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Forensic Collision Reconstruction: A Road Map

Presented by Gavin Dunn, Hawkins Forensics

This online event provided information about the sources of evidence which can be used to forensically examine road traffic collisions.

Introduction

Gavin Dunn, Associate at Hawkins explained that Hawkins is a company specialising in forensic investigation and root cause analysis for the insurance, legal and risk management professions. Hawkins has 8 offices in the UK, plus Dubai, Hong Kong and Singapore. Hawkins covers an increasing number of disciplines including fire engineering, structural engineering, maritime engineering, personal injury, and road traffic accidents (RTAs). Gavin's own background is as a Mechanical Engineer, having worked for more than a decade at the Forensic Science Northern Ireland Office dealing with serious RTAs.

Types of Evidence

Gavin explained that Hawkins analyse evidence after the fact, so rely heavily on the evidence gathered at the time by those involved in the collision, the Police, medical staff, witnesses and from other sources such as dash cam footage, CCTV and the vehicles' internal computer system. He described that the evidence collected will sometimes focus on the wrong place e.g., where impact happened rather than the run up to the accident occurring.

Gavin set out the various types of evidence that he and other forensic engineers can use and consider to better understand what happened in a collision, why it happened and who is responsible.

From The Scene

Vehicle positions – Where have cars and bikes come to a stop? Which way are they facing?

Road topography – What is the condition of the road surface? Are there any crests, bends, or obstructions to motorists' view?

Debris – How large is the field of debris? What type of debris is visible following the collision?

Weather conditions – Was it cold, wet or icy? Was it light or dark?

Marks/damage to the road surface – Are there visible tyre marks or scratches?

Pedestrian/cyclist position – How and where was the pedestrian found? Are there any signs that the person has moved/been moved following the accident (e.g. blood pools or medical equipment discarded elsewhere around the scene)?

Pedestrian/cyclist clothing – What was the person wearing? Is it conspicuous? Is it damaged? What is the orientation and pattern of the damage?

Phones, photos & video – Is there footage/data from smart phones, the Police, dash camera, CCTV, doorbell cams? Best practice is to preserve original footage unedited and unabridged where possible.

Sketch or map – Have those involved in the incident sketched a diagram? Are there maps available to show the collision site and any features of the surroundings?

Reports/statements – Who has provided a statement? How objective are they? Gavin cautioned that human error is possible when relying on memory, especially if time has elapsed between the event and the statement being recorded.

From the vehicle

Marks/damage to the vehicle – What kind of damage (e.g. type, severity, and position) can be seen on the vehicle? Are there signs that the damage was pre-existing?

Lightbulbs – Did the vehicle have lights on? Through testing it is possible to tell if the vehicle lights were on or off during impact.

Seatbelts – Was the occupant wearing a seatbelt? Through analysis it is possible to form an opinion on whether a seatbelt was being worn at time of the accident.

Tyres – Are tyres deflated? Hawkins can assess if deflation of the tyres occurred prior to or during the collision and the likely effect that may have had.

Defects – Are there any pre-existing defects to the vehicle (e.g. blind spots, obstructions on the windscreen) which may have contributed to accident?

Airbag control module – Were the airbags deployed? A crash data retrieval tool or the vehicle manufacturer can download information from the computer which controls the airbags within the car. Usually the speed, pressure on the accelerator pedal, pressure on the brake pedal, engine revolutions, if air braking system has been engaged, and the angle of steering wheel are recorded within the vehicle's internal computer. These types of information are recorded at 0.5 second intervals and can be used to determine if the driver was responding appropriately to the conditions/situation.

Tachographs – Larger vehicles often contain a tachograph which records speed and time spent driving. This can be analogue or digital depending on age of the vehicle.

Infotainment systems – Does the vehicle have built-in phone, map, satellite navigation, or music capability? Third party apps record data at various intervals, which can be analysed. These systems are not designed to monitor sudden changes in speed, so can only provide a partial picture of the events.

How Evidence is Used

Once all the evidence has been received from the client, Hawkins can also undertake a site visit or inspection of the vehicle if needed. When scrutinising the evidence, the assessor must ask themselves if the evidence to be assessed is useful, reliable, and the best available. Relevant evidence is analysed using the most appropriate and up-to-date methodology available. Next, the forensic examiner interprets the results based upon the analysis. As there is usually some degree of interpretation, the expert's opinion is peer reviewed to provide a check. Finally, the examiner reports the results to the client in a clear, concise and balanced manner.

Examples

Example 1 – An armoured vehicle was involved in a collision where the speed and the stopping distance were of interest. The armour modifications on the vehicle increased the weight by 25% from the base vehicle. The laws of physics provide that friction force increases with weight, so a heavier vehicle will stop broadly in same place as a lighter vehicle. This is then confirmed with testing. Further, tests were carried out to ensure greater weight does not affect stability of the vehicle. The analysis concluded that the increased weight of the vehicle did not materially affect the stopping distance.

Example 2 – A lorry was turning, when a passing car lost control and crashed. There were conflicting accounts of whether the lorry contributed to the car's loss of control. The road

layout required the lorry to stop or almost stop to safely negotiate the turning, where the car crashed. The lorry's tachograph was examined to determine the speed of the lorry at the time of the accident. The evidence showed that the lorry had not slowed down to navigate the turn and therefore would likely have impacted the passing car.

Example 3 – A car was being taken for a test drive when it crashed and was badly damaged. There were conflicting reports from the two occupants in the car about why the incident occurred. Analysis was carried out on tyre marks from the scene. The final position of the car was well recorded. Evaluation of the tyre marks showed that the speed of the car was about 100mph, which was consistent with the rest position and damage to the car.

Final thoughts

Some evidence is better than other evidence depending on the circumstances of the collision and will vary widely. The examiners at Hawkins assess all of the available information to work out which evidence is best.

Questions from the audience

Q: How is it possible to determine if a tyre was deflated prior to an accident or has deflated as a result of the accident?
A: As an assessor I would ask myself a series of questions. What is the general state of the tyre? Is there collision damage? Is there a puncture that is not consistent with the crash? Is there a nail that shows wear that ages the tyre? Is there any CCTV which shows the vehicle leading up to the crash?

Q: What is your experience is with minimal impact claims where a person alleges injury but there is little vehicle damage to support it?
A: In cases where no damage is visible to the vehicle, an assessor can check if there is damage to internal parts of the car (e.g. the framework of the bumper under the rubber cover). It can also be helpful to provide evidence of the vehicle's speed to understand the likely forces involved and harm caused. Medical evidence can then be used to compare likely harm in comparison to everyday events and determine the likely extent of injury.