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Centre for Automotive Safety Research

# Vehicle Testing Laboratory

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# About the Vehicle Testing Laboratory

The CASR Vehicle Testing Laboratory is a state of the art purpose-built testing facility located in Kent Town, South Australia.

The only facility of its kind in Australia, the laboratory is equipped to conduct a diverse range of impact and vehicle dynamics testing. It boasts numerous long standing clients, both domestic and international, including private sector and government agencies. The laboratory is the official testing facility for the pedestrian component of the Australasian New Car Assessment Program (ANCAP).

Quantifying and studying the impacts between a pedestrian and a vehicle in a crash can lead to vehicle design changes to provide a better standard of pedestrian protection. The laboratory is used extensively in the reconstruction of actual pedestrian crashes 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, to build a knowledge bank that will help ensure greater protection of pedestrians in the future.

We have the flexibility and technical expertise to provide a variety of testing services and can design tests and adapt or build rigs to suit client requirements.

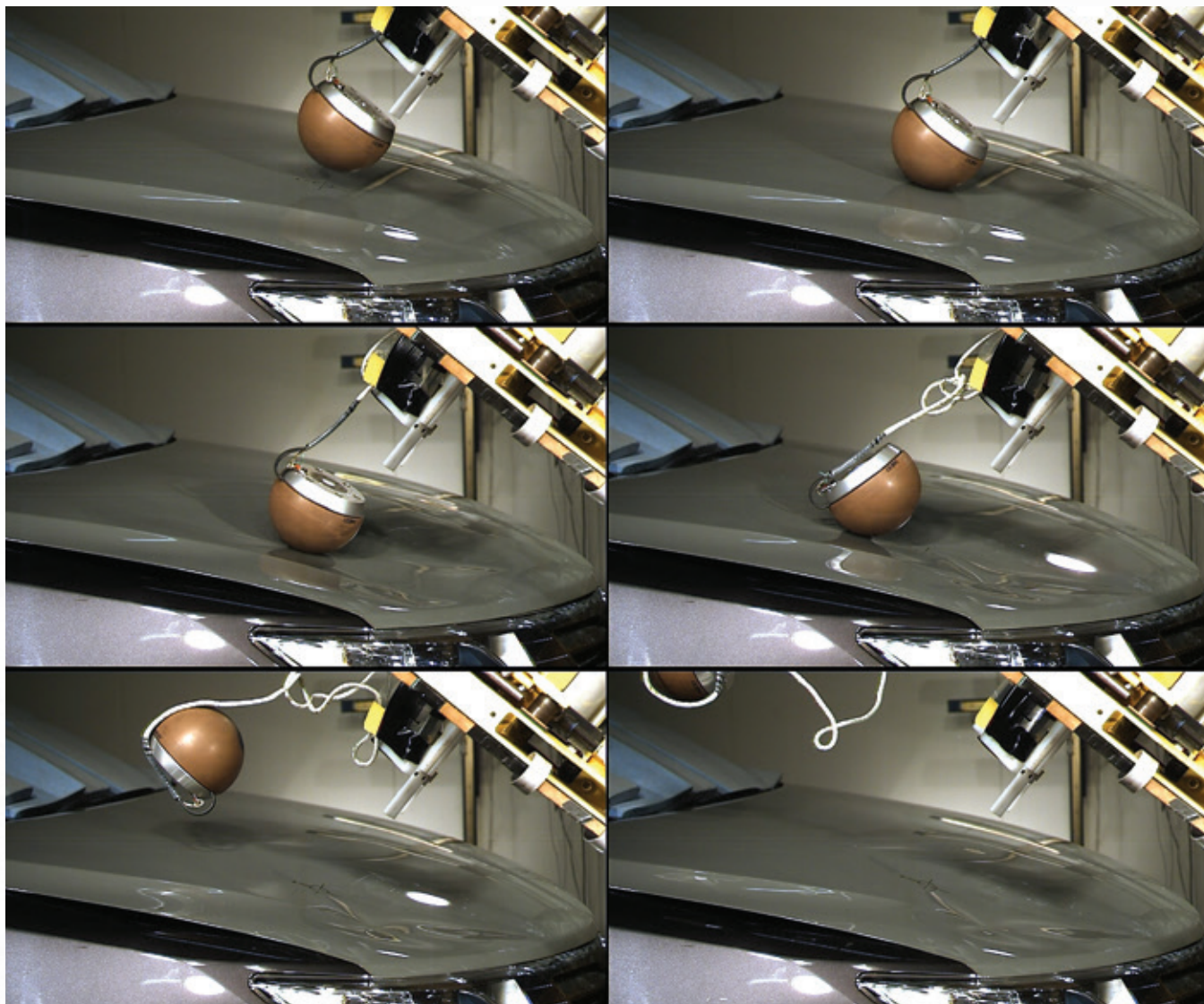
Our capabilities include:

- > Euro NCAP / ANCAP pedestrian subsystem testing
- > Bull-bar compliance testing for AS 4876.1
- > Vehicle testing to comply with GTR-9/European pedestrian safety regulations
- > Vehicle dynamics testing to evaluate primary safety systems, including AEB
- > General impact testing
- > ADR testing
- > Field of view plotting and blind spot assessment

Our team of engineers and road safety experts are able to provide modelling and analysis based on the results of your testing.

The laboratory is also used for internal research projects, including reconstruction of real world pedestrian accidents.





Above: A series of images showing a head impactor striking and deforming the bonnet surface of a vehicle.  
Below: Pedestrian subsystem impactors are used to assess the injury to a pedestrian's leg, pelvis and head.

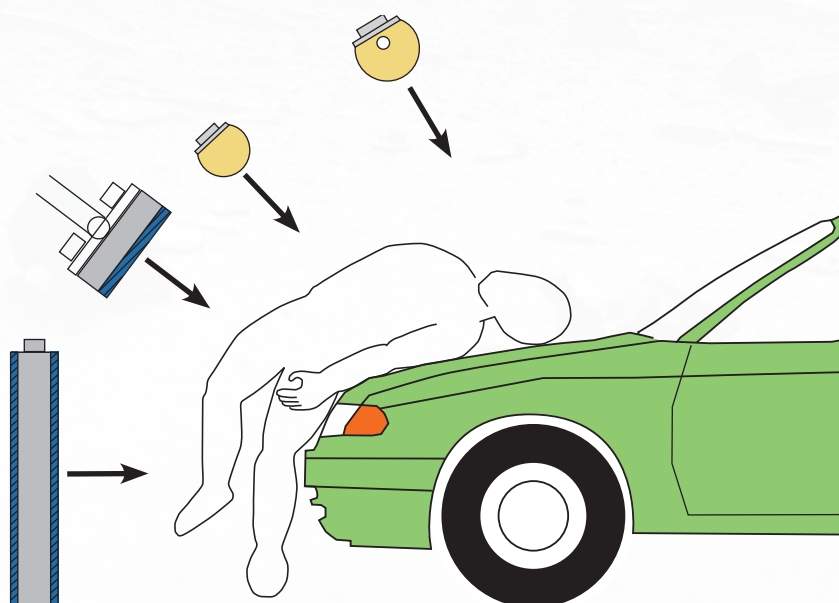
## Pedestrian subsystem testing

The CASR Vehicle Testing Laboratory is the only facility in Australia able to conduct pedestrian subsystem impact tests.

These tests are conducted to assess the risk of injury to a pedestrian when struck by a vehicle and are used in calculating the ANCAP star rating awarded to new vehicles.

The tests are conducted using four impactors that are launched into a stationary vehicle. There are four separate impactors that allow the assessment to be related to the most common serious injuries suffered by pedestrians. The four impactors are a child headform, an adult headform, an upper legform and a full legform.

Our testing uses a headform and a legform launcher that can provide impact speeds of up to 70 km/h. Both machines were designed and constructed by CASR and the design has since been used overseas for various forms of impact testing.



## Vehicle dynamics and primary safety evaluation

The laboratory undertakes vehicle dynamics testing and primary safety systems evaluation using a VBox Differential GPS system (3iSL RTK 100 Hz). The VBox system can measure the position, speed and dynamics of the vehicle at 100 Hz (0.1 km/h speed resolution and sub 2 cm relative positional accuracy).

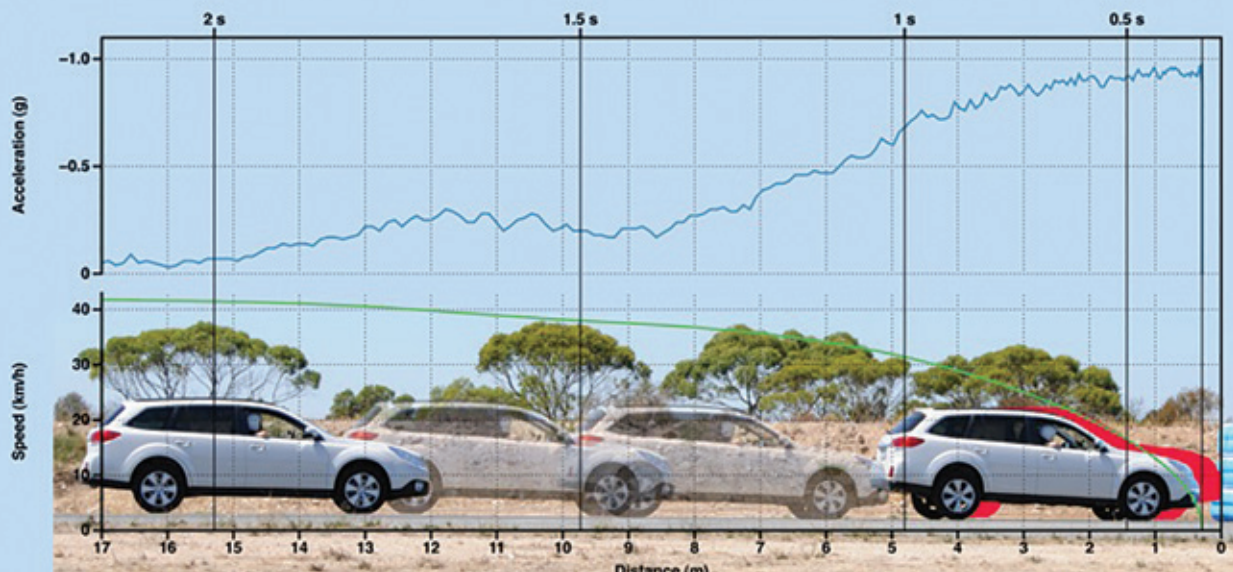
We are able to test and evaluate the following primary safety systems:

- > Adaptive Cruise Control (ACC)
- > Autonomous Emergency Braking (AEB), also known as vehicle/pedestrian collision mitigation and Forward Collision Warning (FCW)
- > Lane Departure Warning (LDW)
- > Electronic Stability Control (ESC)
- > Blind spot detection
- > Automatic main beam control
- > Rear cross pass detection

Other vehicle dynamics applications include:

- > Naturalistic driver studies
- > Brake tests
- > Tyre testing
- > Circuit and driving analysis
- > Speed verification
- > Aquaplane testing
- > Lane change
- > Roll over testing
- > Centreline deviation
- > Motorsport safety

Assessing the capability of Autonomous Emergency Braking (AEB) - vehicle braking response by AEB system when confronted with an obstacle.

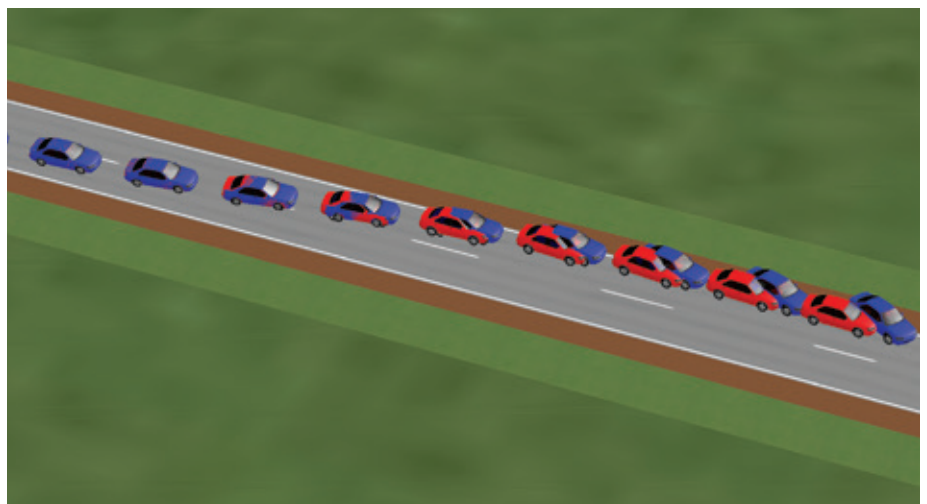


## ADR Testing

The laboratory can assist with the following ADR tests:

- > ADR 3 – Seats and seat anchorages, seats & seat backs
- > ADR 11/00 – Internal sun visors
- > ADR 21 – Instrument panel
- > ADR 22 – Head restraints
- > ADR 31 – Brake systems for passenger vehicles
- > ADR 33 – Brake systems for motorcycles
- > ADR 35 – Commercial vehicle brake systems
- > ADR 38 – Trailer brake systems
- > ADR 18, ADR 18/03 – Speedometer calibration

The CASR Vehicle Testing Laboratory is not limited to vehicles. We are happy to assist with a range of safety testing, modelling and reconstruction, such as plotting the driver field of view, surface impact testing, material impact testing and head injury risk assessment.

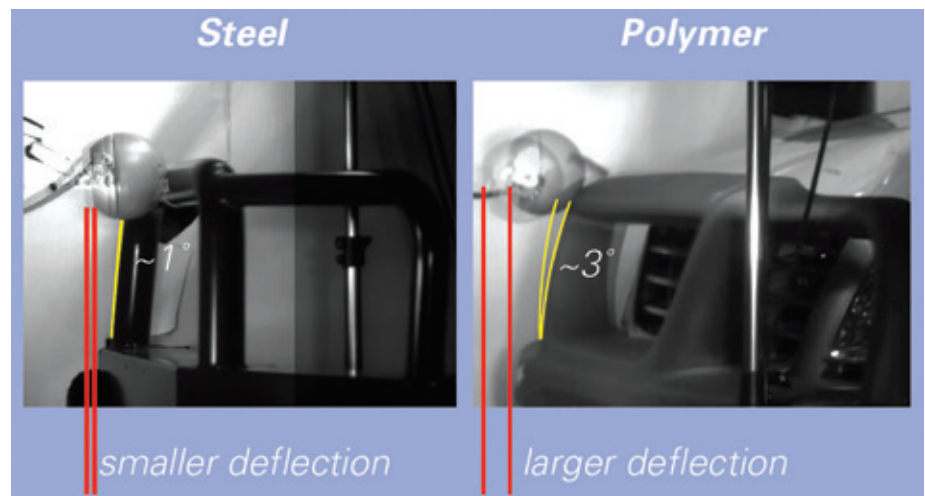


Electronic Stability Control (ESC) - red car with ESC, blue car without.



# Laboratory facilities and equipment

- > Headform launcher – accurate elastic powered launcher capable of launching headforms at any angle to speeds of 70 km/h
- > Legform launcher – accurate elastic powered launcher capable of launching a 20 kg mass at 40 km/h. Speed and angle are adjustable
- > Data acquisition (fixed and portable) 12 channel 50 KHz
- > EEVC WG17 2.5 kg and 4.8 kg headforms
- > GTR 9 specification 3.5 kg and 4.5 kg headforms
- > ACEA 3.5 kg headform
- > Free motion headform complying with the US DOT FMVSS201 requirements
- > In house designed and built solid headform with adjustable mass
- > Damped (gas and fluid) and undamped accelerometers
- > TRL WG17 full legform
- > TRL WG10 upper legform
- > In house designed and built rigid legform for validating CAE models
- > Racelogic VBox 3iSL-RTK x2
- > Racelogic video VBox



- > Brake pedal load sensor
- > Accelerator robot (under development)
- > Braking robot (under development)
- > Small scale high accuracy impactor
- > Polhemus Fastrak motion tracking equipment
- > Small 3D measurement arm
- > High accuracy speed measurement LSMD
- > Radar speed gun

The Vehicle Testing Laboratory workshop is equipped to make or adapt rigs to suit many methods of testing.

The Vehicle Testing Laboratory is fully climate controlled and equipment is certified and calibrated at regular intervals. We carefully consider all aspects of test methods to ensure high accuracy and repeatability.



## Current developments

Our engineers continue to manufacture and develop systems and equipment to ensure our facility is well equipped to serve diverse client requirements.

We are nearing completion in developing accelerator and braking robots for use in Autonomous Emergency Braking (AEB) system testing.

# Our clients

## Australasian New Car Assessment Program (ANCAP)

For over 10 years, we have performed the pedestrian testing component of the ANCAP vehicle testing program. We test approximately ten cars per year to the Euro NCAP pedestrian testing protocol, the results of which are published as part of the ANCAP star rating.

## Government authorities

CASR has carried out a number of research projects to evaluate potential design standards and regulations for pedestrian safety. These projects have involved extensive use of the CASR Vehicle Testing Laboratory, and have been carried out for clients including the South Australian Department for Planning, Transport and Infrastructure, the South Australian Motor Accident Commission, and the Australian Department of Infrastructure and Transport.

## Vehicle manufacturers

Local and overseas vehicle manufacturers have come to CASR for pedestrian safety testing during the design and prototyping phase of vehicle development.

## Bull bar manufacturers

CASR has provided testing services for bull bar manufacturers who wish to demonstrate compliance with AS 4876.1, the non-compulsory Australian Standard for bull bar design.

## Non-vehicle related

A number of other clients, both local and international, have used our laboratory for confidential non-vehicle related research and development.

CASR gratefully acknowledges the support of the following Sponsors:



**Government of South Australia**  
Department of Planning,  
Transport and Infrastructure



**Motor Accident Commission**



**ANCAP**  
Crash testing for safety



# Our experts

Our laboratory is operated by experienced engineers who can advise on, adapt and conduct impact testing to suit client requirements.



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- > Simulation and modelling
- > Vehicle safety research



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- > Pedestrian sub-system testing



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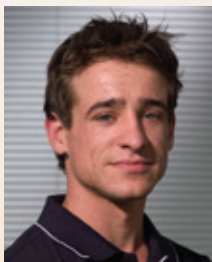
- > Pedestrian sub-system testing
- > Vehicle safety testing



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