

## Introduction

Forensic: To be used in, or suitable to courts of judicature.

Analysis: An examination of component parts.

The seat belt is one of the greatest additions to motor vehicle safety. It has saved tens of thousands of lives over the years and has, in many cases, enabled the occupants of vehicles that have been involved in collisions to “walk away” from situations that would have otherwise ended their lives. Based on data from the National Accident Sampling System (NASS), there were 37,795 fatal traffic collisions in the United States in the year 2001 alone, which resulted in 42,116 deaths. During the same year there were 6,285,000 non-fatal traffic collisions, and in all 3,033,000 people were injured due to traffic collisions. Most of the occupants that were killed in passenger vehicles were not utilizing the seat belt system.

The function of the seat belt system is simple: it helps restrain the occupant and increase the time for “ride down”, making the collision forces less severe on the human body. Yet this function is a simple answer to a complex situation when taking into account the difference that milliseconds can make during a collision. For the most part, this function is performed by a simple pendulum and ratchet mechanism.

A question that is frequently asked in criminal and civil litigation cases involving traffic crashes is whether or not an occupant was utilizing the seat belt system at the time of the collision. The basis for these questions can be of a civil nature, and the answers may be contributing factors in settlements. In a criminal case, forensic seat belt analysis makes it possible for investigators to efficiently correlate injuries. Often the analysis will make it possible to be able to place a defendant behind the wheel as the operator in a vehicular homicide case.

The task of determining occupant-seating positions during a collision can require a multifaceted approach. Analysis of occupant kinematics, injury correlation, and seat belt use can all play a vital role in placing a person in a seating position. Each of these elements will have its own facets needing to be examined, documented, and interpreted in order for the investigator to place all the pieces of the collision puzzle together.

When faced with the task of reconstructing a collision, the investigator should have an established methodology to follow. The first step should be to define the questions to be answered, or to set the parameters of the analysis. Typically, in most collision reconstruction cases there will be numerous issues to address, like the speed of the vehicle at impact, status of lamps at the time of the collision, causation factors, and seat belt use. Each of these should be approached with the same methodology: define the question, gather the facts, analyze the data, and form a conclusion based on accepted scientific principles.

Having an established routine or standard protocol when inspecting a vehicle, such as an inspection checklist or form, will allow the investigator to provide a consistent evaluation and to be less likely to overlook evidence. Performing a thorough and methodical post-collision inspection with accurate documentation of the seat belt system

can yield evidence that will assist in proper determination of seat belt use. Unfortunately, because of a lack of training and experience of many collision investigators in forensic analysis of seat belt systems, the potential exists for inaccuracies in determining seat belt use.

Typically, an investigation can be broken down into three components:

- Inspection and documentation of the exterior of the vehicle
- Inspection and documentation of the interior of the vehicle
- Inspection of the seat belt system.

While the focus of this book is dedicated to the inspection and documentation of the seat belt system, it is necessary to discuss interior and exterior vehicle factors in order to assist the investigator in establishing a better foundation for his or her case. For this reason, this book provides instruction on correct assessment of exterior and interior vehicle factors as necessary and useful components of seat belt forensic analysis.

There will be times in actual collisions when a seat belt system will not meet an occupant's expectancy and will fail to properly restrain the occupant. As with any type of mechanical device, the seat belt system is susceptible to failure.

The purpose of this book is to provide its readers a better understanding of the fundamentals of restraining an occupant during a collision episode. This information will hopefully provide the foundation and tools for an investigator to conduct a successful analysis of a seat belt system and present his or her findings and conclusions more precisely and persuasively to a judge or jury.