

**THE EVOLUTION OF MOTOR VEHICLE ACCIDENT INVESTIGATION  
AND RECONSTRUCTION**

**BY  
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The field of motor vehicle accident investigation stemmed from the field of aviation crash investigation around 1925. At that time motor vehicle accident investigators, who were made up primarily of Police Officers were involved in collecting data regarding the accident including the remaining evidence, witness statements and generating a general overview of the aspects of the accident. Even though the terms “accident investigation” and “accident reconstruction” are used interchangeably, they are different. The primary purpose of accident investigation was and is to enforce highway laws and use statistics compiled on numerous collisions to improve traffic safety. The increasing litigious trends of our society, however, warranted details as to specific collision characteristics regarding causation and avoidance. The answer was accident reconstruction.

Even though the two fields of motor vehicle and aviation crash investigations are quite different, both share similarities in terms of approach, examinations, and even analysis. The reconstruction portion of both fields has a strong common objective, which is to simply answer what happened and how - not necessarily why.

Prior to 1925, the automotive and traffic industries were primarily concerned with dependability and accessibility, and the only sources regarding fatalities were physicians' reports and newspapers. After the first quarter of the last century, U.S. Government agencies started collecting data regarding highway safety. Traffic engineering emerged as a profession in the late 1920's and early 1930's. Since then, a few automotive engineers and other safety experts in other fields began expressing interest in highway safety. During this period, information on how the accident happened was derived almost entirely from witnesses or participants in the collision.

Systematic accident investigation, along with standardized police reports, came about 1950. The early days of motor vehicle accident reconstruction (1940's and 1950's) involved the use of simple tools and the application of mathematics and physics formulae (energy, momentum, and motion) on specific vehicle motion such as braking. Vehicle dynamics and occupant kinematics were not thoroughly understood. Motor vehicle safety and occupant protection was not even seriously considered until approximately 1965. At about 1960, a number of interdisciplinary team projects were initiated in the U.S. and Europe. By 1970, medical and engineering researchers in Universities had started independent projects to collect data. Uniform

compilation of data was performed using a highly structured accident sampling system in the U.S. by 1979.

During the 1960's and 1970's, accident reconstruction, as many other fields, has evolved exponentially. Specific courses were offered for education in the discipline. This is also when accident reconstruction took shape and became established as a profession. The application of computers and specialized software started to emerge to assist in the analysis, in conjunction with the basic foundations of physics and engineering. Complex vehicle dynamics and occupant kinematics, as well as injury mechanisms were also analysed.

The legal system itself was evolving and individuals became involved in lawsuits in order to collect or defend/subrogate damages resulting from accidents. As these cases became more complex, more definitive answers were required as to how the accident occurred. The technical investigator/reconstructionist started assisting the claims investigator/legal counsel by attempting to best answer the raised questions.

Now, in the 21<sup>st</sup> century, experts who arise from an engineering discipline (usually mechanical or civil) undertake specialized courses and extensive training in order to perform accident reconstructions. Accident scenes are often surveyed via laser equipment and diagrammed using computer-generated drawings. Vehicle damage is usually documented by the use of jigs and specialized tools. Traditional techniques and physical principals are applied in conjunction with advanced computer programs. Today's experts must also keep up with the ever-advancing technology such as automotive and traffic engineering, which continuously reshape accident reconstruction.

Automotive technology that is starting to emerge includes active safety features such as adaptive cruise control and dynamic stability control systems. A vehicle equipped with this technology automatically adjusts the throttle and brakes in order to keep a proper following distance with a vehicle ahead or maintain control by selectively applying independent wheel brakes or reducing engine power. Passive safety, including "smart air bags" deploy with a force proportional to the impact force, the weight and the size of the occupant. Ironically, sensors and computers within some production vehicles now record data including seatbelt usage, airbag status, the engine and vehicle speeds, braking rate, and even some driver inputs for a few crucial seconds prior to a collision. This is a mini "black box" (even though it is silver), if you will, which was a previously exclusive technology to the aviation industry.

With all that information, an accident reconstruction may not be required, correct? Wrong. These are one vehicle's information prior to an accident, and that is only one part of the puzzle. In other words, an expert considers all aspects/variables of a collision including other vehicle, scene, and drivers' data, and further combines them in his/her assessment.

One technology that will forever change this field in a way that it never has is Automated navigation systems, in which vehicles are navigated on highways fitted with magnets imbedded in the pavement and sensors and computers within the vehicle that detect the vehicle's position relative to other vehicles, the roadway and the world altogether. This data would be combined with a GPS (Global Positioning Satellite) navigation system to replace the driver in moving and directing the vehicle from one location to another. Accident rates would thus, decrease significantly, as approximately 90% of accidents are primarily caused by driver error. If, however, a mechanical, electrical or computer system failure does occur while this technology is in effect, the results can be devastating, possibly much worse than "traditional accidents".

In summary, accident investigation and reconstruction were probably in existence in some form or another ever since there were accidents. The fields have evolved and will continue to advance with technology. Until automated highways and vehicles are operated or at least satellite images monitor every highway and record every collision as it takes place in real time, accident investigation and reconstruction will not be extinct.