

## **In-depth crash investigations in South Australia**

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### **Abstract**

The purpose of in-depth crash investigation is to produce holistic, high quality information on crashes that is not available from any other source, in order to understand the factors that contribute to crashes occurring, and to provide data necessary for countermeasure evaluation. This paper gives an overview of the method used for the Centre for Automotive Safety Research's (CASR) in-depth crash investigations and demonstrates the value of such data collection through examples of the research that it has enabled on a variety of topics, including: travel speed, alcohol, pedestrians, roadside safety, young drivers, and new vehicle technology.

### **Introduction**

In-depth crash investigation is an essential ingredient of a region's crash investigation system (Monclus, Lowenadler, and Maier, 2006). The purpose of in-depth crash investigation is to produce holistic, high quality information on a sample of road crashes. In this way in-depth crash investigation complements other levels of crash investigation, such as routine police reports, that include a far greater proportion of all crashes that occur, but lack the detail needed to ascertain contributing factors.

In-depth crash investigations have been undertaken in South Australia through the University of Adelaide in various forms since 1963. At times these investigations have been focused on a particular road safety issue, such as speed or pedestrian crashes, but generally have been focused on general crash data collection to achieve the aforementioned purpose.

This paper will give a brief description of the current method and provide examples of the research it has enabled.

### **Method**

#### ***Current in-depth crash investigations***

The specifics of the investigation method have varied over the years since 1963. The current method is briefly described below.

CASR staff members are on call between 9am and 9pm Monday to Friday. Crashes occurring outside of these hours that have been attended by the Major Crash Investigation section of the South Australian Police are also investigated. CASR is notified of a crash seconds after the ambulance is dispatched, and the investigation team immediately travels to the crash scene, provided it is within 100 km of Adelaide and at least one participant is transported by ambulance.

On arrival at the crash scene, CASR staff talk to the emergency services, participants and witnesses; mark the physical evidence at the scene; photograph the scene, vehicles, and road infrastructure; collect data on the vehicles (including event data recorder download), road and crash circumstances; digitally map the road environment and evidence; and record participants' point-of-view videos.

After the initial scene visit, further data is obtained including: the police report, hospital and ambulance notes, driver and witnesses interviews, Coroners report (if fatal), alcohol and drug test

results, crash and offence history of the driver, and location crash history. The speeds of the vehicles are also determined, if possible, using a computerised crash reconstruction.

Finally, a multidisciplinary panel reviews the crash, an agreed version of events is decided upon, factors that contributed to the crash having occurred are identified, and possible countermeasures identified.

### ***Research output***

The central output of CASR's crash investigation project is a database, site diagrams, photos and videos for use in CASR's research; it does not produce findings in and of itself. For this reason its value is chiefly in research output that has been enabled by the in-depth crash investigation data.

### **Results**

The following are some key pieces of research that have been enabled by in-depth crash investigation data.

Historically, the data has been used to determine the relative risk curves for blood alcohol concentration (McLean and Holubowycz, 1981) and travelling speed (Kloeden *et al.*, 1997; Kloeden, Ponte and McLean, 2001; Kloeden, McLean, and Glonek, 2002), demonstrating a doubling of the relative risk of a road crash for every 5 km/h increase in travelling speed and 0.05 g/100mL increase in blood alcohol concentration, respectively. In-depth data was also used to determine the risk of pedestrian fatality relative to travelling speed and showed that a 10 km/h reduction in travelling speed could reduce pedestrian fatalities by 48% (Anderson *et al.*, 1995).

In more recent years the data has been used to show that:

- A medical condition was the main contributing factor in 13% of metropolitan area casualty crashes (Lindsay and Baldock, 2008);
- Barriers are a road departure countermeasure that could create a safe system, while traditional clear zones are not (Doecke & Woolley 2010; Doecke & Woolley, 2011; Doecke & Woolley 2013);
- A failure of the road transport system, rather than road user extreme behavior, is responsible for the majority of non-fatal (91-97%) and fatal (54%) crashes (Wundersitz, Baldock & Raftery, 2014);
- Young drivers are more likely to make driving errors, and their error types migrate from vehicle control errors to decision making errors as experience increases (Wundersitz, 2012);
- Autonomous emergency braking (AEB) could reduce fatal crashes by 20 to 25% and injury crashes by 25 to 35% (Anderson *et al.*, 2013) and that the main crash types for which it is an effective countermeasure are pedestrian, right turn, head on, rear end and hit fixed object crashes (Doecke *et al.*, 2012);
- Connected vehicles have the potential to provide substantial injury and fatal crash reductions (16-20% and 12-17% respectively) for a vehicle already equipped with AEB, as it is effective for certain crash types for which AEB is not (Doecke and Anderson, 2014; Doecke, Grant & Anderson, 2014).

## Conclusion

In depth crash investigations conducted at the University of Adelaide provide a very detailed, holistic data set that has been used to conduct important research into factors that contribute to crashes occurring, and the evaluation of preventative and mitigating countermeasures.

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