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At the Scene

Newsletter of the Centre for Automotive Safety Research

In-depth at-scene crash investigation



In-depth at-scene crash investigation has always played an integral role in CASR research activities.

Every crash has its own story to tell. These crashes are a part of what has shaped so many CASR researchers - the experience of immediate attendance at the scene of a crash; the sights and sounds that drive home the true importance of the work we do.

We believe it is important to get to the scene of a crash as soon as possible after the crash has occurred. Crucial evidence to help understand the nature of a crash is often lost within a short space of time. Therefore, immediate at-scene attendance gives us the best chance of collecting this vital information and allows us to be confident in the conclusions we draw from our in-depth crash database.

A major strength of the in-depth program is our multidisciplinary team. The team includes civil and mechanical engineers, psychologists and a health professional. This approach enables diverse perspectives on crash causation to be shared and encourages discussion about possible countermeasures.

Information from the program has contributed to our understanding of a wide range of road safety issues and has been used in numerous projects.



Sharing our in-depth knowledge

CASR has gained a reputation for unique and high quality in-depth crash investigation. Knowledge gained from the program is used in many ways, including disseminating of information to other road safety professionals and the community.

The findings from the in-depth crash program are integral to the role CASR plays in promoting road safety to the South Australian community. Our researchers share insight and knowledge on crash causation and prevention to many community and professional groups ranging from Local Council and Rotary groups to road authority network managers.

CASR is actively involved in providing at-scene investigation training to countries in the region, including providing instruction to visiting researchers from Thailand and Malaysia. More recently, two staff from the investigation team travelled to Malaysia to deliver a two-day course in crash causation and interviewing techniques to staff at the Malaysian Institute for Road Safety Research (MIROS).

CASR holds regular seminars with engineers from the Department of Planning, Transport and Infrastructure to highlight opportunities for improvement in the safety of the road network based on findings from the in-depth crash investigation program.

A collaboration with the Monash University Accident Research Centre (MUARC) to present a Road Safety Management and Leadership Program demonstrated the real application of in-depth crash findings. As part of the program, which is open to leaders and future leaders in the road safety industry, the in-depth results contributed to sessions on safer infrastructure issues and the importance of speed.

A collaboration with IFFSTAR (France) has allowed postgraduate students from France to include analysis of in-depth crash data in their research projects.

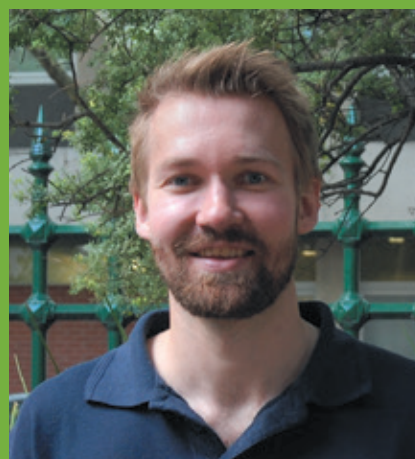
CASR is a data provider and member of the Initiative for the Global Harmonisation of Accident Data (iGLAD) which is aimed at promoting the harmonisation of in-depth crash investigation data collected by different groups around the world, including from Germany, Spain, Czech Republic, France, India, USA, Austria and Italy.

Staff profile

Sam Doecke

Crash investigation co-ordinator

When I began at CASR in 2007 crash investigation was my sole task. These days it is one part of my research at CASR, but it remains something that I am very passionate about, which is just as well, because I now manage the project. This does not stop me from going out to crash scenes and I still enjoy being on-call, not knowing where crash investigation will take us that day. That is not to say it is always an enjoyable task, it can be quite confronting and you meet people when things have gone a little, or a lot, wrong for them. However, what I find personally satisfying is that, while you can't change what happened to them, lessons can be learned from their experiences: something good can come from something bad. This really hits home when we conduct research that would not have been possible without the data we



get from in-depth crash investigation. As well as investigating the crash at scene I also conduct crash reconstructions, which is where I can really apply the skills from my automotive engineering degree. I recently attended the scene of my 200th crash, and I have no plans to stop until we have solved the road trauma problem.

Crash investigation: how it works

The CASR crash investigation team attends at least 50 crashes a year, with 644 crashes investigated since 2002.

Investigators attend vehicle crashes that fit predetermined criteria; the crash must be on a public road, within 100 km of Adelaide, an ambulance has transported at least one person, or ambulance transport has not occurred due to a person dying at scene. Crashes with no motor vehicle involved are not attended (e.g. single bicycle crashes).

The procedure for each individual crash involves:

At the scene

- > photographing the scene and all crash-involved vehicles
- > discussing the crash with police attending the scene
- > marking the final position of the vehicles and any skid or gouge marks
- > discuss the crash with participants and witnesses
- > conducting an engineering survey of the crash site
- > examining the vehicle(s)
- > recording video footage of the approach to the crash site from a driver's perspective

After the crash

- > obtaining a police report on the crash, injury information from hospitals and the results of any alcohol or drug tests



- > conducting a detailed interview with consenting crash participants and witnesses
- > downloading data from the airbag control module of the vehicle (for applicable vehicles)
- > coding the injuries using the abbreviated injury scale
- > reviewing the site design and crash history of the site
- > reviewing the crash and licensing history of the drivers
- > reviewing the Coroner's file for fatal crashes
- > producing computer-aided crash reconstructions
- > performing a multidisciplinary review of the crash
- > placing all of the collected data and information in secure storage.

All of our crash information is treated as highly confidential and to be used for research purposes only. Individual case information is not shared with anyone.

Research outcomes

The CASR in-depth crash investigation program has made a contribution to all areas of our research, and in all areas of the Safe System.

It is often thought that most crashes, particularly fatal crashes, are caused by the extreme behaviour of drivers. Using in-depth data and Coroners data, researchers were able to determine that, contrary to popular belief, only 40% of fatal crashes and 12% of serious injury crashes were caused by extreme behaviour. The majority of crashes actually involve people making normal road user errors.

Research using in-depth data changed the view on how medical conditions play a role in crashes, finding that pre-existing conditions play a far more significant role to crashes than once thought. The research determined that medical conditions contribute to 11-12% of crash events with more than 18% of drivers found to have a medical condition that directly contributed to the crash. These findings attracted considerable local and international interest.

In-depth data was used to determine the potential relevance of electronic stability control (ESC) in the prevention of loss of control crashes on rural roads. It was determined that if ESC had been present in the crash involved vehicles, most of the crashes would have been avoided completely and the severity of the collision reduced in the remainder.

Work completed by CASR based on in-depth crash reconstructions has challenged traditional rural road design



approaches that rely solely on the establishment of clear zones by the side of the road. The work found that while clear zones appeared beneficial for single vehicle crashes involving drift off, this was not the case for crashes where the driver lost control of the vehicle and yawed (spun) off the road. Even if very wide clear zones could be achieved there is a high likelihood that vehicles will also roll over. Better safety outcomes on rural roads can be achieved by adopting narrower clear zones in combination with more roadside barriers.

Our most infamous research determined the relationship between travelling speed and risk of crash involvement. Research, using in-depth data, determined that the risk of involvement in a casualty crash doubled with each 5km/h increase in speed. This research was a major influence on the introduction of the default

Further research outcomes:

- > Post impact trajectory of vehicles in crashes at rural and metropolitan intersections
- > Analysis of crashes involving younger drivers
- > Analysis of cyclists involved in casualty crashes
- > Effects of segregation on cyclist crashes
- > Travelling speed and pedestrian collisions
- > Identification of infrastructure issues
- > Understanding rear end crashes
- > Audit of the Traffic Accident Reporting System
- > Understanding roll over crashes
- > Relationship between road infrastructure and older drivers
- > Understanding tailgating
- > Use of Automatic Crash Notification (ACN) technology
- > Pedestrian and cyclist solutions in the metropolitan area
- > Alcohol and pedestrians
- > Use of protective clothing for motorcyclists

50km/h speed limit, which has resulted in reductions in urban casualty rates of around 15%. This work has been highly cited in publications both nationally and internationally.



A history of the CASR in-depth investigation program

Professor Jack McLean

The first in-depth study, in any country, of a representative sample of road crashes was conducted at the University of Adelaide from 1962 to 1965. Directed by the Professor of Pathology, JS Robertson, and with a research team comprising Tony Ryan, a medical officer, and myself as the engineer, its recommendations included replacing the Give Way to the Right rule at intersections with a major/minor road system. It was also the first crash study to show that pedestrians were run under by the striking car, not run over, which determined that the design of the front of the car was a critical factor in pedestrian protection.

In 1973 the Road Accident Research Unit (RARU) was established at the University of Adelaide to conduct a major at-scene study of crashes in metropolitan Adelaide. I was appointed Director, after having acquired a Harvard PhD in epidemiology and biostatistics. Two research teams (medical officer, psychologist and engineer) investigated a sample of crashes that was representative by time of day and day of week of all ambulance-attended cases for one year. Reported in nine sections

comprising 735 pages, it is still the most detailed and representative in-depth study ever conducted. It reinforced the previous study's call to replace the Give Way to the Right rule with a major/minor road system and, inter alia, quantified the specific financial losses in each crash and who incurred them. It also provided the data for a case control study of a driver's BAC and subsequent risk of crash involvement.

With long term funding from the National Health and Medical Research Council, supplemented by the State and Federal Governments, at-scene in depth crash investigation was extended to include rural crashes commencing in the late 1980s. We found that in many cases it was possible to reach the scene of the crash before the vehicles had been removed. Since then more than 1,000 urban and rural crashes have been investigated in depth.

Some of these studies have been conducted for a specific purpose, such as the role of car design in pedestrian injury for Mitsubishi Motors Japan, and most notably, in two case control studies of travelling speed and the risk of casualty crash involvement.



The metropolitan area speed study led to the conclusion that travelling 5 km/h faster than the 60 km/h speed limit doubled the risk of casualty crash involvement (as does driving with a BAC of 0.05) and that risk doubled with each additional 5 km/h. This finding was critical in the decision to reduce the default urban speed limit to 50 km/h in the Australian Road Rules. It is the only urban area study of its type in any country. A follow up case control study of speed and crash risk on rural roads yielded similar estimates of increased risk.

Publications

A selection of publications based on data collected during in-depth crash investigation:

Baldock MRJ, Long AD, Lindsay VL, McLean AJ (2005) *Rear end crashes* (CASR018).

Doecke SD, Mackenzie JRR, Woolley JE (2013) *Post impact trajectory of vehicles at rural intersections* (CASR086).

Doecke SD, Woolley JE (2013) *Adequacy of barrier and median separation on rural roads* (CASR087).

Doecke SD, Woolley JE (2012) *Post impact trajectory of vehicles at metropolitan intersections* (CASR060).

Hamdane, H., Serre, T., Anderson, R. W. G., & Yerepez, J. (2014). *Accident simulation and reconstruction for enhancing pedestrian safety: issues and challenges*. Expert Symposium on Accident Research, Hannover, Germany, 20-21 June 2014.

Hutchinson TP, Lindsay VL (2009) *Pedestrian and cyclist crashes in the Adelaide Metropolitan Area* (CASR055).

Kloeden CN, McLean AJ, Glonek G (2002) *Reanalysis of travelling speed and the risk of crash involvement in Adelaide South Australia* (CR207), Australian Transport Safety Bureau, Canberra.

Kloeden CN, Ponte G, McLean AJ (2001) *Travelling speed and the risk of crash involvement on rural roads* (CR204), Australian Transport Safety Bureau, Canberra.

Kloeden CN, Versteegh SL, Lindsay VL, McLean AJ (2007) *Right turn crashes at signalised intersections* (CASR007).

Mackenzie JRR, Anderson RWG (2009) *The effects of Electronic Stability Control interventions on rural road crashes in Australia: simulation of real world crashes* (RSRG 2009-005), Department of Infrastructure, Transport, Regional Development and Local Government, Canberra.

Lindsay VL, Ryan GA (2011) *Medical conditions as a contributing factor in crash causation* (AP-R389-11), Austroads, Sydney.

Roberts, P., Woolley, J. E., & Doecke, S. D. (2014). *Providing for road user error in the Safe System* (AP-R460-14). Sydney: Austroads.

Wundersitz LN (2012) *An analysis of young drivers involved in crashes using in-depth crash investigation data* (CASR101).

Wundersitz, L. N., Baldock, M. R. J., & Raftery, S. J. (2014). *The relative contribution of system failures and extreme behaviour in South Australian crashes*. Accident Analysis & Prevention, 73, 163-169.

For a full list of CASR publications see casr.adelaide.edu.au/publications

For further information

Centre for Automotive Safety Research
The University of Adelaide, SA 5005, Australia

Telephone: +61 8 8313 5997

Email: casr@adelaide.edu.au

 <http://casr.adelaide.edu.au>

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Government of South Australia
Department of Planning,
Transport and Infrastructure