organizational policies and procedures differ widely in various jurisdictions, those of the particular jurisdiction concerned should govern when there is any conflict between them and the contents of this book.

THE METRIC (SI) SYSTEM)

The metric system, **Le Systéme International d´Unités** (International System of Units, abbreviated *SI* in all languages), is used in most countries outside the United States. Because this manual is prepared for international use, all mathematical formulae and problem-solving examples are shown in both the *United States/Imperial or English and Metric (SI)* systems.

In North America, a decimal fraction is generally indicated by means of a (decimal) point on the line (not a dot in the raised or centered position). In this regard, it is important for North Americans and many others to understand that in some countries, it is the dot in the raised position that is used; also, that in some countries, a comma is used. It is the North American practice of using the dot as a decimal point situated on the line that is followed in this manual.

CONTENTS

EVIDENCE IN TRAFFIC CRASH INVESTIGATION AND RECONSTRUCTION

Chapter 1

INTRODUCTION TO TRAFFIC CRASH INVESTIGATION

R. W. RIVERS

EVIDENCE DEFINED

1.001 *Evidence* is defined as *that which tends to prove or disprove something; proof. In law, it is considered to be data presented to a court or jury in proof of the facts in issue and which may include the testimony of witnesses, records, documents, objects.* In traffic crash investigation, this can take many forms, perhaps most important of which are observation, recognition, interpretation, recording, and presentation of items observed or that come to the attention of the investigator whether it be at the scene or during subsequent follow-up investigation. An example of this is the observation, measurement, and documentation (both written and photographic) of a skid mark; and then giving written and/or oral evidence in a court of law of a speed calculation based on the skid mark.

1.002 An often critical problem in traffic crash investigation is the recognition, significance, preservation, and utilization of the physical evidence produced by a collision of a motor vehicle with another vehicle, object, or person, and the events preceding and resulting from an occurrence: physical evidence can either astound and perplex or serve as decisive and valuable evidence in establishing and fixing liability

1.003 Traffic crash investigation involves applying the principles of perception, dynamics, and general physics to the movements of vehicles, bodies and other objects leading up to, during, and after a collision. From a properly done analysis, speeds of vehicles, pedestrian and passenger movements, and driver responses that led to the crash and/or took place at impact and post-impact, can be determined. Additionally, analysis performed from available evidence can be used to determine mechanical failure of critical vehicle components–such as steering, brakes, suspension systems, and tires, which could have been the cause or a contributing factor in the crash.

TRAFFIC CRASH DEFINED

1.004 For the purposes of traffic crash investigation, the term *traffic crash* is defined as:

> *That occurrence in a series of events which usually produces injury, death or property damage.*

For the purposes of this manual, the term *crash* is synonymous with the terms *accident*, *collision*, *incident*, or any other applicable, descriptive term used in various jurisdictions and in many published works.

TRAFFIC CRASH INVESTIGATION PROCESS AND OBJECTIVES

1.005 Advanced traffic crash investigation is a process that starts with an investigation and evidence gathering at the scene and continues on until the objectives of advanced traffic crash investigation have been satisfied. This includes the interpretation of evidence, whether gathered by the investigator or another investigator, and arriving at

conclusions based on sound, scientific analysis of all available evidence.

1.006 The objectives of traffic crash investigation are to determine:

a. WHAT happened, i.e., the type of crash
b. WHERE the crash occurred
c. WHEN the crash occurred
d. WHY the crash occurred, e.g., traffic law violation, trafficway engineering defects
e. WHO was involved

The investigator must also decide upon:

a. WHAT is the problem
b. WHAT are the possible solutions
c. WHICH is the best of all possible solutions
d. HOW this solution can be implemented

The investigator should also give, but not limit, consideration to:

a. Identifying high frequency crash sites for further study
b. Problems in geometric design standards in relation to crashes
d. The evaluation of safety, enforcement or other programs that are in place
c. The need for new safety, enforcement or other programs
d. Obtaining and/or supplying data for the planning of education and/or enforcement programs

1.007 In general terms, an initial at-scene and follow-up advanced traffic crash investigation should gather facts and information that will:

a. Determine the cause of the crash
b. Provide information that will assist in crash prevention including engineering, enforcement and education programs
c. Provide evidence for the prosecution in the event there has been a violation of law
d. Meet the requirements of traffic crash report completion
e. Provide sufficient information to meet the requirements of follow-up investigation and reconstruction

1.008 An investigation involves determining how the accident occurred through an analysis based on all available evidence gathered at the scene or during the follow-up advanced traffic crash investigation. There may be a number of hypotheses put forward by police investigators, witnesses, and other persons involved in an investigation. All hypotheses should be considered and evaluated in terms of whether they are credible or ridiculous, given the circumstances and facts at hand, until the reasonable ones have been identified. The most credible of these should then be investigated further, leaving, however, all aspects of the case open for further consideration and investigation as new evidence or information comes to light. Even the apparently non-credible hypotheses may have to be revisited. It is important, however, that the advanced crash investigator appreciates his/her limits in terms of expertise regarding an ability to completely reconstruct a crash. In some cases, it might be advisable or necessary to obtain the services of a properly qualified reconstructionist to interpret evidence gathered and assist in the reconstruction.

TRAFFIC CRASH ANALYSIS

1.009 For the purposes of professional traffic crash investigation, *traffic crash* analysis is defined as:

> *The separation of the whole (the series of events) into its parts or elements, especially to determine the nature, form, etc., of the whole by examination of the parts (events).*

1.010 In order for the investigator to conduct a proper analysis of a traffic crash situation, he/she should be familiar with the various *events* that make up a traffic crash, and then ensure that the investigation covers all aspects of *each* of those events. For the purposes of traffic crash investigation and reconstruction, the *whole* of these various *events* is referred to as the *series of events*, a subject that is introduced in at-scene traffic crash investigation training courses and manuals. Because of the topic's importance to understanding evidence identification, interpretation, and analysis, it is once again reviewed here.

1.011 The following is an outline of events which covers most, if not all, circumstances and/or parameters encountered in traffic crash investigation and reconstruction. There may, however, be other or additional methods that can be used to satisfy

analyses of complex reconstruction problems, particularly through the use of modern, sophisticated computer programs.

1.012–1.015 reserved.

SERIES OF EVENTS AND HUMAN FACTORS

Definitions

1.016 For the purposes of traffic *crash analysis*, the *series of events* includes *situations* that are in place or may at any time arise, all of which may be divided into two distinct categories:[1]

a. *Pre-Scene Series of Events.* The events that lead up to the driver's point of possible perception of a hazard.

b. *At-Scene Series of Events.* The events that occur within the on-scene area, including the point of possible perception.

Human factors include, but are not limited to:

a. Perception time
b. Reaction time
c. Driver experience
d. Disabilities

Individual events and factors will be explained and enlarged upon later in this chapter as well as in various other chapters throughout the manual.

Events and Factors

1.017 The *pre-scene series of events* can be further divided into two areas, namely (1) *pre-trip events*, and (2) *trip events:*

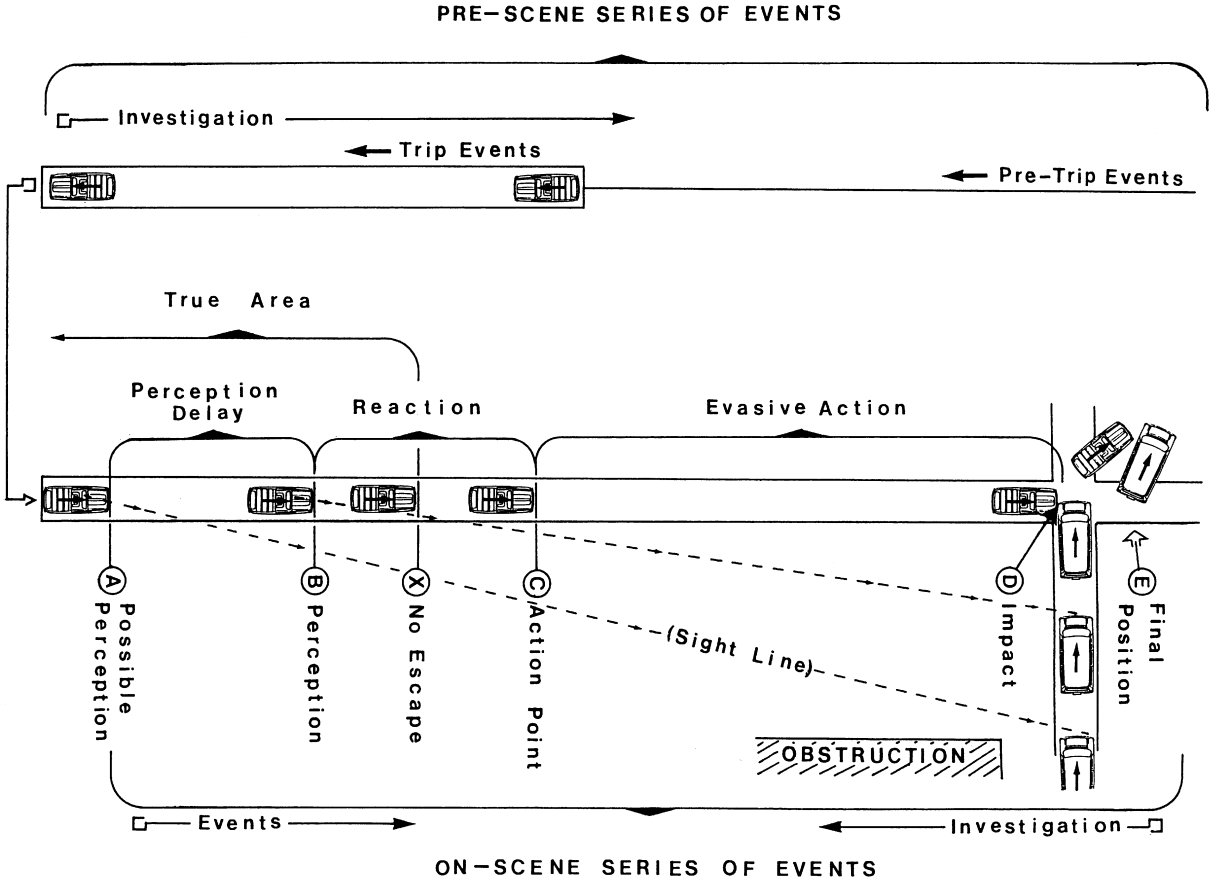

Figure 1–01. An example of the *series of events.*

1. *Pre-trip events.* Generally, those events that occur before and include *situations* that exist *before* the trip is started. They may be considered as backgrounds of the driver and vehicle. Examples of pre-trip events and situations are:

   Driver
   a. Driver experience
   b. Driver training
   c. Intelligence
   d. Alertness
   e. Reaction
   f. Habits
   g. General health condition, including age, an illness, and permanent or temporary injury or disability
   h. Fatigue
   i. A happening that caused emotional upset, stress, depression, or preoccupation
   j. Attendance at a party
   k. Limited sleep or no sleep
   l. Consumption of alcohol or drugs

   Vehicle
   a. Defective headlights, steering, brakes, windshield, wipers, tires, etc.
   b. Overloaded

As the trip is made, many of these pre-trip *events* or *situations* may carry on into the at-scene series of events, e.g., a situation such as the driver's ability to drive being impaired by alcohol or a drug, or an overloaded vehicle.

2. *Trip events.* Those *events* that occur or *situations* that arise after the trip starts and lead up to the point of possible perception, including factors relative to the driver and vehicle, such as, but not restricted to:

   Driver
   a. Stopping for a meal or coffee
   b. Fatigue, illness, or depression
   c. Consumption of alcohol or drugs
   d. Erratic or other unsafe driving (possibly observed by other motorists, pedestrians, businessmen, or other witnesses)
   e. Carbon-monoxide poisoning

   Vehicle
   a. Tire blowout
   b. Brake, headlight, or steering failure
   c. Other mechanical failure
   d. View obstructions, e.g., dirty windshield, defective windshield, or load transfer
   e. Load falling off vehicle

   Environmental
   a. View obstruction
   b. Weather conditions, e.g., rain, snow, ice

1.018 *At-scene series of events* include:

a. *Point of Possible Perception.* The place and time at which the hazard could have been perceived by a normal person. It precedes actual perception and is the beginning of perception delay[2] (see also 3.042).

b. *Point of (Actual) Perception.* The point where a situation is comprehended or perceived as a hazard.

c. *Perception Delay.* The time involved from the point of possible perception to the point of actual perception.

   Inattention or distractions may cause perception delay. In many instances, actual perception immediately follows the point of possible perception, and there is no actual perception delay. When there is a known perception delay, it may be considered to be 0.75 seconds for investigation purposes. The distance traveled during perception delay is perception distance. The point of possible perception and the point of actual perception may be influenced by many driver and environmental factors, some of which are:

   Driver
   i. Experience
   ii. Intelligence
   iii. Judgement
   iv. Alertness
   v. Natural senses (age must be considered)
   vi. Knowledge of area
   vii. Distractions

   Environmental
   i. Weather and light conditions
   ii. Load on vehicle and protrusions
   iii. Location of traffic-control devices
   iv. View obstructions

d. *Perception Distance.* The distance traveled during perception delay. To calculate perception distance, use:

Formula 1–01

U.S.	*SI*
$D = S \times 1.466 \times t$	$D = S \times .277 \times t$

where D = distance
S = speed in mph (km/h)
t = time in seconds

e. *Reaction.* The voluntary or involuntary response to a hazard or other situation that has been perceived.[3]

   i. *Simple reaction.* The response to an expected situation, such as responding to a traffic light.
   ii. *Complex reaction.* The reaction involving a decision, such as when the driver has to decide quickly whether to step on the accelerator or the brake pedal.

f. *Reaction Time.* The length of time from when a person perceives a given situation as being a hazard to when he reacts to his perception. If a person's reaction time is unknown, 1.50 seconds may be used for daytime investigation purposes and 2.50 seconds for nighttime.[4]

   Take for example, the task of braking to avoid an unexpected object on the roadway. Once the object in the path becomes visible, the driver must see the object, recognize the hazard, lift his foot from the accelerator, and push the brake pedal.

   The processes involved are (a) seeing the object, (b) processing the initial information, (d) understanding the information or realizing the danger, (e) deciding what to do, and (f) doing it. For such things, the average driver perception-reaction time is 2.5 seconds[5] (see also 3.044).

g. *Simple Reaction Time.* That which involves an non-complex response, such as touching the horn, can be less than a second. Older drivers have longer reaction times than do young drivers. At about 40 years of age, simple reaction times begin to increase to the extent that at about 70 years of age, a driver's reaction time may increase by as much as 50 percent.

h. *Reaction Distance.* The distance traveled during reaction time. (To calculate reaction distance, use Formula 1–01.)

i. *Action Point.* The place where a person takes action, such as braking or steering, based on his perception of a hazard. The action point follows reaction and may be influenced by the driver's:

   i. Operating skills and habits
   ii. Ability to control the vehicle
   iii. Freedom of movement
   iv. Knowledge of vehicle
   v. Reaction time

j. *Evasive Action.* The action or combination of actions taken (e.g., steering, braking) with intention to avoid a collision or other hazardous situation.

k. *Evasive Action Distance.* The distance traveled from the action point to the place where a traffic unit stops by itself or otherwise avoids a collision, or, if a collision is not avoided, to the point of impact.

l. *True (Safe) Area.* The area leading up to the point of no escape in which evasive action could be initiated to avoid a collision.

m. *Point of No Escape.* The place and time beyond or after which the crash cannot be prevented by a particular traffic unit.[6] Because of committed motion and laws of physics, no action will avoid the collision at this point, although action such as braking or steering may reduce the seriousness of injury or damage. The point of no escape may be anywhere along a driver's path before collision depending upon the speeds of vehicles involved, visibility, and so on. This point may be before the point of possible perception, and if so, a crash cannot be avoided.

The point of no escape may be influenced by such factors as:

   i. Visibility of hazard
   ii. Roadway alignment
   iii. Positioning of traffic-control devices
   iv. Driver distractions
   v. Weather and light conditions
   vi. Condition of roadway surface, e.g., ruts, holes, or other roadway damage, slippery conditions or obstructions, etc.
   vii. Type, size, and condition of vehicle being operated
   viii. Cargo being carried

n. *Encroachment.* The entering or intruding into the rightful path or area of another traffic unit.
o. *Point of Impact.* The place, e.g., the point on the roadway, where a traffic unit strikes another traffic unit or some other object, or overturns.
p. *Primary Contact.* The first contact between two traffic units or a traffic unit and another object, or a vehicle's first contact with a highway surface during an overturn.
q. *Engagement.* The initial penetration of one traffic unit into another traffic unit or object during collision.
r. *Maximum Engagement.* The point or time at which there is maximum penetration by one traffic unit into another traffic unit or object during collision.
s. *Disengagement.* The separation of traffic units or a traffic unit and other object after maximum engagement.
t. *Secondary Contact.* A contact occurring when a traffic unit disengages from a primary contact and strikes the opposing traffic unit a second time or strikes another traffic unit or object.
u. *Post-secondary Contact.* A post-secondary contact occurs when a vehicle disengages from a secondary contact and again strikes the same unit or object or has a first or primary contact with a third traffic unit or other object. Under these circumstances, what may be a secondary or post-secondary contact for one unit may be the primary or first contact by another traffic unit.
v. *Final Position.* The location where a traffic unit comes to rest after collision. In determining the final position, it is important to learn whether the unit stopped at the position where it was found or whether it had rolled, been driven, or moved to that position after the collision. For the purposes of this definition, final position does not include a position to which it may have been driven or forcibly moved, such as being towed by a tow vehicle, after it came to rest after disengagement.
w. *At-Rest Position.* A location to which a vehicle rolls, is driven, or moved after disengagement, such as the position at which it stops or rests as the result of being towed by a tow vehicle or forcibly removed from the point of disengagement.
x. *Personal Injury.* For investigation purposes, a personal injury is bodily harm caused to a person during the at-scene series of events.
y. *Fatal Injury.* A fatal injury is an injury that causes death during the at-scene series of events or a personal injury that thereafter results in the death of the injured person as direct result of an injury sustained during the at-scene series of events. (Note: Local legislation generally stipulates a time limit for an initial personal injury classification to be classified as a fatal injury.)

1.019 Drivers and witnesses generally describe pre-scene series of events and at-scene series of events forward and lead up to the result. An investigator, however, must start with the result and investigate back through the events as far as necessary to determine where, when, how, and why the crash occurred. It may not always be necessary for the investigator to extend his investigation into the pre-scene series of events; however, he should extend his investigation as far back as necessary to determine what a driver may or may not have done before the crash that may have contributed to his action or lack of action at the crash scene.

1.020 Each *traffic unit*, i.e., a road vehicle or pedestrian, involved in a crash has its own series of events. Each unit's series of events must be investigated separately. It should be noted, however, that all the events listed in the series of events may not apply to each and every traffic unit in a crash situation. Some events may not be present in the same series for another unit, and vice versa. For example, there may not be a perception delay, personal injury, or secondary contact in the case of a single vehicle crash, or for one particular unit in multiple vehicle collision. Also, even if the events are the same for one or more vehicles involved in a collision, they may not always follow the same sequence.

1.021–1.025 reserved.

CRASH ANALYSIS USING THE SERIES OF EVENTS

Application of the Series of Events

1.026 A *crash analysis* should include the many variables that play a part in the makeup of an crash situation. These include such things as a driver's sight