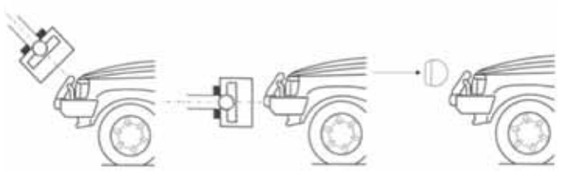
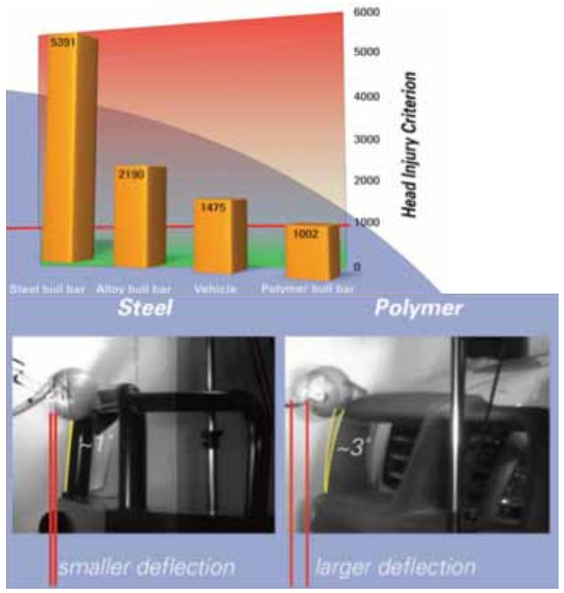
Tests compare pedestrian injury caused by bull bars

In 2006 CASR published a study on the safety of bull-bars fitted to four-wheel drive vehicles, and found that metal bull bars significantly increased the risk of injury to pedestrians in a collision compared to the front of a vehicle.

Three sub-system tests, similar to those used for ANCAP testing of vehicles, were conducted on various steel, aluminium alloy and polymer bull-bars to evaluate their safety performance. The tests simulated a 30 km/h bull-bar impact with the upper-leg/pelvis of an adult and the head of a child.



As demonstrated in the diagram to the right, steel and alloy bull bars degraded the performance of the vehicle. Overall, polymer bull-bars were similar to, or improved the performance of the front of the vehicle.



The difference: softer and lighter material deform more easily, cushioning the impact. This reduces the risk of injury in a collision.

'The University of Adelaide's independence, integrity, academic knowledge and scientific edge have kept the CASR at the forefront of the pedestrian testing and research.'
Hiep Bui, Chief Engineer, Subaru Australia Pty. Ltd.

'CASR staff are friendly, professional and objective oriented people with innovative and cost effective ideas.'
Revathi Krishnamoorthy, Crash Analyst - VSSI,
General Motors Holden Ltd.

'Knowledgeable, consultative and cooperative...a great bunch of guys!'
Hee Loong Wong, Senior Manager Product Engineering,
Hyundai Motor Company Australia

Lab visitors

Pictured after the final vehicle test at the old facility (left to right): Brett Linke, Giulio Ponte, Andrew van den Berg (CASR), Yasuhiro Maeda and Kazuya Takizawa (Suzuki Motor Corp) and Dennis Travassaros (Suzuki Australia).

Government of South Australia
Department for Transport, Energy and Infrastructure

MAC

Government of South Australia

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

Ph +61 08 8303 5997
Fax +61 08 8232 4995
Email casr@adelaide.edu.au
Web http://casr.adelaide.edu.au

Publications

A selection of reports including results from laboratory testing:

Vehicle design for pedestrian protection (CASR037)

Benefits for Australia of the introduction of an ADR on pedestrian protection (CASR048)

The effect of bull bars on head impact kinematics in pedestrian crashes (CASR059)

Headform impact test performance of vehicles under the GTR on pedestrian protection (CASR072)

Implications on easing head impact criteria in pedestrian crash standards (CASR083)

THE UNIVERSITY of ADELAIDE

At the scene

Newsletter of the Centre for Automotive Safety Research

Issue 8, March 2011

Special Edition: Vehicle Testing Laboratory

New laboratory to create more opportunities for research and testing

Since the mid 1990s CASR has operated an impact testing laboratory. The laboratory was initially developed for a long-term study of brain injury mechanisms in fatal road crashes. An important part of that investigation was the force of the impact to the head of a pedestrian when it hit the bonnet of the striking car. Computer modelling is used to estimate the speed of that impact and the impact force is measured by firing an instrumented headform at the same make and model of car. Until the mid-1990s there was only one commercially available headform launcher and its maximum launch speed was just over 40 km/h. With the 60 km/h speed limit in Adelaide researchers needed to be able to reconstruct head impacts at speeds of up to at least 70 km/h.

One of the CASR engineers, Luke Streeter, then set out to design a headform launcher and supervised its construction in Adelaide at only a small fraction of the cost of similar machines. Noburu Takahashi, the senior engineer in charge of pedestrian protection for Subaru in Japan, commented, 'Your launcher may not have cost very much, but it gives the right answer.'

With the development of internationally recognised test procedures to assess the risk of injury to the legs of a pedestrian, a second launcher was designed and built to conduct tests in which instrumented legforms are fired at the front of a stationary vehicle.

The CASR laboratory has recently moved to a new facility at 57 King William Street, Kent Town. While the previous facility had received recognition from international visitors for its accuracy and efficiency, the premises did not allow the centre to expand its operation. CASR intends to make the most of its new facility by promoting the importance of pedestrian testing and expanding the scope of work that it can do for Australian and overseas testing programs and for industry.

'ANCAP have made clear what its roadmap will be over the coming years and we want to be ready to continue to provide a good service to this important program,' said Robert Anderson, Deputy Director of CASR. 'We want the new laboratory to become a centre for vehicle safety testing and to complement existing facilities elsewhere in the country. We see opportunities in roof strength testing for rollovers, as well as the assessment of active safety systems. Active safety is one area that assessment programs will increasingly need to consider. Even electronic stability control, which will soon be a standard feature on all passenger cars, will require assessment as not all systems are likely to perform to the same level. How to fairly rate and compare these systems in a manner that reflects on-road safety will need some consideration. There are a host of other technologies that might eventually also need assessment, and we are keen to create the infrastructure to do this at CASR.'

CASR will host an open day later in 2011 to showcase the new laboratory. This will provide interested parties with an opportunity to view the lab and speak to the staff about current and future testing.

For more information please contact:
Andrew van den Berg,
andrew@casr.adelaide.edu.au

CASR staff pictured (left to right):
Robert Anderson, Marleen Sommariva, Andrew van den Berg, Brett Linke, Daniel Searson, Giulio Ponte

'Working with a state-of-the-art facility like the Centre for Automotive Safety Research increases credibility and also helps us to develop a deeper understanding of pedestrian issues and potential solutions to increase safety.'

'CASR has a vast array of technical knowledge and know-how derived from decades of pedestrian testing and partnering with the Australian Government on standards development, with industry on best practice and with other universities on research.'

Hiep Bui
Chief Engineer
Subaru Australia Pty. Ltd.

A message from ANCAP:
ANCAP and CASR – Tackling the road safety challenge

In Australia, on average, four people die and 75 are seriously injured every day as a result of road crashes – some 1400 people a year dead and an estimated cost of $27 billion a year to the Australian economy.

The Australian community has become de-sensitised to and accepting of such a tragic figure. If four people died in a train or air crash, there would be public outcry and resultant inquiries. So why is it that Australians accept this daily tragedy?

There is a need for concerted action to bring down this figure of death and injuries which is so commonplace in Australia and around the world. The United Nations and the international road safety body, the FIA, have recognised this global problem and have launched the Decade of Action for Road Safety from 2011 to 2020, with the aim of halving the estimated 1.3 million people who die every year from road crashes.

In Australia, the Commonwealth and States have released a discussion paper as the basis for development of the 2011 to 2020 National Road Safety Strategy (NRSS), after the 2001 to 2010 strategy fell well short of its targeted 40 per cent reduction in road fatalities.

It is hoped the new NRSS will provide realistic, achievable targets and goals with practical activities and actions to bring down this high road fatality and trauma rate.

An important part of this road safety equation is the Australasian New Car Assessment Program (ANCAP) – Australia's leading independent vehicle safety advocate. ANCAP crash tests new vehicles, awards them a star rating for safety and provides consumers with independent information on the level of occupant safety in serious front and side crashes.

In the 18 years since its inception, ANCAP has crash tested hundreds of new cars and advised the motoring public of their safety levels. ANCAP's crash testing regime is in line with recognised international protocols, and information is shared with similar assessment programs around the world. ANCAP has overseen the drive by Australian and overseas manufacturers to increasingly incorporate safety into automotive production processes, and the motoring public continues to seek such safety information when making their important new car purchase. Testing has shown that drivers and occupants have twice the chance of being killed or seriously injured in a 1-star ANCAP rated vehicle compared to a 5-star ANCAP rated vehicle.

ANCAP
Crash testing for safety

ANCAP continues to raise the bar in vehicle safety, with the release of its new Road Map identifying emerging safety technologies and their phased inclusion in the ANCAP testing programs over the next five years.

One major element of these new technologies and safety focus is the inclusion of pedestrian safety testing in the event of a collision involving an external road user. While modern safety technologies are designed to protect the driver and passengers, there is also an opportunity for vehicles to have "built-in" safety design for external road users such as pedestrians and bike riders.

ANCAP has worked with CASR for many years to test the pedestrian safety of vehicles. CASR currently conducts pedestrian testing on behalf of ANCAP, and these results are an increasingly important component of ANCAP crash testing.

ANCAP is proud to be associated with CASR in the development of the new lab facilities.

ANCAP is supported by Australian and New Zealand motoring clubs, Australia's State and Federal governments, the New Zealand government, the Victorian Transport Accident Commission, NRMA Insurance and the FIA Foundation. To view ANCAP's star ratings, please go to www.ancap.com.au and link through to vehicle safety results.

For more information please contact:
Allan Yates, Allan.Yates@ancap.com.au
Australasian New Car Assessment Program

Postgraduate research investigates pedestrian protection

Pedestrian impact testing is used around the world as part of new car assessment programs and for compliance with vehicle design regulations.

These testing protocols may stipulate different conditions for the tests: for example, the speed or mass of the headform. Differences in test conditions lead to differences in the measured impact severity.

In 2008, Daniel Searson commenced a PhD at CASR, with the aim of investigating how the selection of test conditions influences the outcomes of pedestrian headform tests. The CASR impact laboratory has been invaluable to this project, with over a hundred impact tests being included as part of Daniel's research.

Daniel's PhD project has shown that the outcomes of pedestrian headform tests are particularly sensitive to the selection of test speed. A small change in impact speed can lead to a big change in the measured severity of the impact. This has implications for real world test protocols, which often specify different test speeds. A vehicle may be rated much higher under a test protocol that specifies a slightly lower test speed, and vice versa.

The results of Daniel's research have been used to estimate how many vehicles might pass the proposed Australian Design Rule for pedestrian protection. If adopted, the ADR would require new vehicle designs to meet a minimum standard of pedestrian protection, which would be validated through the use of pedestrian impact testing.

For more information please contact:
Daniel Searson,
daniel@casr.adelaide.edu.au

International collaboration demonstrates capabilities of lab

Functions of the impact laboratory have been an invaluable part of CASR's research program, not least for the contribution to the centre's international collaborative research activities.

Over the last few years, CASR has been working closely with INRETS, France (now IFSTTAR – The French Institute of Science and Technology for Transport, Planning and Networks).

A common interest in understanding the nature of collisions between pedestrians and vehicles has led to a series of research projects, jointly run by Dr Thierry Serre and Associate Professor Robert Anderson. Dr Serre has been involved in the reconstruction of collisions using full scale tests, while CASR has used sub-system impact tests. A common link in the computer simulation of the collisions led the collaborators to find better ways of modelling the collision event.

A series of visits between researchers in France and Adelaide have ensued. Student François Coulongeat spent time in Adelaide studying how windscreen impact could be modeled, and Dr Baptiste Sandoz, a past student of Dr Serre, is about to complete a one-year postdoctoral appointment at CASR, during which he has been successfully working on a range of head injury research projects.

This collaboration demonstrates how the development and successful operation of a research facility like the CASR impact laboratory can lead to valuable opportunities to work with like-minded researchers from other parts of the world.

For more information please contact: Robert Anderson, robert@casr.adelaide.edu.au

Autoliv Sweden uses technology designed by CASR

Eleven years ago, Autoliv Research in Sweden approached CASR to find out more about the pedestrian headform launcher that had been built and commissioned in Adelaide. Rikard Fredriksson, then the project leader for pedestrian research at Autoliv Research was looking for a machine to use for research and development work.

Soon after, an agreement was reached between CASR and Autoliv and a facsimile of the headform launcher was constructed in Vårgarda, Sweden at the headquarters of Autoliv Research. 'The launcher has been a valuable tool for us to develop pedestrian head injury safety systems, with its simple but very flexible design enabling a high variety of impact speeds and impact angles,' said Mr Fredriksson.

The launcher was used for the development of an active bonnet that protects pedestrians from high forces during a collision. The system uses sensors in the bumper of the vehicle to detect if a pedestrian has been hit. When the system detects that the vehicle is hitting a pedestrian, special inflators are fired to expand a series of bellows at the rear of the hood, lifting it away from hard points underneath the bonnet. The system was launched as the first on the market by Jaguar in 2005.

Further, the launcher has been used for windscreen airbag research protecting the pedestrian from windscreen frame and A-pillar impacts (shown for the first time at the Frankfurt International Auto Show (IAA) 2001). The system was developed using results from impact tests conducted with the impactor as well as full-scale dummy tests.

'We are pleased to have been able to play a role in helping Autoliv to develop an effective design for the protection of pedestrians,' said CASR's Robert Anderson. 'Having an inexpensive and fully resolved design meant that Rikard was up and running only a few months after receiving the designs', he said.

Just like CASR's own machine, the Autoliv device has been in continuous operation since it was commissioned.

For more information please contact:
Robert Anderson, robert@casr.adelaide.edu.au

New lab allows crash reconstruction

One of the principal aims of the laboratory when it was being designed in the late 1990s was to provide a facility for reconstructing head impacts in pedestrian crashes. Head injuries are one of the most common debilitating injuries caused by pedestrian collisions.

Through the in-depth crash investigation program, CASR had collected detailed accounts of the events leading up to a series of collisions, including details of vehicle speeds, injuries and the locations of the interactions between the body of the pedestrian and the vehicle during the collision.

The completion of the laboratory allowed researchers at CASR to reconstruct in-depth cases and make a link between the forces involved in the crash and the severity of the injury.

Robert Anderson said, 'what we found was that the results of impact tests directly reflected the relative severity of injuries in real crashes. This was a validation of the approach of using a headform to assess injury risk, and a good indication that it is possible to lessen the severity of injuries through achieving vehicle designs that produce lower injury scores in such testing.'

For more information please contact:
Robert Anderson,
robert@casr.adelaide.edu.au