



THE UNIVERSITY  
OF ADELAIDE  
AUSTRALIA

➤ Centre for  
Automotive Safety Research

Report 2005







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**Government  
of South Australia**

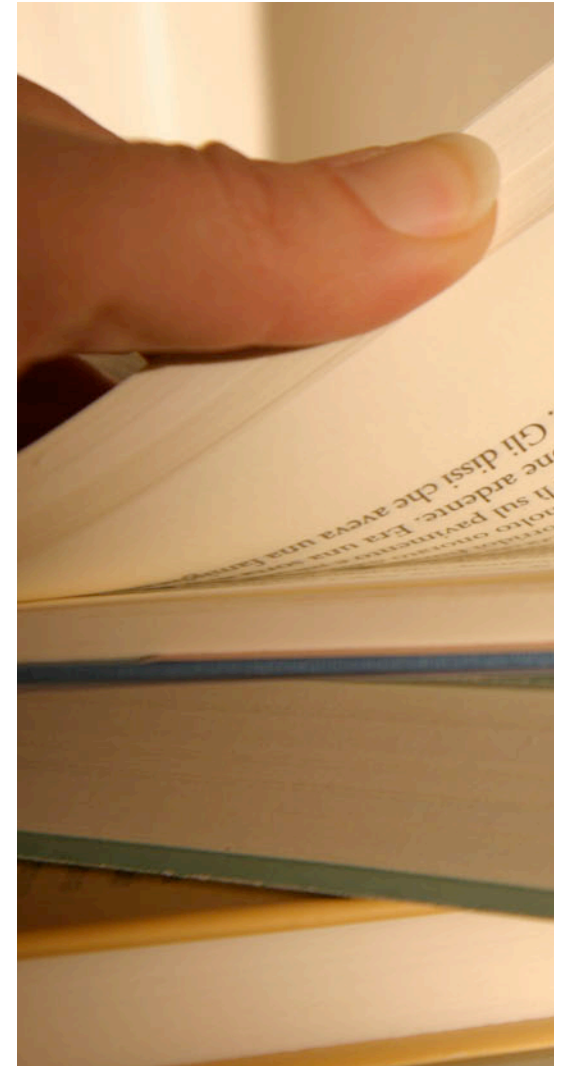
Department for Transport,  
Energy and Infrastructure



**MOTOR ACCIDENT  
COMMISSION**

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CASR conducts research in road safety and injury control that contributes to the reduction of the human and economic costs of road crashes

The Centre for Automotive Safety Research is internationally recognised in its field.

Established more than 30 years ago at the University of Adelaide, initially as the Road Accident Research Unit, the Centre continues to base its research program on an understanding of what actually happens in road crashes, derived from at-scene crash investigation.

In the past, information collected in crash investigations has been supplemented with neuropathology to study brain injury mechanisms, and with speed measurements to relate travelling speed to the risk of crash involvement. The former work has challenged the previously prevailing paradigm that brain injury could be produced without direct impact to the head. If that ever happens it is extremely rare. The latter studies on speed and crashes have been used to justify the reduction in the default urban speed limit from 60 to 50 km/h throughout Australia.

Our continuing study of pedestrian injury and vehicle design also includes investigation of pedestrian accidents at the scene. Forty years ago the first paper showing that car design plays a major role in pedestrian injury was published by Jack McLean, CASR's Director, and Tony Ryan. CASR has recently been researching this topic in collaboration with Honda R&D Co. Ltd. and Mitsubishi Motors Corporation. Jack McLean is the Australian



representative on the International Committee charged with developing test procedures to evaluate a vehicle's level of pedestrian protection and Robert Anderson chairs the computer modelling subcommittee.

The level of pedestrian protection provided by current model vehicles is assessed in the CASR Streeter Impact laboratory as part of the Australasian New Car Assessment Program (ANCAP). The only laboratory of its type in Australia, it was inspected in September 2005 by staff of Tsinghua University, Beijing, which is planning the development of a similar facility.

Our research program includes more than 30 separate projects and related activities, some of which are on-going or continuing over more than one year. These projects ranged from the esoteric, such as "Determining accurate contact definitions in multi-body simulations for DOE-type reconstructions of head impacts in pedestrian accidents" (with Honda R&D), to projects immediately relevant to South Australian motorists, such as the report "Effect on casualty crashes of a reduction in the speed limit from 110 to 100 km/h on selected rural roads".

The information collected at crash sites can also be relevant to road and traffic engineers in their design and maintenance of a safe road network. Regular seminars are presented by Jeremy Woolley and other CASR staff to facilitate discussion on such matters with engineers in the South Australian Department for Transport, Energy and Infrastructure.

Our international activities included convening a three day International Seminar on Road Safety in Bangkok in March, 2005. It was conducted in collaboration with the Thai Government Office of Transport Planning and Khon Kaen University and sponsored by Takata Corporation. The seminar, which was attended by 138 participants from 12 countries, was an outstanding success.

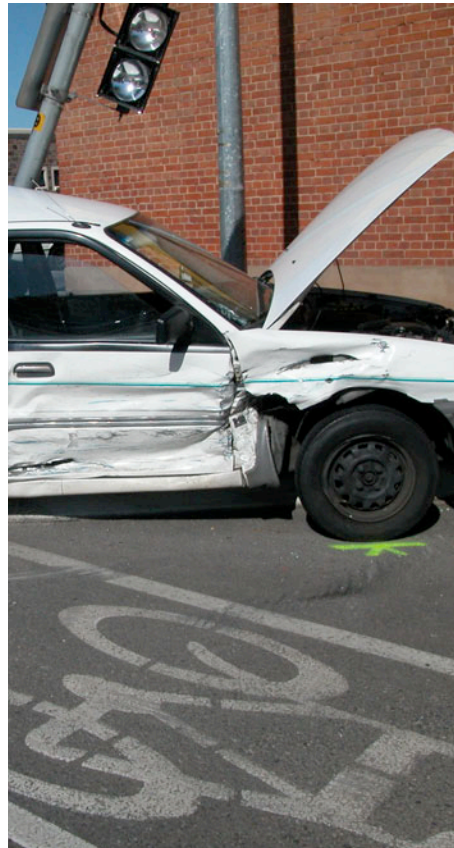
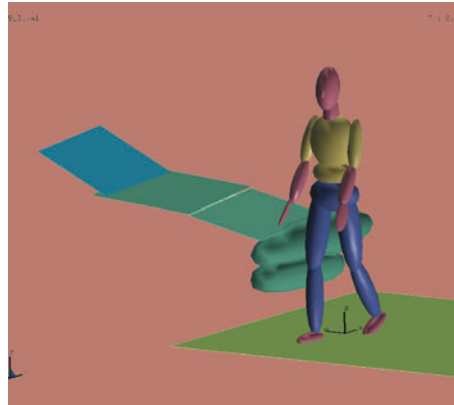
We also hired an exhibitor's booth at the 19th International Conference on the Enhanced Safety of Vehicles which was held in Washington DC in June. Our main aim was to demonstrate the Laser Speed Measurement Device that we have developed and hope to have marketed internationally. The booth also proved to be a very effective way to publicise the work of the Centre.

The relocation of CASR from the University's Medical School building to refurbished accommodation within the Engineering Faculty was effected without great disruption in November 2005. The end result has been more useful accommodation, particularly for the Centre Library which has the most extensive collection in Australia of material on road safety.

While we secure income from contract research activities conducted for other organisations in Australia and overseas, we gratefully acknowledge the substantial sponsorship from the South Australian Government through the Motor Accident Commission and the Department for Transport, Energy and Infrastructure.



# Understanding road crashes



# Crash investigation and reconstruction

CASR's on-going program of at-scene crash investigation distinguishes it from other road safety research groups in Australia and from most overseas.

It involves a team of CASR crash investigators attending the scene of a road crash when an ambulance is called. One member of the team photographs the crash scene and marks the final positions of the vehicles, while another investigator identifies the people involved in the crash, including those transported to hospital by ambulance, and attempts to speak with any witnesses to the crash.

Detailed photographs and measurements are taken of relevant damage to the vehicles and the site is surveyed and a scale plan prepared. At a later date information is obtained on the injuries sustained and interviews conducted with those crash participants and witnesses who are willing to be interviewed.

Factors involved in the causation of both the crash and the resulting injuries are reviewed at regular CASR meetings. The crash history of the site then is examined and compared with findings from the case review. About 100 casualty road crashes are investigated in this manner each year and in 2006 the Centre will commence a rural study, examining crashes within a 100 km radius of Adelaide.

Periodical presentations are made to regional managers and senior engineers at the South Australian Department for Transport, Energy and Infrastructure on matters arising from the investigations that are relevant to the safety of particular locations and generally to the safety of the road and traffic system.

Our at-scene, in-depth approach yields a wide range of detailed information that can be gathered in no other way. Two studies by the Centre on travelling speed and the risk of crash involvement were feasible because we were able to collect the data needed to calculate speeds at the scene of the crash.

We obtain a much clearer understanding of the nature of road crashes than is possible from the very limited information contained in routine police reports. This is important because the number of topics that could be examined under the heading of road safety research is limitless; but many, if not most, are of little or no value in identifying effective crash and injury countermeasures. Continuing scrutiny of actual crashes gives us some confidence that the topics we select for more formal investigation have been wisely chosen.

We put the data we collect to good use: for instance, by examining the routinely collected crash data for a site with a detailed investigation of one (or more) crashes at that site, we have identified problems with the road infrastructure and provided the information to the relevant authority.

Another example of how we use this data is the detailed reconstruction of pedestrian crashes, to identify mechanisms of injury, so that vehicle design might be improved.





# Crash injury biomechanics

Crash safety technology develops through better understanding of the way the forces produced in a crash act on the human body, and the body's tolerance to those forces. For example, the design of a motorcycle helmet must take account of the typical speed at which an impact might occur; the characteristics of the surfaces that the helmeted head may strike and tolerance of the human head to impact forces.

These considerations are used to choose appropriate materials and designs for a helmet, and the manufacturer of the helmet usually is required to demonstrate the head would be adequately protected in a crash. Similar principles apply across different areas of injury biomechanics.

CASR has a long-standing interest in the biomechanics of head and brain injury, and injury causation in pedestrian collisions. The way in which the brain is injured in an impact is still not fully understood despite half a century of research on the subject, due to the complex interaction of forces, anatomy and physiology. Our study of injury causation in pedestrian collisions links into several

international projects that are formulating pedestrian safety criteria for new vehicles.

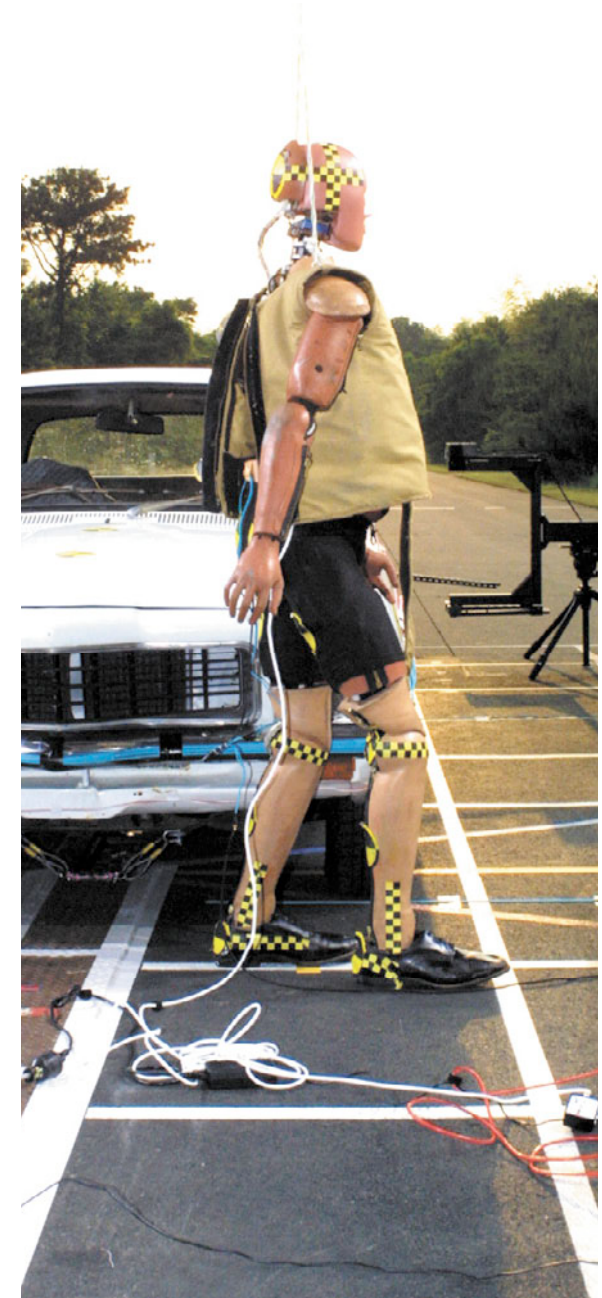
## Brain injury research

One method to investigate the biomechanical aspects of brain injury causation is crash reconstruction, studying the mechanisms of injury in crash victims. CASR has unique data on fatal brain injuries, including those sustained by pedestrians, making the biomechanical reconstruction of the brain injuries possible. The data has been compiled in close collaboration with the Division of Tissue Pathology at the Institute of Medical and Veterinary Science in Adelaide, South Australia.

When sufficient information is available from crash investigation, computer simulation (see later section) is used to estimate head impact velocity in the collision. Physical reconstructions are performed in the Centre's Streeter Impact Laboratory. The information gained enables us to estimate the severity of the impact or carry out further simulations to estimate the forces generated in the brain during the impact. In the latter analysis, patterns of stress and strain estimated by the model are compared with the microscopic distribution of brain injury in the actual case.

Uncertainties in the reconstruction are included in our analyses to allow a probabilistic estimate of head impact conditions. The project overall has involved collaborations with Honda R&D, Japan and Wayne State University, USA.

The combination of medical, analytical, laboratory and field data means we have an uncommon vantage-point from which to survey, and contribute to, literature on brain injury biomechanics. On behalf of the Centre, Professor Jack McLean and Dr Robert





Anderson co-authored a chapter for the book "Head Injury" (edited by P. Reilly and R. Bullock), which is the text promoted by the prestigious National Neurotrauma Society, USA.

### Computer modelling & reconstruction of pedestrian crashes

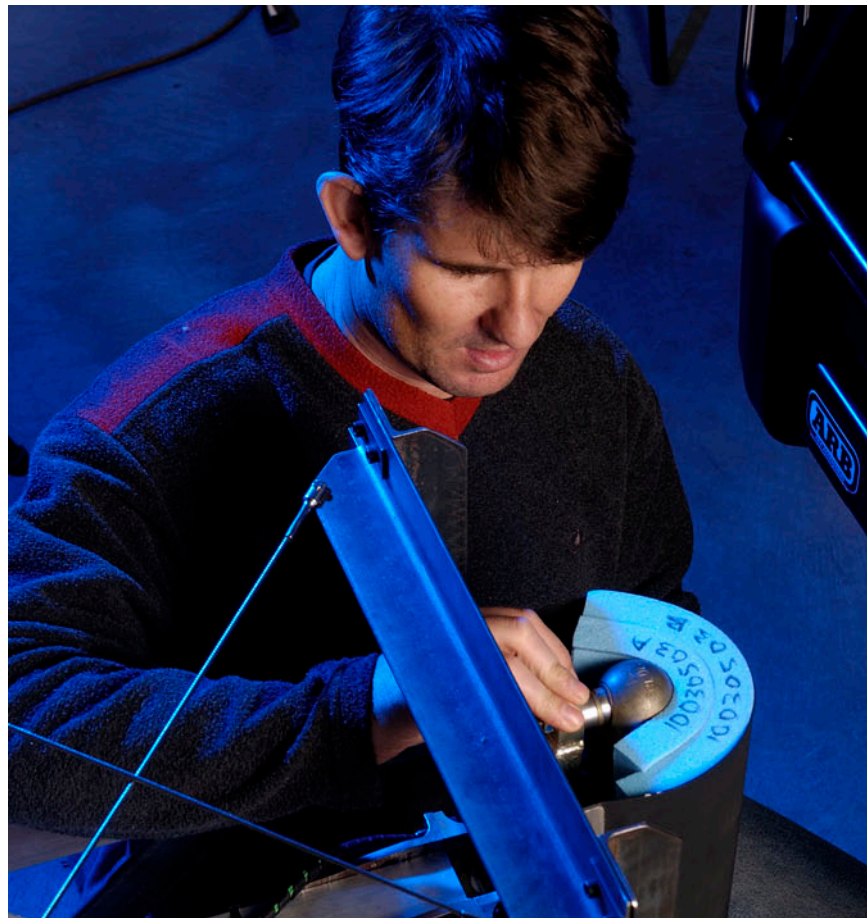
CASR continues to devise simulation tools to study how pedestrians are injured in collisions with vehicles. The simulation represents the pedestrian as a 'multi-body' model of segments connected by kinematic joints. The properties of the model are based on the properties of the human body as measured in human volunteer tests, and validated against published data from tests on human cadavers.

The modelling provides information on head impact speeds typically encountered in pedestrian crashes. This in turn is used to develop test methods to assess the pedestrian safety of vehicles. Our current interest extends to developing methods of modelling crashes that account for any uncertainties in the reconstruction of the crash.

Honda R&D Co.Ltd. has created a crash test dummy, POLAR II, for simulating a collision between a car and pedestrian. CASR has conducted three reconstructions of actual accidents to see how the dummy simulation compares with computer modelling, sub-system tests and the actual accident. Much of this work took place at the Japan Automobile Research Institute and at Honda R&D Co. Ltd. in Japan.

More recently we have embarked on a major study of pedestrian injury mechanisms with Mitsubishi

Motors Corporation, Japan. We are devising improved methods of characterising the interaction of the pedestrian and the vehicle, to improve numerical simulations of the vehicle-pedestrian collision. We are using these methods to reconstruct, via simulations, the forces placed on the human body in 10 collisions we investigated at the scene.



# Impact laboratory testing

CASR studies the influence of vehicle design on pedestrian injury in a collision. The Streeter Impact Laboratory is a central component of our pedestrian safety research, which considers both accident prevention and injury mitigation through vehicle design.

It is the only laboratory in Australia able to conduct pedestrian “sub-system” impact tests on vehicles. It is equipped to assess the danger posed by the front of a vehicle to a pedestrian. Our study does not use crash test dummies, as is done with studies on occupant protection, but “sub-systems” that represent, separately, the head, upper leg and lower leg of a pedestrian. These sub-system impactors are launched at the stationary vehicle.

The laboratory is used by CASR researchers to reconstruct pedestrian crashes they have investigated, and by government and industry to assess the level of pedestrian safety afforded by vehicles and attachments such as bull bars.

## Australasian New Car Assessment Program

One of our most significant clients is the Australasian New Car Assessment Program (ANCAP). It provides vehicle buyers with information on the crash performance of vehicles, including side impact tests, offset-frontal tests and pedestrian tests. Since 1999 we have been contracted to

perform the pedestrian tests, and since 2000 we have tested 43 vehicles for the program.

Generally, the testing has shown a range of results, with some vehicles clearly designed to ensure some level of protection for pedestrians, while other vehicles have performed poorly.

## Testing pedestrian safety of bull bars

We are undertaking a program of testing to assess bull bars for the potential danger they pose to pedestrians. We have selected a range of bull bars made of different materials. Each bull bar and the vehicle to which they attach are subjected to two kinds of impact. These tests assess the risks of head injury to a child and leg injury to an adult.

When released, the results of this testing could form the basis for a consumer rating program for bull bars, in a similar way that new cars are assessed by the Australian New Car Assessment Program.

## Reconstruction of pedestrian crashes

The Streeter Impact Laboratory, was named in 2005 in honour of Luke Streeter, who developed it. The lab was conceived to assist us in studying real-world pedestrian crashes. While computer simulation can tell us something about the motion of a pedestrian in a crash we have investigated, it cannot reliably provide estimates of the severity of impacts on the body of the pedestrian.

Understanding the severity of an impact allows the forces that cause injury to be quantified, and this can lead to a better standard of pedestrian protection. We have used the laboratory extensively in the reconstruction of actual pedestrian crashes in order to relate injuries to the head to the forces that produced the injury. Our expertise in the laboratory complements the unique data on real-world pedestrian injury we have compiled, in building a knowledge bank that will help ensure greater protection of pedestrians in the future.

# Analysis of routinely collected data

There are several types of routinely-collected data useful to our research which are collected and collated on a regular basis.

The most important is the information about road crashes that is recorded by the police. This has some biases and errors in it, but is nevertheless invaluable for tackling many research questions.

Mortality and hospital in-patient statistics often give better information about injury.

Other databases or datasets are useful for converting crash numbers to crash rates, for example, datasets on how much travel people do, driving licences, and vehicle registrations.

Sometimes it is sufficient to tabulate the data straightforwardly, but for other projects more sophisticated processing is required.

The emphasis might be on describing the characteristics of a particular class of crash, or how the numbers have changed over time.

Interest might instead centre on whether any change in crash numbers has occurred, following some change in (for example) the law, the environment, or the vehicles.

More complex analysis may involve limiting the crashes to those satisfying some complicated condition, or cross-tabulating variables derived from some combination of those in the dataset, or collating two or more sources of data.

Examples of CASR projects that have used such techniques include examining trends in crash numbers in South Australia, analysing the effect of reducing the default urban speed limit from 60 km/h to 50 km/h, and comparing young drivers' crash numbers subsequent to their obtaining a driving licence by different methods.





# Human factors research

The human operator (driver, rider, or pedestrian) invariably is implicated in road crashes.

Understanding the difficulties faced by, and needs of, operators when they use the road system is a key concern in identifying how crashes can be prevented. If tasks confronting road users can be made easier then fewer mistakes will happen, leading to fewer crashes. Such an understanding is best reached through multi-disciplinary teams from fields such as psychology, health sciences and engineering. By employing experts in a variety of disciplines, CASR is able to study effectively the human factors that contribute to crash occurrence. Our studies may be observational in nature, or involve interviews, focus groups, laboratory testing or analysis of data from the in-depth crash investigation of road crashes.

Our association with the Department of Psychology at the University of Adelaide allows us access to their test library, which contains standardised tests of a wide range of cognitive abilities, questionnaires assessing a wide range of attitudes and traits, and instruments that measure the abilities necessary for driving.

We are experienced in testing other aspects of functioning required for safe driving too. These include sensory abilities (particularly vision) and physical abilities (such as head-neck flexibility) and cognitive abilities (such as visual attention and speed of information processing), with some experiments using instrumented vehicles driven on a closed-road circuit. Furthermore, we run studies using standardised on-road driving tests conducted by driving instructors and occupational therapists that yield detailed assessments of a person's fitness to drive. An ongoing study at CASR aims to identify subgroups of younger drivers who have a high likelihood of crash involvement. Using questionnaires, we are exploring the relationships between driver personality, experience, risky driving behaviours and crash involvement. This

study is being conducted in collaboration with the University of Adelaide's Department of Psychology.

Another study involving collaboration with the Psychology Department was of the Useful Field of View test, a commercially available test that measures visual perception. It is claimed by its manufacturers to be especially useful in determining the crash risk in older drivers, and thus as a test that can be used in the re-licensing process. We found that the test measures basic processes (inspection time and crowding in the visual field) that can be determined more simply and for a lower cost.

Data from in-depth crash investigation was used in a study of rear end crashes. Analysis of the causes of rear end crashes revealed a high prevalence of human factors, including medical conditions of the drivers of striking vehicles and various forms of inattention, which were described in detail.

Following on from a previous project concerned with the use of child restraints in cars, which used observational and parent interview methodologies, a further study was conducted using a focus group. This study explored issues surrounding the premature use of adult seat belts for children in the booster seat range. A number of factors were identified that were associated with inappropriate use of adult seatbelts, including the lack of readily accessible information concerning child restraint use and related legislation.

# Literature reviews

Literature reviews can reveal what is known about a topic and what is yet to be discovered. Often, it is only after previous research has been examined that an appropriate focus can be brought to proposed research questions. In many cases, a review of the literature is sufficient to determine the best policy for a particular road safety issue or problem.

Such reviews are made all the more possible because of CASR's development and maintenance of its world-class road safety library. In addition to library searches, up-to-date knowledge also is obtained at conferences and professional meetings.

One recent CASR review was concerned with issues associated with the high crash rates of younger drivers. Specifically, it focused on the possible role of personality, as well as the motivations and attitudes of younger driver subgroups. This, together with a review of the relationship between crash culpability and prior driving records, has elicited knowledge used to shape a major study of younger drivers.

As part of a multi-faceted study into rear end crashes, literature pertaining to the nature and possible means of reducing such crashes was reviewed. This considered factors associated with drivers (e.g. attention), vehicles (e.g. crash

avoidance systems) and road infrastructure (e.g. pavement skid resistance) so that all factors contributing to rear end crashes could be identified. It enabled a full discussion of the methods available to reduce the occurrence of rear end crashes, and was complemented by an examination of both in-depth and routinely collected crash data.

Another literature review was conducted to determine the best practice for the practical assessment of medical fitness to drive. The review drew conclusions regarding best practice with regard to the personnel administering the practical driving assessments (PDAs), testing done prior to a PDA, the nature of the PDA itself, scoring of the PDA, licensing recommendations, and post-PDA follow-up. Another section provided a discussion of the methodological difficulties of assessing the validity of PDAs.

Additionally, CASR is able to conduct meta-analyses of previous research. Such analyses increasingly are being

advocated in medicine and social science, and are a valid way to review previous work pertaining to many facets of road safety. Meta-analyses emphasise a tightly-specified research question, selection of relevant studies of high quality, and some form of averaging of the results from these studies. The availability of a comprehensive library and considerable statistical expertise at the Centre make the use of meta-analyses possible for appropriate projects.



Applying our  
understanding





# Evaluating change

A significant impediment to further progress in road safety is the legacy of a road transport network designed to various standards and philosophies of years gone by.

Governments seek to improve the safety of these road networks and the way in which they are used. Examples of such improvements include the installation of crash barriers, changing road geometry, adoption of Intelligent Transport System technologies and lower speed limits.

However, the expected advantages of these changes often far exceed the actual benefits. Furthermore, the way in which some road safety changes deliver their benefits is commonly misunderstood and sometimes counterintuitive. With few exceptions, such changes tend to deliver small incremental improvements to the overall road safety situation, usually over long periods. These include programs such as the introduction of speed cameras or shoulder sealing on major highways.

CASR has a comprehensive understanding of the role and application of countermeasures to road safety problems. We frequently undertake research combining behavioural studies, mass data analysis and process reviews to determine any benefit of specific actions. The results of these studies

help ensure that governments can make better decisions to protect road users using limited resources in an efficient, cost-effective manner.

## Methodological issues surrounding the evaluation of road safety initiatives

There has been an important movement in medicine, social welfare, education, and other fields to emphasise research that is methodologically of "high quality". This especially means randomised experimentation, and meta-analysis of previously-conducted research. In a randomised controlled experiment, some of the experimental units (e.g. people, schools, intersections, or suburbs) are randomly assigned to one treatment and the other units to an untreated study sample for a comparison, or control group. Randomisation is considered very important because harsh experience in many fields has shown how easy it is for biases to occur if any other method of assigning experimental units is used. Systematic reviews, assessments of all studies on a particular topic, are an even stronger form of evidence than individual

randomised experiments. Yet there are serious difficulties in identifying randomised experiments in bibliographic databases relevant to road safety, particularly as research methodology has not in the past been considered important in the indexing of engineering research.

In several conference papers, we have reviewed the relevance of randomised experimentation to road safety research. Our conclusions are broadly that the advantages of randomised experimentation are real, but perhaps not as strong in regards to matters of principle as some advocates claim. The practical difficulties are very real for some research questions (imagine randomly assigning 20 suburbs to traffic calming and 20 to some other treatment, for example), but the difficulties have been overcome in other contexts (in educational research, schools are sometimes randomly assigned to different treatments, for example). In research design, there is probably no general solution to the problem of balancing methodological quality, difficulties of practicability, and cost. One thing that does

seem clear though, is that an increasing premium will be placed on library services and information retrieval skills to aid in the identification of high quality road safety evaluations. CASR, with its significant library collection and road safety information specialist, will be fully prepared to service such an increase in demand.

Evaluations that we carry out most often necessitate a before/after analysis. As no actual experiment has taken place, we must instead carefully identify appropriate control groups, and determine what possible biases and confounders may be affecting our results.

#### 100 km/h speed limit

In July 2003, the speed limit on approximately 1,100 km of rural arterial roads in South Australia was reduced from 110 km/h to 100 km/h. CASR was asked by the Department for Transport, Energy and Infrastructure to evaluate the consequences of this change on crash frequency. The number of crashes on these roads in the two years before and the two years following the change was compared with that on other roads where the 110 km/h limit was not changed. It appears that the speed limit reduction has had the effect of reducing casualty crashes by about 20 per cent. On average, a speed reduction of 2 km/h was found. The effects of this change are similar to the effects of the reduction of the urban limit from 60 to 50 km/h: speeds on streets with the new 50 km/h limit dropped by 2.2 km/h coinciding with a 20 per cent decrease in injury crashes.



# Informing government and community

CASR maintains the premier library of road safety material in Australia. It offers researchers access to the main journals, the latest research reports, books and conference proceedings and, importantly, valuable holdings of archival items.

These archival items are not just of historical value. They may record significant studies into road crash prevention, offering data and findings as relevant today as when they were published three or four decades ago. In some cases the CASR Library is one of a few institutions in Australia to hold a copy. So it is appropriate then that the library, from November 2005, is now housed in premises that both improves current researcher access to the collection and allows items to be stored in a manner that ensures that they will still be available to researchers for many years to come.

Libraries such as that at CASR cannot, however, service every client need from their own collection. Membership of the Tranzinfo network of transport related libraries in Australia and New Zealand offers the CASR Library ready access to thousands of other items. The CASR Library takes an active role in the functions of the network, and in 2005 extended its resource sharing activities by establishing a current awareness service produced by member libraries and using a new Tranzinfo logo. These bi-monthly bulletins feature a single "Hot Topic" in the transport sector, with responsibility rotated around member libraries. The first issue, covering level crossing safety, was produced by the CASR Library - sharing our knowledge of information resources on that topic with hundreds of transport professionals around Australia and New Zealand.

The CASR Library also produces a weekly email news-alert service, which informs those involved in road safety research or policy of the latest Australian and international developments.





# Technology development

CASR develops technologies related to its research. We do this to make the intellectual output of the Centre available to the community and to relevant industries.

## Laser Speed Measurement Device

CASR's Laser Speed Measurement Device (LSMD) has been developed for use in crash testing laboratories and for pedestrian sub-system testing in particular. The speed of a projectile in a crash or impact test needs to be measured and this is especially difficult in pedestrian sub-system testing where the head-form or leg-form is launched at various angles and is in free flight for only a short period before impact.

The LSMD uses two lasers matched to two sensors: the projectile breaks each laser beam in sequence. The time between these events is measured and as the distance between the lasers is known, the speed can be calculated. Originally created as a working prototype for use in our own laboratory, the LSMD is being commercialised with the assistance of Tiller and Tiller, one of Australia's leading industrial design firms.

## Traffic micro-simulation to assess the impact of ITS technology

Intelligent Transportation Systems (ITS) promise more efficient transportation. CASR is cooperating with the Transport Systems Centre at the University of South Australia to study the effect of ITS in an Australian Central Business District (CBD) environment. This is being funded jointly by CASR and the Australian Research Council.

ITS impacts have been hard to quantify due to difficulties in isolating network effects, and limitations with normal traffic models. Our project therefore takes advantage of state-of-the-art traffic micro-simulation models to test various ITS scenarios in an accurate representation of the Adelaide CBD. The model provides a tool for studying the effect on traffic flows of safety related traffic controls.

## Protective headband

We have pursued the development of head protection for car occupants – the CASR headband – for some years. This arose from a request by the Federal Office of Road Safety to estimate the effect of mandating the padding of the upper interior of passenger cars, which meant looking at the structures commonly hit by the head of an occupant in a crash.

An analysis of CASR's previous investigations of fatally injured car occupants showed nearly half of all serious head injuries came from impacts within an area of the head from the forehead to behind the ears. We deduced it was likely that a device padding the head would be more effective than padding the upper interior of the car – it would be protective in about half of all crashes that otherwise would lead to serious injury.

The Federal Office of Road Safety then sponsored a series of projects, asking the Centre to develop concepts of what form the head padding might take. It was recognised the purpose of the proposed device was primarily to provide protection to drivers of older vehicles not equipped with advanced crash protection (the median age of the vehicle fleet in South Australia being around 11 years).

Prototype headbands constructed and tested have demonstrated a significant protective effect in simulated frontal impacts.

## TARS interface

The Traffic Accident Reporting System (TARS) provides the official record of traffic accidents reported to the Police in South Australia. It consists of three linked databases (crashes, units and casualties). Analysis of the data in the past has required specialised skills and a close knowledge of the databases' structures.

To assist our own research, we have developed a web-based interface with TARS, permitting easily customised queries to be made, with results displayed as cross-tabulations – for example, crashes of a particular type by time of day and day of week for a series of years – or as histograms, such as the distribution of ages of fatally injured pedestrians. Analyses of the crash history of a particular road or intersection also can be performed, and we are able to examine the effect of urban speed limit changes in given locations.

The Department for Transport, Energy and Infrastructure maintains TARS and has access to our web-based interface to answer its own queries. Opportunity exists to provide access to the interface to a wider range of users, including local government agencies.



# Takata International Seminar on Road Safety

The Takata International Seminar on Road Safety was convened by CASR in Bangkok in March, 2005. It was conducted in collaboration with Khon Kaen University and the Thai Government Office of Transport Planning and sponsored by Takata Corporation through a grant to CASR.

The seminar was opened by the Permanent Secretary of the Thai Ministry of Transport, Mr. Wanchai Sarathulthathat. Guest lecturers invited by CASR included Dr Lindsay Griffin, past Director of the Center for Transportation Safety at the Texas Transportation Institute (TTI), Dr Leonard Evans, previously with General Motors Research Laboratories and now the President of Science Serving Society, and Professors Dinesh Mohan and Geetam Tiwari of the Indian Institute of Technology in New Delhi. CASR was represented by Jack McLean, Jeremy Woolley and Matthew Baldock.

Associate Professor Dr Paibul Suriyawongpaisal and Dr Samart Ratchapolsitte set the scene with a keynote address "The Road Safety Situation in Thailand and Asia" followed by a presentation by Dr Leonard Evans on "Road Trauma: A World-Wide Problem." Lindsay Griffin described the development of safer roadsides based on the extensive research program at TTI and also presented three sessions on the evaluation of road safety programs: "Why evaluate?"

"How do we know what we know?" and "How do we conduct evaluations?" Dinesh Mohan lectured on crash injury biomechanics, and vehicle factors in injury prevention, and Geetam Tiwari showed how transport planning can play a major role in road safety, with particular reference to the Asian setting. Leonard Evans emphasised the importance of the interactions between "Young Drivers, Driver Licensing and Traffic Law" and later presented the final address in which he summarised the current state of knowledge on major factors in road crashes and the most effective countermeasures.

The presentations by CASR staff addressed topics such as human factors in road safety and the relationship between travelling speed and the risk of crash involvement, by Jack McLean. Matthew Baldock reviewed the current state of knowledge on the role of alcohol and other drugs in crash causation and Jeremy Woolley addressed the related topics of roadside hazards and road safety auditing, together with

an outline of the CASR approach to the in-depth investigation of road crashes.

The seminar was attended by 138 participants from 12 countries. In addition to those from Thailand, the participants included the Lao Director General of the Ministry of Communication, Transport, Post and Construction; the Director of Planning of the Cambodian Ministry of Public Works; and the Director of the International Cooperation Department of the Vietnamese Ministry of Transport and Communications.

The arrangements for the seminar were greatly facilitated by a close professional relationship between Pongrid Klungboonkrong of Khon Kaen University and Jeremy Woolley of CASR.

Leonard Evans, a Past President of the International Traffic Medicine Association, said that the seminar was "Possibly the best that I have ever attended".





# Projects and publications

Best practice criteria for practical driving tests of medically referred drivers

Compilation and analysis of Australian and international methods for practical assessment of driver medical fitness. Report to be included in CASR report series.

Contact: Matthew Baldock  
[matthew@casr.adelaide.edu.au](mailto:matthew@casr.adelaide.edu.au)



Children in adult seat belts

Survey of the frequency of child restraint use in metropolitan South Australia, with a particular focus on the use of booster seats.

Report published in CASR report series.

Contact: Robert Anderson  
[robert@casr.adelaide.edu.au](mailto:robert@casr.adelaide.edu.au)

ANCAP pedestrian testing

Testing of vehicles for the pedestrian component of the Australasian New Car Assessment Program (ANCAP) vehicle crash performance ratings.

Contact: Robert Anderson  
[robert@casr.adelaide.edu.au](mailto:robert@casr.adelaide.edu.au)

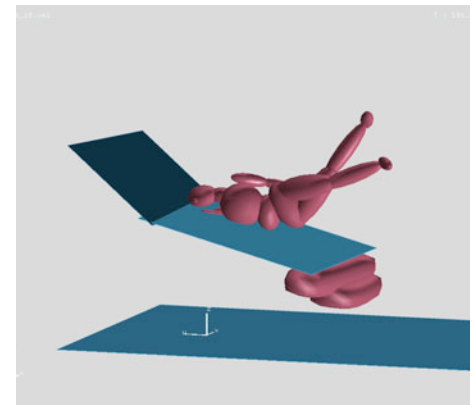


Causes of crashes at signalised intersections

Literature review examining crashes at signalised intersections, and an analysis of data on such crashes in South Australia.

Report to be included in CASR report series.

Contact: Craig Kloeden  
[craig@casr.adelaide.edu.au](mailto:craig@casr.adelaide.edu.au)



Annual performance indicators for enforced behaviours

Yearly review of enforcement in South Australia covering random breath testing, restraint usage and speeding.

Reports issued as part of CASR report series.

Contact: Matthew Baldock  
[matthew@casr.adelaide.edu.au](mailto:matthew@casr.adelaide.edu.au)

Bull bars and pedestrians

Investigation of the role bull bars may have in increasing the severity of crashes with pedestrians, involving tests conducted at the CASR Impact Laboratory.

Report to be published in CASR report series.

Contact: Robert Anderson  
[robert@casr.adelaide.edu.au](mailto:robert@casr.adelaide.edu.au)







### Development of a protective headband for car occupants

Continued refinement of a head injury prevention device that can be worn by car occupants.

Contact: Jack McLean  
[jack@casr.adelaide.edu.au](mailto:jack@casr.adelaide.edu.au)



### Economic cost of road crashes

Assessment of the economic cost of road crashes in South Australia for the year 2002.

Report published in CASR report series.

Contact: Matthew Baldock  
[matthew@casr.adelaide.edu.au](mailto:matthew@casr.adelaide.edu.au)

### Creating a community road safety resource

The CASR Library endeavours to help members of the public answer road safety questions they might have, and produces information sheets to answer common queries.

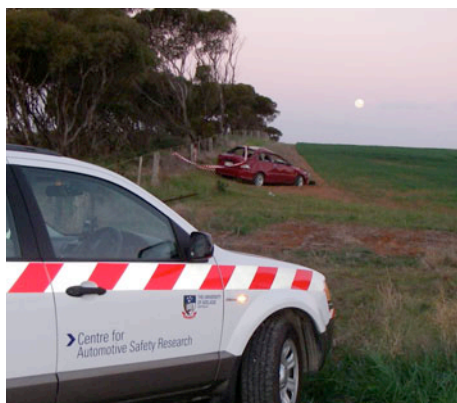
Contact: Andrew Meier  
[andrew@casr.adelaide.edu.au](mailto:andrew@casr.adelaide.edu.au)



### Drug case control study

Preliminary investigation of the feasibility of conducting a drug driving case control study in South Australia.

Contact: Matthew Baldock  
[matthew@casr.adelaide.edu.au](mailto:matthew@casr.adelaide.edu.au)



### Development of peripheral vision tests for driver assessment

Evaluation of software to test peripheral vision capabilities of older drivers. Completed in conjunction with the Psychology Department of the University of Adelaide.

Report published in CASR report series.

Contact: Matthew Baldock  
[matthew@casr.adelaide.edu.au](mailto:matthew@casr.adelaide.edu.au)



### Edge delineations

Examination of issues related to tactile markings on road edges, including their cost effectiveness as a crash prevention measure.

Report to be included in CASR report series.

Contact: Jeremy Woolley  
[jeremy@casr.adelaide.edu.au](mailto:jeremy@casr.adelaide.edu.au)



### Evaluation of the Driver Improvement Program (DIP)

Two-phase evaluation of a workshop program for disqualified Learner's or Provisional licence holders aged 25 years or under in South Australia. Reports published in CASR report series.

Contact: Paul Hutchinson  
[paul@casr.adelaide.edu.au](mailto:paul@casr.adelaide.edu.au)



### Head injury study

Investigation into the mechanisms of brain injury including further testing of a finite element model of the skull and brain.

Contact: Robert Anderson  
[robert@casr.adelaide.edu.au](mailto:robert@casr.adelaide.edu.au)

### Elderly drivers - crash causes and performance

An examination of older driver issues in crashes using data from CASR in-depth crash investigations, expanding on the findings of a PhD thesis.

Report published in CASR report series.

Contact: Matthew Baldock  
[matthew@casr.adelaide.edu.au](mailto:matthew@casr.adelaide.edu.au)



### Evaluation of red light and speed camera program

Study of crash rates at Adelaide signalised intersections before and after red light camera installation, and review of vehicle speeds at selected intersections. Report to be included in CASR report series.

Contact: Craig Kloeden  
[craig@casr.adelaide.edu.au](mailto:craig@casr.adelaide.edu.au)

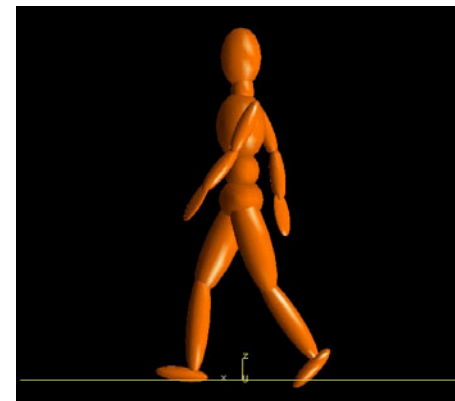


### Examination of 100km/h speed limit zones in South Australia

Analysis of the effect that reduced speed limits in parts of South Australia have had on road crash rates, casualty rates, and observed speeds.

Report published in CASR report series.

Contact: Paul Hutchinson  
[paul@casr.adelaide.edu.au](mailto:paul@casr.adelaide.edu.au)



### IHRA pedestrian safety activity

Ongoing representation on the International Harmonized Research Activities Pedestrian Safety Expert Group and further development of the IHRA computer model of the pedestrian-car collision.

Contact: Jack McLean  
[jack@casr.adelaide.edu.au](mailto:jack@casr.adelaide.edu.au)





## Laser Speed Measurement Device

Refinement and commercialisation of an impact testing measurement tool, which uses lasers and sensors to assist in measuring projectile speeds.

Contact: Robert Anderson  
[robert@casr.adelaide.edu.au](mailto:robert@casr.adelaide.edu.au)



## Impediments to the use of child restraints

Study of social, educational and economic barriers that prevent South Australian families accessing correct child restraints.

Report to be included in CASR report series.

Contact: Robert Anderson  
[robert@casr.adelaide.edu.au](mailto:robert@casr.adelaide.edu.au)



## Methodology of evaluating interventions

Examination of evidence-based research methods in the field of road safety, including the extent to which they have been used, and implications for the future.

Papers presented at 2005 Adelaide International Public Works Conference and published in the journal Traffic Engineering & Control.

Poster presented at 3rd International Conference on Evidence-Based Librarianship in Brisbane.

Contact: Paul Hutchinson  
[paul@casr.adelaide.edu.au](mailto:paul@casr.adelaide.edu.au)







### Neck injuries

Comprehensive report on whiplash disorders including epidemiology, injury biomechanics, and clinical and biomechanical interventions. Report published in CASR report series.

Contact: Robert Anderson  
[robert@casr.adelaide.edu.au](mailto:robert@casr.adelaide.edu.au)



### Metro at-scene crash investigation

At-the-scene investigation of casualty crashes in metropolitan Adelaide, to identify crash causes, injury patterns, and to propose countermeasures.

Contact: Jeremy Woolley  
[jeremy@casr.adelaide.edu.au](mailto:jeremy@casr.adelaide.edu.au)



### Rear end crashes

Use of CASR in-depth crash investigation data to examine risk factors for the incidence of rear end crashes. Also includes an analysis of police-reported crash data, and a review of countermeasures.

Published in CASR report series.

Contact: Matthew Baldock  
[matthew@casr.adelaide.edu.au](mailto:matthew@casr.adelaide.edu.au)



### Roll over crashes

Analysis of rollover vehicle crashes in South Australia using Traffic Accident Reporting System (TARS) data, with literature review examining vehicle design issues. Report published in CASR report series.

Contact: Jack McLean  
[jack@casr.adelaide.edu.au](mailto:jack@casr.adelaide.edu.au)





### Traffic microsimulation

Intelligent Transport Systems (ITS) technologies study, using a traffic microsimulation model on a duplicate of the Adelaide CBD. Undertaken by the Transport Systems Centre, University of South Australia and the Adelaide City Council.

Contact: Jeremy Woolley  
[jeremy@casr.adelaide.edu.au](mailto:jeremy@casr.adelaide.edu.au)



### Validation of the TARS database

Comparison of records in the Traffic Accident Reporting System (TARS) - maintained by the Department for Transport, Energy and Infrastructure in South Australia - with those from CASR in-depth studies. Report to be included in CASR report series.

Contact: Craig Kloeden  
[craig@casr.adelaide.edu.au](mailto:craig@casr.adelaide.edu.au)

Should U-turns be permitted at signalised intersections in South Australia?

Study of the implications of introducing to South Australia the Australian Road Rule on U-turns at signalised intersections. Report to be included in CASR report series.

Contact: Paul Hutchinson



### Use of crash reports in hospital treatment

Literature review to examine whether knowledge of the nature of a road crash aids in the treatment of injuries. Report published in CASR report series.

Contact: Robert Anderson  
[robert@casr.adelaide.edu.au](mailto:robert@casr.adelaide.edu.au)



### Trends in casualty and fatal crash numbers in South Australia

Examines the road crash statistical trend over the past two decades - a general decline in fatalities but much less so in total casualties. Report published in CASR report series.

Contact: Paul Hutchinson  
[paul@casr.adelaide.edu.au](mailto:paul@casr.adelaide.edu.au)



### Why does crash risk rise during the day?

Study of causes for notable rises in serious crash risk from mid-morning until late evening. Undertaken by the Transport Systems Centre, University of South Australia. Report to be included in CASR report series.

Contact: Jeremy Woolley  
[jeremy@casr.adelaide.edu.au](mailto:jeremy@casr.adelaide.edu.au)

## Selected publications 2005

### Conference papers

Anderson R, Dokko Y, McLean J (2005) 'Determining accurate contact definitions in multi-body simulations for DOE-type reconstructions of head impacts in pedestrian accidents' in Proceedings of 19th International Technical Conference on the Enhanced Safety of Vehicles, Washington DC, United States, 6-9 June, 2005. Washington DC: National Highway Traffic Safety Administration.

Anderson R, Kloeden C, Hutchinson TP, McLean AJ (2005) 'Choices of licensing method and crashes of young drivers' in Proceedings of the Australasian Road Safety Research, Policing and Education Conference, 14-16 November 2005, Wellington, New Zealand. Wellington: Fairdene Productions.

Baldock MRJ, McLean AJ, Berndt A (2005) 'Self-regulation of driving and older drivers' functional abilities' in Proceedings of the Australasian Road Safety Research, Policing and Education Conference, 14-16 November 2005, Wellington, New Zealand. Wellington: Fairdene Productions.

Hutchinson TP, Meier AJ (2005) 'If you do not know whether a real-world intervention will work, consider a randomised controlled experiment' in Proceedings of the 2005 Adelaide International Public Works Conference, 21-25 August 2005, Adelaide, South Australia. Thebarton: All Occasions Group.

McLean J (2005) 'Fifty years of at-scene crash investigations: methodological considerations' in Proceedings of the Australasian Road Safety Research, Policing and Education Conference, 14-16 November 2005, Wellington, New Zealand. Wellington: Fairdene Productions.

### CASR report series

Reports available online at: <http://casr.adelaide.edu.au/reports.html>

Baldock MRJ, McLean AJ (2005) 'The economic cost and impact of the road toll on South Australia.' Adelaide: Centre for Automotive Safety Research. CASR Report Series CASR008. 37pp

Baldock MRJ, McLean AJ (2005) 'Older drivers: Crash involvement rates and causes.' Adelaide: Centre for Automotive Safety Research. CASR Report Series CASR015. 39pp

Baldock MRJ, Long AD, Lindsay VL, McLean AJ (2005) 'Rear end crashes.' Adelaide: Centre for Automotive Safety Research. CASR Report Series CASR018. 53pp

Burns NR, Kremer SM, Baldock MRJ (2005) 'Development of peripheral vision tests for driver assessment.' Adelaide: Centre for Automotive Safety Research. CASR Report Series CASR019. 41pp

Versteegh SL, Anderson RWG (2005) 'Using crash information to improve the treatment of crash injuries.' Adelaide: Centre for Automotive Safety Research. CASR Report Series CASR014. 16pp

### Journal articles

Hutchinson TP (2005) 'Better sampling, more analyses, bigger laboratories?' What's New in Laboratory Technology; 15(6): 12-13

Hutchinson TP (2005) 'Consensus versus polarisation: measuring ordinal variability.' Australasian Journal of Market and Social Research; 13(1): 27-35

Hutchinson TP (2005) 'Critical reading and critique of medical articles.' Saudi Medical Journal; 26(1): 160-161

Hutchinson TP (2005) 'Randomised experimentation in evaluating transport and transport safety interventions.' Traffic Engineering and Control; 46(6): 225-229

Kloeden C, Woolley J, McLean J (2005) 'Effect of a lower default urban speed limit on speeds in South Australia.' Road & Transport Research 2005; 14(1): 81-85

Woolley J (2005) 'Recent advantages of lower speed limits in Australia.' Journal of the Eastern Asia Society for Transportation Studies 2005; 6: 5562-5573. Paper online at: [http://www.easts.info/on-line/journal\\_06/3562.pdf](http://www.easts.info/on-line/journal_06/3562.pdf)

### Book chapters

Anderson R, McLean J (2005) 'Biomechanics of closed head injury' in Reilly PL (ed) and Bullock R (ed) Head injury: pathophysiology and management. 2nd edition. London: Hodder Arnold, pp 26-40

Wundersitz L, Burns N (2005) 'Identifying young driver subtypes: relationship to risky driving and crash involvement' in Dorn L (ed) Driver behaviour and training: volume II. Aldershot: Ashgate, pp 155-168





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