ROAD SAFETY COMMITTEE

INQUIRY INTO VEHICLE SAFETY

AUGUST 2008

PARLIAMENT OF VICTORIA

ROAD SAFETY COMMITTEE INQUIRY INTO VEHICLE SAFETY AUGUST 2008

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Road Safety Committee

Inquiry into Vehicle Safety

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Inquiry into Vehicle Safety

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Committee Members

This inquiry was conducted during the term of the 56th Parliament.

Committee Members

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Secretariat

Ms Alexandra Douglas	Executive Officer
Mr David Baker	Principal Research Officer
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Ms Kate Woodland	Office Manager from 17 December 2007

The Road Safety Committee

The Victorian Road Safety Committee is constituted under the *Parliamentary Committees Act* 2003, as amended.

The Committee comprises seven Members of Parliament drawn from both houses and all parties. The Chair is elected by Members of the Committee.

Section 15 of the *Parliamentary Committees Act* 2003, describes the functions of the Committee as:

> The functions of the Road Safety Committee are, if so required or permitted under this Act, to inquire into, consider and report to the Parliament on any proposal, matter or thing concerned with –
>
> (a) road trauma;
>
> (b) safety on roads and related matters.

Committee Address

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Terms of Reference

To the Road Safety Committee – for inquiry, consideration and report no later than 31 March 2008 on vehicle safety –

and the Committee should:

(a) identify and prioritise those vehicle safety technologies that have the most potential for reducing the number of crashes and or the seriousness of injuries sustained in crashes;

(b) compare the level of safety provided by these leading edge technologies with the minimum regulated standards (Australian Design Rules);

(c) compare the rate of fitting of these leading edge technologies in Australia with that of other developed economies including Europe, the United States of America and Japan and identify any impediments to encourage their adoption;

(d) review the level of manufacturers/importers de-specifying (decision not to fit) vehicle safety technologies commonly available overseas to vehicles imported and sold in Australia;

(e) seek advice from high volume local vehicle makers and vehicle importers as to when the vehicles in their product ranges will have these high priority vehicle safety technologies; and

(f) recommend strategies for encouraging vehicle manufacturers to fit leading edge vehicle safety technologies to vehicles sold in Australia and for increasing the public's knowledge and demand for these technologies.

1 March 2007

The Reporting date was extended to 31 August 2008 by resolution of the Legislative Assembly on 4 December 2007.

Chair's Forword

"Yeah it's an old bomb a lemon I know, it's my first car! If it gets scratched or it's smashed its OK, it's cheap, I'll practice my driving in this until I get better at driving and save some money to buy a more expensive car."

This attitude was much the norm in years gone by, and maybe still the case now for some. This attitude must change, because unfortunately new drivers particularly young people more than any other in the community are over represented in road crash fatalities and serious injuries.

Buying the right car is a very important decision that people will make in their lives, in fact it could be a matter of life and death.

To some these comments may seem very dramatic or even an over statement, but I don't believe that is the case for those families in our community who have been touched by the road toll, who tragically have lost loved ones in road crashes.

That is why the Road Safety Committee's Inquiry into Vehicle Safety is an important inquiry which makes some key recommendations which we believe will assist in reducing injuries and loss of life in road crashes.

The Road Safety Committee acknowledges that technologies in vehicles have improved in the past few decades, but encourages the industry to do much more, because the cars they build now will be on our roads for the next 10 years or more, so improvements in vehicle safety need to be implemented now in order to reduce the risk of road crashes.

Having said that, I also believe this issue is one that is a shared responsibility. We all have a role to play when it comes to road safety, we could have all the futuristic technologies under the sun in our vehicles but we still will not be immune to being a road crash victim if we don't drive carefully.

Driver behaviour is very important, being human we are prone to make mistakes but just because we make a mistake on the road in our cars should not cost us our lives. That's why safer vehicles are very important, as active safety technology in a vehicle will assist drivers to detect and avoid potential risks and assist the driver in maintaining control, thereby reducing the risk of a crash.

The committee believes that the Stars on Cars Program, whereby a vehicle is assessed as to how safe it is, is an important issue because the consumer can then make a conscious decision when purchasing a vehicle about how safe the vehicle is and therefore would encourage manufacturers to improve safety in the vehicles they produce.

The recent developments of safer vehicles has moved much further ahead than Australia's regulations, and the specified requirements for new vehicles in Australia are lagging behind Japanese, European, and American standards.

The inclusion of mandatory requirements for Electronic Stability Control and curtain airbags has contributed greatly toward Victoria's inclusion of modern safety equipment in passenger vehicles, but those decisions were made on the back of sustained campaigns.

The Road Safety Committee has agreed the time has come to make recommendations with an eye to the future.

Pre-emptive systems are now available for passenger cars and heavy vehicles making the management of a potentially dangerous situation more easy and effective to control, perhaps even avoiding a crash situation altogether.

The Road Safety Committee is critical of the practice of manufacturers, both domestic and importers, in the tendency to 'bundle' safety equipment such as Electronic Stability Control & Curtain Air-Bags with other non-essential luxury packages (leather trim, cruise control, satellite navigation etc.).

Motorcycles manufacturers have largely avoided the development of safer technologies that have been introduced in passenger cars and heavy vehicles, leaving even anti-lock braking as an option on new bikes rather than a requirement. The Road Safety Committee acknowledges that it is an overdue necessity in saving motorcyclists' lives.

Evidence has been taken by members of the Committee in Australia and overseas. The Committee's overseas study tour, to examine how Governments and manufacturers in the United States, Japan, and Europe deal with vehicle safety regulations, yielded much vital information.

The Committee has weighed up the viewpoints of domestic and international manufacturers, and the aforementioned studies in deciding which practical steps the Victorian Government can arrive at to increase the safety of Victorian motorists.

As a consequence, the Committee recommends that Pre-emptive Brake Assist for all passenger and heavy vehicles, and Anti-lock

Braking Systems for motorcycles become mandatory on all newly manufactured vehicles. The Committee also strongly criticises manufacturers for de-specifying safety technologies for vehicles being imported into Australia.

The Road Safety Committee are pleased to present this report on Vehicle Safety and the recommendations contained in it were made with the sole objective of reducing fatalities and injury on our roads.

Finally I would like to thank my Parliamentary colleagues on this Committee for their sincere commitment and the bi-partisan approach that was taken in preparing this report in the true tradition of this very important Committee. Also, of course, I thank the dedicated staff of the Committee for their hard work in the preparation of this report; namely our Executive Officer Ms Alexandra Douglas, Research Officer Mr David Baker and Office Manager Ms Kate Woodland.

John Eren, MLA

Chair

Executive Summary

While Victoria has traditionally had a strong road safety record, one that is recognised internationally, the same can not be said about our vehicles. Where once Victoria led the world with the introduction of seatbelt legislation, in the last three decades Victoria's leadership and levels of vehicle safety has fallen behind the standards set by other developed economies.

This report has found that the availability of safety technologies is at far lower rates in Australia than overseas, and international developments in Intelligent Transport Systems are seeing Australia fall further behind.

The traditional understanding of occupant restraints such as seatbelts, and more recently airbags as vehicle safety technology has been superseded by the new generation of active safety technologies. These technologies warn a driver of a crash risk or even intervene in the driving to prevent a crash.

Currently, the safety benefits of new technologies are predominantly restricted to luxury vehicles. Leading edge technologies are largely absent from Australian manufactured vehicles.

Of equal concern to the Committee is that heavy vehicles and motorcycles are not benefiting from a focus upon vehicle safety. The range of available technologies and development for motorcycles is very poor.

The Victorian and Federal Governments have not taken sufficient steps to ensure that vehicle safety in Australia keeps pace with international developments. Pro-market policies and in-action have resulted in the safety of Australian vehicles falling behind that of Japan, Europe and the United States.

Contributing to disparities between leading countries and Australia is the practice of de-specification. The Committee has seen convincing evidence that vehicles imported, and even those manufactured in Australia, often have safety technologies removed from models sold in Australia. While manufacturers dispute the practice of de-specification the Committee considers that de-specification claims are valid.

Similarly, the Committee has identified bundling safety options with non-safety features can provide a disincentive to consumers because of the higher cost of selecting packages that include luxury items such as leather trim. The Committee considers this practice to

be unethical and recommends that the Government take urgent steps to strongly discourage the practice.

The Committee did not receive any clear indication from manufacturers of the future availability of technologies prioritised by the Committee.

Of the leading edge technologies identified by the Committee two stand out as the number one priority. These are Pre-emptive Brake Assist for cars and heavy vehicles and Anti-locking Brake Systems for motorcycles. The Committee recommends that these two technologies be mandated through the same process employed by the Victorian Government to mandate Electronic Stability Control and curtain airbags to ensure fitment to new vehicles.

While all vehicle and road safety stakeholders have a role to play in seeing these safety technologies are fitted to Australian vehicles, a technology has to first be made available. Industry opposition to regulation means this responsibility lies with manufacturers.

Australian Design Rules exist in an attempt to ensure that manufacturers produce vehicles of a minimum safety standard. Yet, current Australian Design Rules equate to an Australasian New Car Assessment Program star rating of approximately 1.3 stars. The Committee considers that Australian Design Rules are increasingly outdated and do not reflect international developments in vehicle safety. To ensure that Australia keeps pace with safety developments the Committee recommends that Australia adopt United Nations Economic Commission for Europe vehicle regulations.

The Victorian Government has demonstrated a willingness to address the inadequacy of Australian Design Rules and the lowering levels of vehicle safety in Australia. The announcement of mandatory Electronic Stability Control and curtain airbags is an important step toward regaining Victoria's position as a world leader in vehicle safety. However these two technologies are established technologies and campaigns were already increasing availability and fitment.

The Committee has recommended that Australia adopt the United Nations Economic Commission for Europe (UNECE) Regulations as a step towards achieving vehicle safety standards closer to that achieved in Europe. However vehicle standards alone do not necessarily ensure universal fitment.

The Australian New Car Assessment Program, Government fleet vehicles, third party insurance discounts, Occupational Health and Safety and public awareness campaigns are areas in which the Committee has developed strategies to encourage the fitment of safety technologies.

Recommendations

Vehicle Standards

1. **That, through the Australian Transport Council, the Minister for Roads and Ports pursues the replacement of the Australian Design Rules with United Nations Economic Commission for Europe regulations for vehicle standards.**

2. **That the Victorian Government seeks from the Australasian New Car Assessment Program a review of crash testing protocols to include multiple dummy sizes and the effects of crashes at lower speeds.**

Identifying Safety Technologies

3. **That VicRoads require the fitment of Pre-emptive Brake Assist to new cars and heavy vehicles, as a pre-requisite for registration from 2015.**

4. **That VicRoads require the fitment of Anti-lock Braking Systems to new motorcycles as a pre-requisite for registration from 2011.**

5. **That VicRoads undertake research to ascertain the benefits of Automatic Stability Control for motorcycles and, if found to be significant, promote the technology widely to motorcycle riders.**

6. **That, through the Australian Transport Council, the Minister for Roads and Ports pursues the introduction of regulations to mandate that prime mover and trailer combinations are fitted with compatible braking technologies.**

7. **That VicRoads:**

   a) **map the speed zones of Victoria's road system by the end of 2009; and**

   b) **fit transponders where variable or no speed limit exists, or the speed limit is temporarily changed to facilitate the implementation of Intelligent Speed Assistance technology.**

8. That VicRoads and the Transport Accident Commission fit and trial developmental alcohol interlocks to its vehicle fleet.

9. That the Department of Treasury and Finance fit the current alcohol interlock system used in Victoria to all Victorian Government fleet vehicles.

10. That the Minister for Roads and Ports make representation, at the Australian Transport Council, for the adoption of the dynamic test for United States vehicle standard FMVSS 202-33 as part of Australian Design Rule 3 – Seats and Seat Anchorages.

11. That VicRoads investigates appropriate roadside markings for unsealed roads and unsealed shoulders, that will increase the proportion of roads suited to application of Lane Departure Warning technologies.

12. That the Transport Accident Commission identify on which vehicles Adaptive Cruise Control is available, and promote this information through the www.howsafeisyourcar.com.au campaigns.

13. That VicRoads promote Adaptive Cruise Control technology to heavy vehicle drivers through the Transport Safety Group.

14. That the Victorian Government request from the Australasian New Car Assessment Program the promotion of pedestrian protection ratings alongside occupant protection ratings.

15. That the Minister for Roads and Ports make representation, at the Australian Transport Council, the adoption of the draft amendment to United Nations Economic Commission for Europe Regulation 16 as part of Australian Design Rule 69 – Full Frontal Impact Occupant Protection.

16. That the Minister for Roads and Ports make representation, at the Australian Transport Council, that all seatbelts, in all seating positions, in new vehicles be fitted with repeatable seatbelt pre-tensioning by 2015.

17. That VicRoads:

- **publish a guide ranking the ease of installation for all child restraint systems to promote correct installation; and**

- **subsidise the cost of having a child restraint system installed at VicRoads approved fitting stations.**

18. **That VicRoads investigates all the issues associated with the possible safety benefits of Daytime Running Lamps.**

19. **That the Minister for Roads and Ports promote, at the Australian Transport Council, the standardisation of warning signals used by manufacturers.**

Stability Control and Curtain Airbags

20. **That the Transport Accident Commission continue to promote Electronic Stability Control.**

21. **That VicRoads ensures that, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*, commitment to mandate Electronic Stability Control by 2011 includes all new heavy vehicles and heavy vehicle articulated trailers.**

22. **That the Transport Accident Commission promote vehicles fitted with Trailer Stability Assist on the Crash Avoidance Features webpage on the www.howsafeisyourcar.com.au website.**

23. **That the Transport Accident Commission explain the different acronyms used for Electronic Stability Control, and that ESC be promoted as the standard name of stability control technology as part of the Electronic Stability Control campaign.**

24. **That the Transport Accident Commission continue to fund and produce a campaign to promote curtain airbags to increase fitment rates of curtain airbags until the beginning of 2012.**

Strategies to Encourage Fitment

25. **That VicRoads analyse crash data and the Used Car Safety Ratings data to determine a crash profile for the Melbourne metropolitan area, regional centres and country regions, and then determine the safety technologies most suited to addressing these crash profiles. This information should be shared with vehicle manufacturers to encourage fitment of technologies that would help reduce Victorian crashes.**

26. **That the Victorian Government develop and implement strategies to strongly discourage retailers from bundling safety technologies with non-safety features.**

27. That VicRoads and the Transport Accident Commission provide sufficient funding, over the next five years, to implement the Australasian New Car Assessment Program Stars-On-Cars program in Victoria.

28. That the Transport Accident Commission review and expand the website, www.howsafeisyourcar.com.au, and promote the following technologies:

- **Pre-emptive Brake Assist**
- **Lane Departure Warning**
- **Adaptive Cruise Control**
- **Pedestrian Protection**
- **Active head restraints**
- **Repeatable Seatbelt Pre-tensioning.**

29. That the Transport Accident Commission undertake economic modelling to establish discounts for compulsory third party insurance premiums according to the safety features fitted to vehicles.

30. That the Victorian Government collaborate with private insurance companies to encourage insurance incentives for safer vehicles.

31. That once Intelligent Speed Adaptation technology becomes available, Victoria Police, the Department of Justice and VicRoads, develop and trial a program to target recidivist speed offenders and drivers/riders caught exceeding the speed limit by 30 km/h.

32. That from 2010, all new Government cars purchased or leased have a five star Australasian New Car Assessment Program crash rating. In the interim, all new vehicles purchased be fitted with all available safety options.

33. That the Department of Transport, Department of Innovation, Industry and Regional Development and VicRoads engage the South Australian and Federal Governments in the formation of an inter-governmental vehicle safety taskforce charged with the task of encouraging local manufacturers to fit leading edge technologies.

34. **That VicRoads investigates, by 2010, the potential introduction of Lane Departure Warning and Forward Collision Warning technologies to all new commercial vehicles.**

Intelligent Transport Systems

35. **That the Victorian Government coordinate, with ITS Australia, the financial and technical support required to develop, trial and adopt Intelligent Transport System infrastructure for Victoria as a matter of urgency.**

36. **That VicRoads fit transmitting beacons with a 000 emergency call function to all existing vehicles as a part of vehicle regulation from 2011.**

37. **That the Department of Transport and the Department of Justice extend the existing 000 emergency number to include distress calls generated by in-vehicle transmitting beacons.**

Abbreviations and Definitions

Abbreviations

AAA	Australian Automobile Association
ACEM	Association de Constructeurs Européens de Motocycles (The Motorcycle Industry in Europe)
ACMA	Australian Communications and Media Authority
AIDE	European Adaptive Integrated Driver-Vehicle Interface
ARRB	Australian Road Research Board (now ARRB Transport Bureau)
ATC	Australian Transport Council
ATSB	Australian Transport Safety Bureau
BAST	die Bundesanstalt für Straβenwesen (Federal Highway Research Institute Germany)
CALM	Communications Air-interface, Long and Medium range
CARRSQ	Centre for Accident Research and Road Safety Queensland University of Technology
CASR	Centre for Automotive Safety Research, University of Adelaide
CICAS	United States Department of Transportationation, Co operative Intersection Collision Avoidance Systems
CRS	Child Restraint Systems
EEVC	European Enhanced Vehicle Safety Committee
ETSC	European Transport Safety Council

EuroNCAP	European New Car Assessment Program
FCAI	Federal Chamber of Automotive Industries
FHWA	United States Department of Transportationation, Federal Highway Administration
FMCSA	United States Department of Transportationation, Federal Motor Carrier Safety Administration
FMVSS	Federal Motor Vehicle Safety Standard (United States)
GHz	Gigahertz
GPS	Global Positioning System/Satellite
GTR	Global Technical Regulation
HIC	Head Injury Criterion
HMI	Human Machine Interface
IIHS	Insurance Institute of Highway Safety (United States)
INRETS	L'Institut National de Recherche sur les Transports et leur Sécurité (National Institute for Transport and Safety Research France)
IRMRC	New South Wales Injury Risk Management Research Centre, University of New South Wales
JNCAP	Japanese New Car Assessment Program
LED	Light Emitting Diode
MHz	Megahertz
MLIT	Ministry of Land, Infrastructure and Transport (Japan)
MUARC	Monash University Accident Research Centre
NCAC	National Crash Analysis Center, The George Washington University

NCAP	New Car Assessment Program (United States)
NeTC	National Electronic Tolling Committee
NHTSA	United States Department of Transportationation, National Highway Traffic Safety Administration
NRMA	National Roads and Motorists' Association
NTC	National Transport Commission
OHS	Occupational Health and Safety
PBS	Performance Based Standards
RACV	Royal Automobile Club of Victoria (RACV) Ltd
RITA	United States Department of Transportationation, Research and Innovation Technology Administration
SUV	Sports Utility Vehicle
SWOV	Netherlands Institute for Road Safety Research
TAC	Transport Accident Commission
UNECE	United Nations Economic Commission for Europe
VRU	Vulnerable Road User
VTA	Victorian Transport Association
WG	Working Group
4WD	4 Wheel Drive

Definitions

ABS	Anti-lock Braking Systems: monitors wheel lock during braking and adjusts braking force to free a locked wheel and maintain optimal braking.
ACC	Adaptive Cruise Control: adjusts a vehicle's speed to maintain a preset distance to the vehicle in front.
Active safety	Technologies designed to prevent or mitigate injury from a crash.
ADR/ADRs	The Australian Design Rules: stipulate the minimum regulated standard that a vehicle must comply with for registration.
ANCAP	The Australasian New Car Assessment Program: an independent body which crash tests new vehicles to determine a vehicles safety rating – represented in a star rating.
ASC	Automatic Stability Control: modifies wheel speeds to maintain equal traction between wheels on a motorcycle.
ASV	Advanced Safety Vehicle Project: is a joint Intelligent Transport System vehicle program between the Japanese Government, research institutes and manufacturers.
Austroads	The association of Australasian road authorities
Cost-Benefit	The calculated ratio between the economic cost and the economic benefit of fitting a safety technology.
Data map	An electronic map of speed limits and traffic signs for use with in vehicle navigation and safety technologies.
DRL	Daytime Running Lamps: low level front lights designed to improve visibility of the vehicle during daylight hours.

DSRC Dedicated Short Range Communication: a communication protocol for an internationally agreed Intelligent Transport System frequency range of 5.850 GHz - 5.925 GHz.

EBS Electronic Braking Systems: use electronic signals to activate braking systems at the wheel.

ESC Electronic Stability Control adjusts each wheel independently to ensure that a vehicle maintains the direction indicated by the steering system.

FCW Forward Collision Warning: monitors the distance to a vehicle in front and emits a warning when the gap becomes too close to permit safe braking for the speed being travelled.

Intelligent Transport Systems

Advanced technology based systems that enable communication between intelligent infrastructure and intelligent vehicles.

ISA / ISAssist

Intelligent Speed Assistance: warns a driver when they exceed the speed limit for the road being travelled.

ISAdapt Intelligent Speed Adaptation: restricts a driver's ability to exceed the speed limit.

ISOFix a standard in Europe for the fitment of child restraint systems.

LATCH Lower Anchors and Tethers for Children: a standard in the United States for the fitment of child restraint systems.

LDA Lane Departure Assistance: applies autonomous corrective steering when a vehicle departs from the driving lane, if the driver has not indicated an intention to do so.

LDW	Lane Departure Warning: warns a driver that they are steering out of the driving lane, if the driver has not indicated an intention to do so.
Passive safety	Technologies designed to protect vehicle occupants in the event of a crash.
TSA	Trailer Stability Assist: adjusts independent wheels to maintain trailer direction, and is aligned with the towing vehicle.
UCSR	The Used Car Safety Ratings system compiles real world crash data to determine the safety rating for a vehicle model.
VicRoads	Registered business name of Roads Corporation, the statutory body that manages the Victorian arterial road network, vehicle registration and driver licences.
Vehicle to Infrastructure (V2I)	Communication to and from vehicles with a traffic control centre via roadside infrastructure.
Vehicle to Vehicle (V2V)	The communication between vehicles of their location, safety and traffic information.

Chapter

1

Introduction

In 2007 333 people were killed on Victorian roads. The number of serious injuries in 2005 (the latest available statistics) was 6,177, approximately seventeen serious injuries per day.[1]

Historically, Victoria led the world in road safety measures when, in 1970, following a recommendation of the then Parliament of Victoria Road Safety Committee the fitment of seatbelts was made mandatory for cars. Two years later, the wearing of seatbelts was mandated.

The fitment of seatbelts illustrates the affect safety technologies can have in reducing serious injuries and fatalities on Victorian roads. Since 1978, the introduction of anti-lock brake systems, airbags and Electronic Stability Control (ESC) has increased the public's awareness of the role of technology in achieving enhanced vehicle safety.

New safety technologies are being fitted at an increasing rate with each new model launch. Further promises of safer driving in the future, including increasing vehicle intervention in the driving task, are revealed annually at international motor shows.

Vehicle safety technologies are regularly identified in State and Federal road safety strategies as a countermeasure to the number of crashes and injuries. The release of two yearly action plans during the span of these safety strategies aims to ensure that the Government keeps up to date with developments in leading edge technologies.

Yet, the full potential of technological advances is not being realised in Australia due to low rate of fitment of safety technologies into vehicles. The Federal Government's action plan, *National Road Safety Action Plan 2007-2008* recognises this, noting that:

> ... vehicle systems to strongly encourage seat belt use, increase speed awareness, improve dynamic stability and reduce head injuries in side impact crashes have been provided in a minority of new vehicles sold in the last few years.[2]

VicRoads, in their submission to the Inquiry, also highlighted poor fitment rates of technologies, stating that:

> ... Australia is lagging behind in the adoption of important vehicle safety technologies.[3]

Of concern also to the Committee is the disparity in fitment of technologies between vehicle types. The range of technologies being developed and introduced to motorcycles is less than for cars and heavy vehicles. The Transport Accident Commission (TAC) submission reinforced this stating that:

> No objective data exists about the prevalence and availability of advanced technologies on motorcycles ...[4]

Conduct of the Inquiry

On 1 March 2007, the Legislative Assembly issued the Road Safety Committee with the Inquiry into Vehicle Safety. Notices were placed in major metropolitan and regional newspapers in the week beginning 31 March 2007 advising the Terms of Reference and inviting submissions. Additional written invitations for submissions were sent to key stakeholders identified by the Committee.

Submissions and Hearings

Thirty-five submissions were received from members of the public, vehicle manufacturers and importers, road safety organisations, Government departments, automobile clubs and safety technology suppliers.

See Appendix A for a list of submissions received by the Committee.

The submissions expressed a range of views regarding strategies for increasing the fitment rate of safety technologies. Suggestions of priority safety technologies informed the Committee's initial identification of vehicle safety technologies.

Further evidence was sought through public hearings held between August 2007 and March 2008. Various vehicle manufacturers and importers who did not make submissions were requested to appear before the Committee and all but one appeared. While the Committee had a productive meeting with Nissan in Japan, gaining

important knowledge about developing safety technologies, Nissan Australia declined an invitation to appear before the Committee.

See Appendix B for a list of public hearings.

Overseas Study Tour

Included in the Terms of Reference of the Inquiry the Committee was to identify leading edge vehicle safety technologies and compare the availability of these technologies in Australian vehicles to that of other developed economies, and explore ways of encouraging fitment.

The Committee undertook an overseas study tour from 25 August to 16 September 2007. Meetings were held in Japan, the United States, Belgium and Germany. Discussions with a range of international experts, manufacturers and researchers provided the Committee with insight and detailed knowledge of developments in safety technologies and strategies to encourage fitment.

See Appendix C for a list of overseas meetings.

Defining Vehicle Safety Technology

Technologies are broadly grouped into two categories:

- active technologies designed to avoid crashes, and
- passive technologies that protect vehicle occupants in the event of a crash.

Post-crash communication technologies are a distinct third category of safety technologies. These systems are found within the vehicle and notify emergency services of a crash.

Passive Safety Technologies

Passive safety technologies are typically visible technologies such as seatbelts, airbags, motorcycle helmets and child restraints. Passive technologies are designed to protect vehicle occupants in the event of an impact or crash.

Active Safety Technologies

The United Nations Economic Commission for Europe (UNECE) document, *World Forum for Harmonization of Vehicle Regulations (WP.29) How It Works How to Join It,* defines active safety as a technology that will assist drivers to detect and avoid hazards through improved vehicle behaviour and handling as well as help a

driver maintain control of a vehicle, thereby decreasing the likelihood of a crash.[5]

Electronic Stability Control (ESC), which controls the braking of each individual wheel to maintain the stability of a vehicle independent of the driver, is an example of an active safety technology.

Where an active technology does not prevent a crash, in most instances it will reduce the intensity of a crash and will result in fewer severe injuries.

Active technologies are either warning systems that alert a driver to risks, or are interventional applications that technologically avert or mitigate a risk. In most cases, an active safety technology is initially fitted as warning system before a subsequent development introduces it as an interventional function.

Developments in passive technologies are increasingly overlapping with active technologies. For example, the majority of current seatbelt pre-tensioning systems use a once-off pyrotechnic device, triggered when a crash occurs and is therefore defined as passive safety. Pre-emptive pre-tensioning seatbelts use an electric motor to apply pre-tensioning when a crash risk is detected. If the risk passes, the pre-tensioned seatbelt is returned to the normal position. This leading edge pre-tensioning technology is defined as an active safety technology.

Historically passive technologies have played a key role in saving lives. However, during the course of the Inquiry the Committee was repeatedly informed that the potential of passive technologies to improve vehicle safety is being overshadowed by the expanding development of active technologies that will avoid a crash altogether.[6]

GM Holden Ltd in their submission to the Inquiry stated that:

> The future opportunity for safety is in crash avoidance ...[7]

A 2001 report into the competitiveness of the European automotive industry by the European Commission, *CARS 21: A Competitive Automotive Regulatory System for the 21st Century*, also noted the future direction of technologies. The report concluded that:

> ... future significant gains in casualty reduction from a combination of vehicle and road infrastructure engineering are expected to come from crash avoidance technologies ...[8]

The Committee identified a shift in focus on developing active safety technologies away from passive technologies.

Vehicle Types

For the purpose of this Inquiry the Committee has considered three vehicle types or categories: light vehicles; heavy vehicles; and motorcycles.

The predominant vehicle on Victorian roads is a light vehicle, which includes cars, sport utility vehicles (SUV), four wheel drives (4WDs) and light commercial vehicles. For the purpose of this inquiry the Committee defines all these vehicles as cars.

Heavy vehicles include rigid axle trucks, articulated trucks and buses.

Motorcycles include all two (and three) wheel vehicles requiring road registration.

Impediments to the Inquiry

The Committee faced a number of impediments during this Inquiry, including limited research data, a bias toward cars and the focus of particular vehicle safety technologies.

Data Availability

Due to the low fitment rate of vehicle safety technologies in Australia, and to a lesser extent internationally, the ability to research the effectiveness of leading edge technologies is limited. Low fitment rates limit the available crash data for comprehensive assessment, hindering the Committee's ability to make evidence-based decisions.

While crash testing, such as that undertaken by the Australasian New Car Assessment Program (ANCAP) has been used since the early 1970s to assess passive technologies, active technologies cannot be assessed by crash testing as they are intended to avoid a crash.

The dilemma is that until technologies are fitted and used on the road they cannot be evaluated.

Therefore the predicted safety benefits of new technologies, particularly active technologies, are estimations until there is sufficient market penetration to permit statistically significant real world data analysis. Some of the technologies identified by the Committee have limited real world exposure.

Car Bias

The Committee also found a bias toward cars in both research and technical development. This made the Committee's efforts to thoroughly investigate the range of vehicle safety options available to all vehicle types difficult. There is some overlap in technological development between cars and heavy vehicles, such as Lane Departure Warning (LDW) technology which was originally developed for heavy vehicles. However heavy vehicles are not automatically served by the fitment of safety technology developed for cars. Vehicle specific research and development is required.

Motorcycles have largely different safety requirements. Primary, is the increased vulnerability of motorcyclists compared to drivers who are afforded protection from surrounding vehicle structure. The Committee found little evidence of developments of safety technologies for motorcycles during its investigations. There is a disproportionate lack of research and development into relevant safety technologies from manufacturers and road safety institutions for motorcycles.

Commercial in Confidence

The Committee was repeatedly informed by manufacturers during public hearings that information relating to future vehicle technologies could not be revealed due to 'commercial in confidence'. This was cited to justify refusal to answer the Committee's inquiries into what technologies were being developed and when leading edge technologies would be made available.[9]

Professor Brian Fildes, Chair, Road Safety, Monash University Accident Research Centre (MUARC) at a public hearing in Melbourne, 6 August 2007, also noted the frustration, stating that:

> ... in terms of what they are going to fit in their next vehicle, they will never share that with us ... because that is their commercial-in-confidence information.[10]

The degree of reticence by manufacturers varied. Manufacturers producing vehicles with a greater range and higher fitment of safety technologies tended to be more willing to discuss issues pertinent to

the Committee's Inquiry, both at the public hearings and during the overseas study tour.

Two manufacturers were open to informing the Committee of forthcoming technologies. Mercedes Benz showed the Committee prototype technologies during a visit during the overseas study tour and Hyundai were willing to supply indicative information based on planned fitment programs overseas and product development.[11]

Popularity of Electronic Stability Control

It became apparent to the Committee early in the Inquiry that the popularity of ESC within road safety circles influenced the information the Committee received. The significance of this technology distracted witnesses from identifying other leading edge technologies.

While acknowledging the benefits of this technology, the Committee considers that the downside of this focus detracts from public awareness about other, arguably better technologies that are emerging.

Prioritising Vehicle Safety Technologies

In order to prioritise vehicle safety technologies the Committee sought advice from experts, both in Australia and internationally.

Submissions

Submissions received by the Committee identified a range of safety technologies. Four submissions were classified as commercial literature, promoting a single technology.[12] This included the Bosch submission that only referred to ESC, ignoring all other safety technologies available from Bosch. Speed limiting technology was the sole focus of two submissions.[13] However submissions from VicRoads, MUARC and the TAC, critically prioritised an extensive list of vehicle safety technologies.

VicRoads, in their submission to the Inquiry elected to classify vehicle safety technologies as high and medium priority. Highest priority was attributed to technologies that may affect the greatest reduction in road trauma.[14] Technologies classified as medium priority were considered to have an unlikely saving in the causality of crashes as these technologies are either in development or have only limited commercial availability.[15]

The submission from MUARC similarly prioritised technologies as high and medium priority. Like VicRoads, high priority technologies were those supported by robust evidence that indicates a likely effectiveness. Medium priority safety technologies, while deemed to

have some road safety value, lacked sufficient formal studies to substantiate estimates of likely effectiveness.[16]

Of interest to the Committee however is MUARC's own vehicle fleet policy. The policy reveals both a pragmatic approach of fleet vehicle selection criteria with the possibility to test leading edge safety technologies. The policy allows the predicted benefits of medium priority safety technologies, that have not had sufficient real world exposure to enable statistical analysis, to be classified as 'highly desired' and therefore a requirement for fitment to MUARC's fleet vehicles.[17]

In their submission to the Inquiry, the TAC used the following seven criteria to prioritise vehicle safety technologies:

- effectiveness and road trauma impact;
- state of readiness to implement;
- cost;
- community acceptance;
- regulatory requirements;
- infrastructure requirements;
- potential for greater vehicle fleet penetration.[18]

While evidenced-based research is paramount, it is not readily available for all leading edge technologies. Furthermore waiting until sufficient evidence becomes available, where estimates indicate a significant safety benefit, limits potential safety benefits that may be achieved.

The Committee used the selection criteria from VicRoads, MUARC and the TAC as a starting point in formulating its own criteria. The Committee has not allowed the readiness for commercial availability nor infrastructure inadequacies to rule out priority technologies identified in Chapter 3.

The Committee has also selected technologies to ensure representation of all vehicle types and occupants.

Road Safety Strategies

Where Federal and State Government road safety strategies contained reference to leading edge safety technologies, the Committee gave due consideration to current priorities. These strategies include the:

- Federal *National Road Safety Strategy* 2001-2010 and subsequent two yearly *Action Plans*;
- Federal *National Heavy Vehicle Safety Strategy* 2003-2010;
- Victorian road safety strategy, *arrive alive!* 2002-2007;
- Victorian Motorcycle Road Safety Strategy 2002-2007; and
- Victorian road safety strategy, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017.*

The prioritised technologies identified within the strategies reflect the respective Governments' objectives and agendas. The Committee has referenced road safety strategies to ensure that this Inquiry builds on the work of the Federal and Victorian Governments. At the same time, the Committee has not restricted the identification and prioritising of technologies to those previously identified within these road safety strategies.

Significantly, the Victorian Government's second road safety strategy, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*, announced in February 2008, pre-empted the recommendations of this Inquiry. The Committee is pleased with the announcements made in relation to the fitment of Electronic Stability Control and curtain airbags. However the Committee would have appreciated being consulted, particularly as this inquiry was issued by the Government and the Committee were asked to investigate and report on vehicle safety technologies.

The Committee similarly reviewed international road safety strategies. These provided a critical perspective of Australia's approach to the role of promoting and increasing the fitment of vehicle safety technologies and other potential strategies.

Cost-Benefit Analysis

Analysis of the safety benefits and fitment cost is an economical comparative assessment of the introduction of a technology. Will the outcome of fitting a technology cost more than the savings realised through reductions in the costs of road crashes and personal injury? The larger the ratio in favour of the benefit

achieved versus the cost incurred (cost-benefit ratio), the greater the safety outcome compared with the financial expense.

The difficulty posed by cost-benefit analysis is that the benefits and costs are not born by the same parties. A cost-benefit analysis assessment is therefore a road safety assessment and an economic calculation.

MUARC has identified that for a simple safety technology, such as seatbelt reminders, a 1:5.1 ratio warrants the fitment of this technology for the driver, with benefits exceeding costs by a factor of five. However, fitment for all seating positions is deemed unwarranted by manufacturers due to the cost-benefit ratio being less than one 1:0.7.[19] The cost of fitting the technology for all passengers is higher than the perceived savings in safety.

Mr Peter Robertson, General Manager, Vehicle Safety Standards with the Federal Department of Infrastructure, Transport, Regional Development and Local Government at a hearing in Melbourne, 4 February 2008, identified detailed cost-benefit analysis as one factor of regulatory impact statements that are considered when regulating a technology.[20]

Cost-benefit analysis is further complicated by the parties that bear the costs or savings of a technology fitment decision. Manufacturers and vehicle purchasers pay for the development and fitment of a technology. However, a reduction in road crashes presents savings for insurance companies and the State in cost reductions for medical resources, road infrastructure repair, emergency services, transport disruption and ongoing rehabilitation. Cost–benefit analysis identifies the need to share the cost burden of fitting new technologies so that it is in part borne by the beneficiaries of fitment, not manufacturers alone.

It must be noted that cost-benefit analysis favours available technologies as the money has already been invested. Accurately assessing the cost variables of technologies still requiring development and investment is difficult, as is assessing the benefits when sufficient data does not exist.

The Committee has considered cost-benefit analysis, where available in assessing the potential of vehicle safety technologies.

Public Acceptance

An understanding and appreciation of the public's acceptance of vehicle safety technologies has also informed the Committee's selection of safety technologies to be prioritised.

Human Machine Interface

The Committee was concerned that drivers would develop a dependency upon the various warning systems. This concern was somewhat allayed by the MUARC findings in the 2006 report, *On-Road Evaluation of Intelligent Speed Adaptation, Following Distance Warning and Seatbelt Reminder Systems: Final Results of the TAC SafeCar Project*. In relation to the following warning device systems, the report stated that:

> Most participants (78.4%) disagreed or strongly disagreed that they would wait to hear warnings ... rather than use their own judgement.[21]

However, this finding is contradicted by a 2005 report from the French National Institute for Transport and Safety Research (INRETS), *Literature Review of Behavioural Effects*, as part of the European Adaptive Integrated Driver-Vehicle Interface (AIDE) project which found that drivers can become reliant upon a technology. This reliance may result in a driver having difficulty recognising and adapting their driving to the particular driving conditions being experienced.[22]

Some active safety technologies are increasing the interaction between the driver and the vehicle. This technology-based interaction is called the Human Machine Interface (HMI). When a vehicle generates a warning signal the driver needs to register and interpret the warning and respond with a driving adjustment.

The HMI interaction is complicated by the variations in the signals used for the similar warning systems by different manufacturers. Different signals in different vehicles may potentially diminish the effectiveness of a vehicle safety technology.

The European Commission has attempted to address this issue through a Code of Practice for the design, development and assessment of active vehicle safety technologies. The focus of the Code of Practice is the development of active technologies with:

> ... particular emphasis on the human factors requirements for 'controllability'.[23]

The Code of Practice defines controllability as the capacity of a driver to perceive a critical situation; decide on an appropriate driving response; and the ability to execute this response.[24]

The Committee suggests that the European Code of Practice be adopted by Australian vehicle manufacturers as link between research and development of active safety technologies.

Another concern that the previous Road Safety Committee expressed in the 2005 report, *Inquiry into the Country Road Toll*, was the possibility that drivers may rely on these devices and become less vigilant. In the report the Committee stated that the:

> ... effectiveness in improving road safety does not dispel the possibility that drivers may become over-reliant or less vigilant as a result of such devices.[25]

Of greater concern, the Committee noted that an over-reliance on technologies may cause drivers to lose skills. The report noted that:

> ... behavioural adaptation to the systems may cause drivers to be take greater risks in their driving ... drivers may lose skills they previously had ... [and] that drivers may expect more from the technology than it can provide.[26]

The Committee considers this issue to be especially pertinent in relation to Forward Collision Warning (FCW) and Adaptive Cruise Control (ACC) technologies, which are discussed in Chapter 3.

The INRETS report, *Literature Review of Behavioural Effects*, also highlighted this issue of drivers using safety warnings as a means of pushing safe driving limits, as opposed to adjusting their driving when confronted by an identified risk.[27]

During a meeting with Mr Dominique Cesari, the Deputy Director, INRETS, 10 September 2007, in Brussels as part of the overseas study tour, the Committee were informed that on hearing an audible warning, drivers had a tendency to look to the dashboard of the vehicle.[28] In effect, a driver's attention is diverted from an impending danger.

At a public hearing, 6 August 2007, Professor Fildes, MUARC, identified the potential hazard of HMI overload. He commented that:

> If a driver is faced with a whole lot of responses that they are getting from various sources of technology are they going to be able to handle it? Is it going to become more of a hazard than a help?[29]

The Committee considers it important that the method of alerting a driver, or rider, to a safety issue needs to be thoroughly tested and

developed to ensure that a warning elicits an appropriate and safe response. Despite these concerns, the method of warning chosen by manufacturers and suppliers has not prevented the Committee from considering the overall safety benefits of a technology.

Summary

The fitment rate of vehicle safety technologies may determine the potential reduction in road trauma that could be realised. However, the Committee faced a number of obstacles in identifying and prioritising technologies for the Victorian context. These included:

- A lack of evidence from real world driving exposure of technologies.
- Manufacturer reluctance to reveal details of future vehicle safety technologies.
- A bias in information towards cars and Electronic Stability Control (ESC).

The Committee has sought to balance the safety needs of all road users by prioritising a list of technologies that have the potential to offer improved safety irrespective of vehicle type, and in the case of cars, the occupant's age or seat position.

The need to ensure that active technologies and related warnings assist rather than hinder the driver was an important consideration when assessing new technologies.

The Committee recognises that road safety needs to be considered on a short and long-term basis. This recognition has informed the technologies identified by the Committee in Chapter 3, the strategies recommended in Chapter 5 and the importance of Intelligent Transport Systems discussed in Chapter 6.

Endnotes

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Chapter

2

Vehicle Standards

Existing safety technologies are subject to vehicle standards that specify minimum requirements in most cases. Vehicle standards set out requirements to ensure that all vehicles meet a minimum level of operational safety. Vehicle standards are called Australian Design Rules (ADRs), in Australia.

However, many new and leading edge technologies are not covered by an ADR. The result is that some technologies currently fitted to vehicles available for sale in Victoria are not subject to ADR approval.

The Committee has been asked to identify impediments, including ADR requirements, to the fitment of leading edge technologies.

It is important to recognise that technology covered by an ADR does not ensure that the feature will be fitted to a vehicle. The Federal Government can however mandate the fitment of a technology through legislation.

The difference is between a vehicle standard to which a technology must comply, if fitted, and a legislated requirement for the fitment of a particular technology, which complies with a vehicle standard.

In Australia the Federal *Motor Vehicle Standards Act 1989* requires that all new and imported vehicles meet ADRs before a vehicle can be issued with a compliance plate, permitting registration for road use.[1]

A decrease in local vehicle manufacturing and a correlating increase in international trade in vehicles generated an increased focus on international standards. A review of ADRs was undertaken between 1983 and 1986 to more closely align Australian and international vehicle standards. The review was guided by an Australian Transport Council (ATC) recommendation that:

> ... international harmonisation of vehicle safety standards should be actively pursued ... except where there is sufficient evidence to justify unique requirements.[2]

The distinction between the affect of an ADR and mandatory fitment is important. The United States, Japan, European countries and Australia may all agree that a technology should meet a determined standard, but fitment is not guaranteed. Therefore, where a country is achieving a higher level of fitment, this may be the result of a legislative requirement for mandatory fitment.

Another factor in terms of leading edge technologies is that a relevant vehicle standard may be made irrelevant as development and fitment of a technology outpaces the establishment or amendment of a relevant standard to include the new technology.

This situation was illustrated for the Committee by Mr Peter Robertson, General Manager, Vehicle Safety Standards with the Federal Department of Infrastructure, Transport, Regional Development and Local Government at a public hearing in Melbourne, 4 February 2008. Mr Robertson illustrated his point with an example of how the standards for front lighting did not keep up with new, adaptive front lighting. Mr Robertson explained that:

> The market for that technology was moving very quickly, and we had vehicles arriving here in Australia with it. But the Australian design rules did not allow it. It is because they are old; they are out of date. So we had to move very quickly to make sure that the regulation could match the availability of the technology.[3]

Australian Design Rules

The first legislated ADR was published in January 1969, establishing a vehicle standard for the strength and durability of seatbelts and seatbelt anchorages.[4] However this and subsequent ADRs were only 'selectively applied' by State and Territory laws until a national set of uniform standards was adopted in September 1989.[5]

Prior to 1989, individual States and Territories set their own standards for vehicles, which at the time were largely manufactured or assembled in Australia. The establishment of national vehicle standards with the passing of the Federal Government's *Motor Vehicle Standards Act 1989*, saw States and Territories cede the power to make independent vehicle standards.[6]

ADRs were transformed from localised standards for vehicles manufactured and imported into Australia, into a national system that would facilitate international trade through the harmonisation of vehicle standards.

Relevance of Australian Design Rules

Appropriate ADR standards do not exist for a number of leading edge technologies.

Of greater concern to the Committee, some ADRs are inadvertently restricting the fitment of leading edge technologies to Australian vehicles. Mr Robertson from the Federal Department of Infrastructure, Transport, Regional Development and Local Government stated at the hearing that:

> What we are finding increasingly is that the regulations, some of which have histories going back 30 years, just simply did not foresee the availability of technology, and you find that you are trying to put it into the market and the regulations are stopping it.[7]

ADRs are not keeping pace with technologies being fitted to vehicles sold in Australia. While the Committee appreciates that an ADR cannot be developed ahead of a new technology, there is a need for the ADR review process to be more responsive to developments in vehicle safety.

International Harmonisation

The primary goal of internationally harmonised vehicle standards is the removal of trade barriers. Australia has pursued harmonisation of ADRs with UNECE regulations since the mid-1980s in order to facilitate the free trade of vehicles internationally.[8] According to the Federal Department of Infrastructure, Transport, Regional Development and Local Government website, another benefit of greater trade access through harmonisation of vehicle standards will be better access to safer vehicles.[9]

The effect is that where an ADR is harmonised with a UNECE Regulation, Australia will recognise a vehicle that complies with a UNECE Regulation as also complying with the equivalent ADR. For example, ADR 1 – Reversing Lamps, clause 7.1 states that:

> The technical requirements of any of the editions of United Nations Economic Commission for Europe Regulation No. 23 UNIFORM PROVISIONS CONCERNING THE ADOPTION OF REVERSING LAMPS FOR POWER DRIVEN VEHICLES AND THEIR TRAILERS up to and including the edition incorporating the 00 series of amendments are deemed to be equivalent to the technical requirements of this rule.[10]

However, while an international agreement to harmonise standards between countries is facilitating comparable standards, in Australia it does not equate to comparable rates of safety technologies being fitted to new vehicles.

The 1958 Agreement on international harmonisation of vehicle standards, facilitated by the UNECE through the World Forum for Harmonization of Vehicle Regulations is known as Working Party 29 (WP.29).[11] WP.29 administers vehicle standards and is charged with the research, analysis and development of vehicle standards including those relating to vehicle safety.

Subsequently two further international agreements have been signed:

- UNECE 1997 Agreement concerning the Adoption of Uniform Conditions for Periodical Technical Inspections of Wheeled Vehicles and the Reciprocal Recognition of Such Inspections; and

- UNECE 1998 Agreement concerning the Establishing of Global Technical Regulations (GTR) for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles.[12]

The goal of the 1998 agreement was to involve the United States who had remained independent of UNECE regulations as a non-signatory of the 1958 Agreement.[13]

Australia became a party to the 1958 agreement on 25 April 2000 but is not a party to the 1998 GTR agreement, which includes the United States.[14] While this may have no real effect on vehicle standards, it is restricting Australia's role in the development of international vehicle standards.

A stated intention of UNECE Regulations is to ensure that harmonised standards do not compromise the existing safety standards of a signatory.[15] The spirit of the agreement should therefore ensure that Australia's harmonisation does not reduce the minimum safety standards of ADRs.

However, a paper by Mr Michael Griffiths, Mr Michael Paine and Ms Renae Moore, 'Three Point Seat Belts on Coaches – The First Decade in Australia', presented at the *19th International Technical Conference on the Enhanced Safety of Vehicles*, Washington DC, June 2005, criticised international harmonisation arguing that harmonisation only provides a minimum safety standard and is used by regulators and policy-makers to publicly present an impression of vehicle safety.[16]

During the overseas study tour the Committee met with Mr Dominique Cesari, Chair of the European Enhanced Vehicle Safety Committee (EEVC) in Brussels, 10 September 2007. Mr Cesari expressed the view that it is lobbying by the automotive industry that affect a dilution of UNECE regulations.[17] Mr Cesari claimed that UNECE regulations of passive technologies were reduced while concessions were made to increase requirements of Brake Assist.[18]

The claim that UNECE regulations only ensure a minimal safety standard is the same criticism levelled at ADRs.

Minimum Standards of Australian Design Rules

The contemporary focus of ADRs is shifting from a technical design standard to a performance based standard that stipulates an outcome rather than the means of achieving that outcome.[19]

The shift to standards based on vehicle performance is associated with the Federal Government's policy of harmonising ADRs with international vehicle standards. The intention is to permit scope for new initiatives and developments that are not limited by over-regulated vehicle standards.

ADR 69 - Full Frontal Impact Occupant Protection is an example of the performance approach to standards. The ADR outlines the crash test requirements for assessing the safety of a vehicle. The test measures the forces and accelerations that a person would be likely to experience in a frontal crash when travelling at 48 km/h.[20]

While the standard does not stipulate the fitment of front airbags, the fitment of front airbags has been the practical outcome in vehicle designs to meet this requirement.

Performance based standards do not intend to inhibit development of leading edge safety technologies through overly restrictive criteria.

However the Victorian Transport Association (VTA) submission to the Inquiry cites the National Transport Commission (NTC) 2006 Discussion Paper, *National Heavy Vehicle Braking Strategy* which noted that:

> … the ADRs are failing to provide a catalyst for the adoption of the latest safety technology.[21]

An attempt has been made to address this failure through the recent establishment of Performance Based Standards (PBS) for heavy vehicles in Australia.

The NTC website states that the focus of PBS is:

> ... on how well the vehicle behaves on the road, rather than how big and heavy (length and mass) it is, through a set of safety and infrastructure protection standards.[22]

However the new era of performance based standards limits the scope for vehicle standards to lead development, instead consigning standards to ensuring a minimal level of safety.

In most instances leading edge technologies are an improvement of current technologies and standards. However standards can only be strengthened once the new technology has been developed and proven. Therefore, there will always be a lag between the release of a technology and the review, or development of, appropriate standards.

Maintaining the relevance of ADRs is further complicated by the Federal Government's policy of reducing the number of ADRs, under the assumption that this will assist development.

VicRoads, in their submission stated that:

> The current policy of the Federal government is to reduce the number of ADRs to reduce compliance burdens on vehicle manufacturers and support greater innovation in the industry.[23]

A reduction in ADRs reduces the overlap with UNECE Regulations and therefore the level of harmonisation. A quantitative decrease in the number of UNECE regulations harmonised with ADRs will result in lower safety standards of Australian vehicles relative to the safety requirements of present and future UNECE Regulations.

Harmonisation in Practice

Australia, as a party to the 1958 Agreement implements harmonisation of UNECE Regulations within ADRs. A clause within a harmonised ADR accepts an identified UNECE regulation as being 'deemed to be equivalent'.[24]

Australia also has partially harmonised ADRs. Partial harmonisation accepts a UNECE Regulation as equivalent but with additional requirement. In such cases, harmonisation is on Australia's terms and is not a commitment to the UNECE regulation. In 2007, harmonised or partially harmonised ADRs accounted for 80 per cent of all ADRs.

Harmonisation of the remaining 20 per cent has either not begun or has been suspended due to the view that the Australian regulation is superior – such as child seat restraints – or the Australian context is deemed to necessitate a specific standard, for example, unique heavy vehicle combinations.[25]

However the process of harmonisation practised by Australia will only ensure that an UNECE regulation is adopted where it overlaps with an ADR. Where a UNECE regulation has no equivalent ADR then the standard is effectively not a requirement for Australian vehicles. This deficit in vehicle standards exacerbates the minimum standards of ADRs.

At the beginning of 2008 there were 126 UNECE Regulations compared with 64 ADRs.[26] While some ADRs represent more than one UNECE Regulation a gap remains between ADRs and UNECE Regulations.

The Committee considers that there is a greater level of safety provided by UNECE Regulations compared with ADRs. For example, UNECE R114 sets a standard for airbag replacement modules.[27] There is no equivalent ADR and therefore no standard for replacing airbag modules, jeopardising the safety of repaired vehicles.

It appears to the Committee that ADRs are not currently intended to encourage the development or fitment of leading edge technologies. Minimum safety levels, selective harmonisation and fewer standards resulting in limited application of UNECE Regulations are aspects of Australia's independent ADRs. These aspects are effectively contributing to the comparatively low minimum vehicle safety standards applied to Australian vehicles.

New Zealand Vehicle Standards

The Committee discovered in the course of the inquiry that New Zealand vehicles often have a higher specification of safety technologies than comparable Australian models. At a public hearing in Melbourne, 19 November 2007, Mr Lindsay Smalley, Senior Director, Honda Australia, informed the Committee that New Zealand Land Transport rules accept a range of vehicle standards, including Japanese vehicle standards.[28]

Japan and New Zealand are a party to both the 1958 Agreement and the subsequent 1998 Global Agreement on Global Technical Regulation (GTR). So in addition to clear access to Japanese vehicles, New Zealand is ensuring that they have access to the safest vehicles from countries signed to either international agreement.

This means that vehicles complying with Japanese standards are considered to have complied with New Zealand vehicle standards. In practice, any vehicle available in Japan can be imported straight into New Zealand. This does not occur in Australia because ADR compliance requires additional vehicle standards, that are unique to Australia, be met.

Therefore, Japanese vehicles with leading edge safety technologies can be more readily imported into New Zealand than Australia.

At the hearing, Mr Smalley, Honda Australia Pty Ltd, informed the Committee that New Zealand has an advantage over Australia by accepting vehicles that meet Japanese vehicle standards. Mr Smalley stated that:

> New Zealand have no Australian design rule constraint. They do not buy what we call a KQ spec motor car which means ADR compliant. They buy a Japanese specification motor car generally. They are buying the standard export unit out of Japan.[29]

New Zealand has ensured access to leading edge safety technologies through adopting Japanese standards and signing two international agreements.

The Committee considers that Australia's independent set of vehicle standards is, despite harmonisation, contributing to a minimum level of vehicle safety that is lower than other economies, such as New Zealand.

The Committee finds that the most efficient means to ensuring that Australian vehicle standards are comparable with the safety levels in developed countries, including Japan, the United States and from Europe, is to abolish ADRs and adopt all current and future UNECE Regulations.

Recommendation

1. **That, through the Australian Transport Council, the Minister for Roads and Ports pursues the replacement of the Australian Design Rules with United Nations Economic Commission for Europe regulations for vehicle standards.**

Legislating Vehicle Standards

The trade imperative behind harmonisation is evident in the fact that harmonisation of ADRs with UNECE Regulations do not result in

universal legislative requirements for the fitment of safety technologies.

The UNECE guidelines for WP.29 acknowledge that the responsibility of legislating fitment requirements lies with individual countries. The guidelines state that:

> ... regulations developed under WP.29 are "optional", they do not carry the force of law until they are adopted and implemented by Contracting Parties to an Agreement into their national laws ... Hence, those elements of a regulation that relate to its adoption and implementation are considered to be the political jurisdiction of the Contracting Parties to the specific Agreements.[30]

There is a significant distinction between adopting and implementing UNECE regulations and the affected safety outcome for Australian vehicles. Only by legislating a requirement for fitment of a technology will fitment be ensured.

Therefore the adoption of the above Recommendation will not guarantee that all safety technologies covered by a UNECE regulation are fitted to Australian vehicles.

The Committee recognises that legislative measures are limited where a technology is not sufficiently proven. However, while Governments hesitate to enact legislation, fitment of leading edge safety technologies is directed by vehicle manufacturers.

This influence of market forces has contributed to lower fitment rates of safety technologies to Australian vehicles compared to other leading economies. Similarly, there are variable fitment rates between vehicle makes within Australia.

The European Union and the United States have demonstrated a willingness to take legislative steps to guarantee the fitment of vehicle safety technologies. The development and legislation of new child restraint standards are examples.[31]

A 2001 European Commission report, *CARS 21: a Competitive Automotive Regulatory System for the 21st Century*, recommends that the safety technologies listed below be made a regulated requirement to ensure that European vehicles have a market advantage by having a high level of safety features.[32] These include:

- Electronic Stability Control;
- seatbelt reminders;

- Brake Assist Systems;
- heavy vehicles' rear vision system (to avoid blind spots) and conspicuity;
- ISOFix child seats; and
- Daytime Running Lamps.

A legislated commitment in Europe may benefit Australia. Evidence of this is revealed in the fitment and availability information in Chapter 3. However this positive safety outcome is not necessarily the case. A lack of corresponding Australian legislation leaves imported vehicles vulnerable to de-specification, the removal of safety technologies. This practice is discussed in Chapter 5.

However, Dr Jörg Beckmann, Executive Director of the road safety lobby, the European Transport Safety Council (ETSC), advised the Committee during discussions in Brussels, 11 September 2007, that in his experience lobbying members of the European Parliament, he had found little political will to support the implementation of laws mandating vehicle safety technologies.[33]

This resistance may mean that, despite a willingness within Europe to regulate fitment of technologies, these too may be minimum requirements.

The Federal Government action plan, *National Road Safety Action Plan 2007-2008*, identified regulating vehicle safety technologies as one method for reducing road trauma through vehicle safety.[34] ADR 69 was regulated in September 2007 to permit seatbelt reminders that meet UNECE Regulations to be fitted to vehicles sold in Australia.[35]

The Committee considers that where manufacturers are not fitting known safety technologies, and the market forces are not effectively increasing fitment rates, then legislation is a necessary step.

Australasian New Car Assessment Program

To try and overcome the restrictions of ADR practices and improve vehicle safety standards, the Australasian New Car Assessment Program (ANCAP) was established. ANCAP was launched in December 1989 and began crash testing in 1992. ANCAP measures safety, predominantly via crash testing vehicles, and awards star ratings with the intention of encouraging maximum levels of vehicle safety through consumer advocacy.

As an indication, a vehicle built today to meet the ADR standards would only be likely to achieve a 1.3 star crash rating.[36] This minimum standard is reinforced by the increasing number of

imported vehicles which score a five star crash rating. To date no passenger car manufactured in Australia has scored the maximum five stars.

In addition to crash ratings for individual vehicles, ANCAP aims to: 'compare the relative safety of the Australian vehicle fleet'.[37] Other developed economies have similar programs, but the main three NCAPs are in Europe, the United States and Japan. There are, however, differences between the three in the number and type of crash tests used.

At a public hearing in Melbourne, 19 November 2007, Mr Paul du Preez, General Counsel and Company Secretary, Hyundai, stated that the United States testing regime is 'very tough'.[38]

At a subsequent public hearing, 4 February 2008, Mr Ross McArthur, Chair, ANCAP Technical Committee, commented that each EuroNCAP star equates to a 12 per cent reduction in injury risk.[39] ANCAP has elected to align its testing protocol with that used by EuroNCAP.

A 2000 Australian-Swedish conference paper, *How Does EuroNCAP Results Correlate to Real Life Injury Risks – a Paired Comparison Study of Car-to-Car Crashes*, presented the results of a study into the benefits of vehicle rankings based on crash testing. The study found that three and four star rated cars were 30 per cent safer than two star rated cars.[40]

Similarly, the VicRoads website states that:

> Studies conducted by MUARC have found that ANCAP crash test results are a good indicator of a new car's on-road crash performance.[41]

The VicRoads submission claims that ANCAP has been influential in increasing demand for safer vehicles.[42] The importance of crash testing in the development and fitment of passive technologies was also reiterated by Mr Adrian Hobbs, the then Secretary General, EuroNCAP at a meeting with the Committee in Brussels, 10 September 2007.[43]

The increasing focus on active technologies in technical development and public awareness campaigns however, poses a risk to ANCAP's relevance due to its restriction to testing passive safety technologies.

In order to address this discrepancy, ANCAP has commenced awarding three additional points for advanced seatbelt reminders and from January 2008, requiring Electronic Stability Control (ESC) to be fitted for the vehicle to be eligible for a five star rating.[44]

During the overseas study tour, the Committee met with Professor Kennerly Digges from The National Crash Assessment Center at George Washington University, 28 August 2007. The Committee were provided with a critical assessment of the appropriateness of the speeds at which crash tests are performed by organisations such as ANCAP.

In Australia vehicles are crashed tested at:

- frontal offset– 64 km/h;
- side impact– 50 km/h; and
- pole impact – 29 km/h.

Professor Digges informed the Committee that while impact speeds being used in crash tests were indicative of likely fatalities, serious injury is a far greater concern. He cited Canadian research that recommended reducing the speed of crash tests from 35 mph to 25 mph (48 km/h to 35 km/h). The reason being, that running crash tests at high speeds does not represent the crash speeds of the majority of crashes and the profile of drivers, which result in serious injuries as opposed to fatalities.[45]

Victorian statistics support Professor Digges claims that serious injuries are far greater in number than fatalities. In 2005, (the most current data available for Victoria) there were 6,177 serious injuries and 346 deaths in the same year.[46]

The Canadian research is therefore even more pertinent to Australia where the speed for a frontal offset crash test is 64 km/h.

In addition, Professor Digges noted that crash test dummies are unrepresentative of women or older persons and therefore tests need to represent age as well as speed.[47]

In their submission VicRoads acknowledge that there are limitations to ANCAP's current system, and that improvements should be made. In their submission they state:

> ANCAP's current focus is injury prevention. It currently publishes supportive material for crash avoidance technologies but does not include them in the rating system. Crash avoidance needs to be better addressed by ANCAP.[48]

When the suggestion of varying impact speed of crash tests was put to Mr McArthur, Chair, ANCAP Technical Committee, during a public hearing, Mr McArthur responded that ANCAP was committed to using EuroNCAP testing protocols.[49]

The Committee considers that ANCAP has made an important contribution to raising the level of vehicle safety. However, the high incidence of serious injuries resulting from vehicle crashes points to an area of road safety that is routinely eclipsed by the focus on the road toll. Therefore, it is time that the profile of serious injuries was addressed by ANCAP. A review of ANCAP crash testing protocols is required to extend the influence of ANCAP ratings to the vehicle designs that also protect occupants from serious injury.

ANCAP is funded by all state and territory Governments, New Zealand and Australian motoring bodies, the FIA Foundation and the Insurance Australia Group. While the Committee acknowledge it is not solely Victoria's responsibility to fund ANCAP, this Committee's sole concern is for Victorians' safety. Therefore if the other parties do not provide the necessary funding, then VicRoads and the Transport Accident Commission (TAC) should.

Recommendation

2. That the Victorian Government seeks from the Australasian New Car Assessment Program a review of crash testing protocols to include multiple dummy sizes and the effects of crashes at lower speeds.

Industry Ambivalence Toward the Australasian New Car Assessment Program

A number of manufactures and importers expressed dissatisfaction to the Committee about ANCAP and its testing protocol.

Mr Ian Butler, Director, Integration and Safety Engineering, GM Holden Ltd at a public hearing in Melbourne, 8 October 2007 discussed the merits of the ANCAP program and ESC, stating that:

> I am not a huge fan of ANCAP in general because I think it is too simplistic, so there will be a challenge here to figure out how a feature like that can find its way into the NCAP environment and still offer some value …[50]

Mr Peter Griffin, Corporate Manager, External Affairs, Toyota Motor Corporation Australia, at a hearing in Melbourne, 29 October 2007, commented on the appropriateness of the tests noting that:

> The industry as a whole has had some concerns historically with ANCAP testing, given that the rating is based on one particular test which can be open

> to variations on how the test is done and the particular conditions at that time …[51]

Similarly, Mr Ashley Sanders, Manager, Certification and Regulation Compliance Department of Mitsubishi Motors Australia Ltd at a hearing in Melbourne, 29 October 2007, expressed concerns about the optional pole test, stating that:

> … ANCAP does not test every single vehicle that is released to the market so we do not see there is a [level] playing field at all with the way that ANCAP does their business.
>
> … they also require a pole test to be conducted for you to achieve a five-star rating but the top pole test must be at the manufacturer's cost. If the manufacturer does not choose to do a pole test then they cannot get a five-star result … What we are saying is that to achieve a five-star result you have to pay for it and we do not believe in paying for stars.[52]

Since 1 January 2003, for a vehicle to achieve a five star rating at least one point of the minimum 32.5 point score has had to be a result of a pole impact test.[53]

The 2008 release of Ford's new Falcon model met with criticism that it did not have curtain airbags equipped as standard. A newspaper article in the Brisbane *Courier Mail*, 12 April 2008, reported that Ford intends to overcome this criticism by seeking:

> … approval from Detroit to have one of its new FG Falcons put through an optional pole crash test which will give it a chance to become a maximum five-star safety-rated car.[54]

The Committee is not surprised to read in the VicRoads submission that the policy of the Federal Chamber of Automotive Industries (FCAI) is: 'to not cooperate with ANCAP'.[55]

The Committee accepts that there may be limitations in the ANCAP process, but these do not distract from the evidence that crash testing provides the vehicle buying public with an indication of a vehicle's safety.

However, the Committee also considers manufacturers' reservations about ANCAP as a positive acknowledgement of the influence ANCAP asserts in raising consumer awareness of vehicle safety, and the consequent pressure applied to manufacturers to increase vehicle safety.

Used Car Safety Rating

Used car safety ratings (UCSR) or crashworthiness data are undoubtedly the most accurate form of crash testing as they are a record of actual crashes.

The TAC website www.howsafeisyourcar.com.au provides a USCR database based on:

> ... statistics collected from car crashes in Australia and New Zealand between 1987 and 2005, where someone was killed or seriously injured. Over two million police reported crashes are analysed in the latest UCSR.[56]

However the police crash reports used in Victoria to compile the UCSR are not intended for this analytical purpose and as such there are some qualifications. Significant to this Inquiry is that only driver involvement is recorded. Injuries or fatalities to passengers are not included.[57]

Records such as UCSR will become increasingly relevant as a measure of the effectiveness of emerging active safety technologies, identified in the following chapter. As these technologies become increasingly prevalent within the vehicle fleet, the data sample will increase, providing a more accurate assessment of the safety benefits of current leading edge safety technologies.

The 2007 Monash University Accident Research Centre (MUARC) review, *Vehicle Safety Ratings Estimated from Police Reported Crash Data: 2007 Update*, found the greatest gains in vehicle safety were made between 1970 and 1979 during which time: 'a number of new Australian Design Rules aimed at occupant protection took effect'. Further improvements have been made: 'with notable steady gains from 1985 to 1995 and since 2000'.[58]

The importance of vehicle standards during the 1970s in improving vehicle safety is evident in the findings from real world crash data. The more recent notable steady gains may be, in part, attributed to the start of ANCAP crash testing in 1992 and the later adoption of EuroNCAP testing protocols in 1999. The role of manufacturers in introducing and fitting safety technologies, especially airbags, cannot be ignored. Mercedes Benz began fitting airbags in 1980 and GM Holden Ltd was the first local manufacturer in 1993.

The Committee considers the analysis of real world crashes to be an important indicator of the safety benefits of technologies. However the Committee recognises that this tool is currently limited

by the need for statistically significant market penetration of technologies for accurate analysis.

Summary of Findings

- The Australian Design Rules (ADRs) set a minimum safety standard for Australian vehicles and do not address leading edge safety technologies.
- The existence of an ADR does not necessarily mean that a technology will be fitted to a vehicle.
- The harmonisation of ADRs with United Nations Economic Commission for Europe (UNECE) Regulations is not complete and does not result in the application of all UNECE Regulations to Australian vehicles.
- The Committee considers that a commitment to international standards would ensure that existing gaps in the Australian Design Rules are closed instead of widening.
- ANCAP has had a greater effect in raising vehicle safety than ADRs.
- For ANCAP to remain relevant to road safety it needs to consider occupant protection from serious injury, in addition to fatalities.

Recommendations

1. **That, through the Australian Transport Council, the Minister for Roads and Ports pursues the replacement of the Australian Design Rules with United Nations Economic Commission for Europe regulations for vehicle standards.**

2. **That the Victorian Government seeks from the Australasian New Car Assessment Program a review of crash testing protocols to include multiple dummy sizes and the effects of crashes at lower speeds.**

Endnotes

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Chapter

3

Identifying Safety Technologies

In Chapter 1 the Committee discussed a number of factors that had hindered the Committee's ability to make objective, evidence-based decisions on which technologies offer, or promise, the greatest safety benefits.

The main issue is that until a technology achieves sufficient market penetration, there is a lack of reliable data for a critical assessment of possible benefits.

Therefore, in the absence of sufficient real world data to enable evidenced-based decisions the Committee had to rely on the following criteria in order to identify and prioritise leading edge safety technologies:

- vehicle manufacturers;
- computer modelling from vehicle safety researchers;
- the popularity of particular technologies;
- overseas research and development; and
- international assessments of technologies.

The technologies that have been proven by real world data to improve road safety, Electronic Stability Control (ESC) and side curtain airbags, are to be mandated in Victoria in 2011 and 2012 respectively. These technologies are dealt with in Chapter 4.

As discussed, when compiling the list of priority technologies it became evident to the Committee that there is an obvious discrepancy in the development and fitment of technologies across the three vehicle types. Cars are relatively well served, despite discrepancies between marques. With heavy vehicles the focus has been on load carrying performance and fuel efficiency priorities ahead of safety, some manufacturers are fitting leading edge safety technologies. But safety technologies for motorcycles are by far the least developed.

The Committee is concerned that motorcycles are not benefiting from the advances being made in vehicle safety technology. Given the vulnerability of motorcyclists, the Committee would like to see a concerted effort in both the development of safety technologies and increased fitment rates.

Vehicle Standards

In this chapter the Committee has compared technologies with existing Australian Design Rules (ADRs) where an applicable standard exists, in order to establish the relevance of current vehicle standards, or where an ADR may be preventing the fitment of leading edge safety technologies.

Comparing Availability of Technologies

The Committee collected information from vehicle manufacturer's websites to determine the availability of safety features between Australia, Europe, the United States and Japan. The availability and ease of accessing information varied considerably between manufacturers. Collection was completed 30 April 2008.

Language however presented an obstacle to the collection of this information from Japanese and European websites. The United Kingdom has been used as an indicative sample of availability in Europe, and the Japanese New Car Assessment Program publication, *Why Not Choose a Car Based on Safety Performance?*, has been used for Japanese references.

However, in most cases information in this publication was restricted to models manufactured prior to 2007 and limited to the following technologies:

- Active Head Restraints;
- Adaptive Cruise Control;
- ISOFix;
- Lane Departure Warning; and
- Pre-emptive Brake Assist.

Websites for heavy vehicles and motorcycles do not make notable references to safety technologies. This is illustrative of discrepancies in the priority attributed to safety and the proportional lack of safety development for motorcycles and heavy vehicles. At the time of writing, requests for information from manufacturers had received limited response. Therefore no data tables have been produced.

The difficulty in obtaining vehicle data has been recognised by the European Commission. The 2007 report *Road Safety Performance Indicators and Country Comparisons*, confirms the Committee's difficulty in obtaining information encountered through this Inquiry. The report includes a discussion on the lack of available information on airbag fitment rates, stating that:

> The knowledge on the presence of airbags in vehicles in member states is limited and has been recently assessed by means of a questionnaire in one country only – The Netherlands.[1]

A 1996 publication from the United States Transportation Research Board, Committee for Study of Consumer Automotive Safety Information, *Shopping for Safety: Providing Consumer Automotive Safety Information*, reviewed available sources of comparative safety data for consumers in the United States. The Transportation Research Board recognised that while information is available:

> … much more could be done to make the information more comprehensive and easier for consumers to interpret and use.[2]

Technology suppliers were another avenue investigated to determine the availability of safety technologies prioritised by the Committee. The Committee found that suppliers were keen to promote their products and therefore supply the information sought by the Committee. However, information was largely restricted to existing technologies and did not indicate actual fitment in vehicles.

Prioritising Technologies

The Committee has prioritised technologies based on a number of factors including:

- the road safety risk targeted by a technology, such as, speeding, fatigue;
- potential road safety benefit;
- whether the technology has applications for all vehicle types, such as Intelligent Speed Assistance and Daytime Running Lamps;
- road safety benefit for vulnerable road users;
- infrastructure requirements; and

- international vehicle standards.

In this chapter the Committee identifies a number of new and established technologies that the Committee considers to be priority technologies. These technologies have been categorised by safety application and listed in Table 3.1. The categories are braking, cause targeted and driver assist active technologies and passive technologies.

Active technologies are sub-divided into two categories: cause targeted technologies that address major causes of road trauma such as speeding, fatigue and alcohol; and driver assist technologies such as Lane Departure Warning (LDW).

The final category is passive technologies which includes specific technologies for children and motorcycles.

Table 3.1 Priority Safety Technologies

Braking	Active		Passive
	Cause targeted	Driver Assist	
Brake Assist Systems	Intelligent Speed Assistance	Lane Departure Warning	Active Head Restraints
Motorcycle Anti-lock Braking System	Fatigue Monitoring	Adaptive Cruise Control	Seatbelt Technologies
Prime Mover and Trailer Compatibility	Alcohol Interlocks	Pedestrian Protection	Child Restraint Systems
Automatic Stability Control		Blind Spot Monitoring	Motorcycle Airbags
			Daytime Running Lamps

The Committee considers that this list takes into consideration all motorised vehicle types and road users. In addition to available technologies the Committee has also identified technologies that have potential but still require research and development for mass production. In this way the Committee has captured the most significant and newest technologies that provide the greatest promise of improved vehicle and road safety.

The Committee has prioritised two technologies, Pre-emptive Brake Assist and Anti-locking Braking Systems for motorcycles. These two technologies require immediate attention.

Subsequent to these two braking technologies, the Committee considers that active technologies need to be prioritised, including

Intelligent Speed Assistance, fatigue monitoring, Land Departure Warning, Adaptive Cruise Control (ACC) and pedestrian protection.

Updating Priorities

The rate at which safety technologies are evolving means that technologies that are at one time identified as promising, may never be fitted widely within the vehicle fleet as more advanced technologies take their place.

An example is provided by the Forward Collision Warning (FCW) technology, identified as important by the 2005 Road Safety Committee report, *Inquiry into the Country Road Toll*. The significance was supported by evidence from the 2006 Monash University Accident Research Centre (MUARC) review, *On-road Evaluation of Intelligent Speed Adaptation, Following Distance Warning and Seatbelt Reminder Systems: Final Results of the TAC SafeCar Project*, that found FCW could result in a 34 per cent reduction in the amount of time a vehicle spent in a rear collision risk zone.[3] However FCW does not appear in this Committee's list of priority technologies.

This is because the functions of FCW technology have been incorporated into Pre-emptive Brake Assist and ACC. Both of these technologies have developed FCW from a stand alone warning technology into an interventional active technology, thereby superseding FCW.

The issue of redundancy was raised in Chapter 1 in relation to the need to keep Government road safety strategies up-to-date. The evolving importance of technologies also makes it difficult to develop and maintain relevant vehicle standards.

Braking Technologies

Common sense indicates that the brake system is an essential safety feature for every vehicle.

The importance of brake systems and the specific requirements of different vehicle types are represented by the four applicable Australian Design Rules (ADRs). These are:

ADR 31 – Brake Systems for Cars

ADR 33 – Brake Systems for Motorcycles and Mopeds

ADR 35 – Commercial Vehicle Brake Systems

ADR 38 – Trailer Brake Systems

Each ADR is harmonised with the United Nations Economic Commission for Europe (UNECE) regulations, except for ADR 33 which is partially harmonised.

As discussed in Chapter 2, the level of safety required by ADRs is a minimum requirement. Manufacturers have continued to advance the development of braking technology, far exceeding the minimum ADR requirements. The discrepancy in actual brake performances and required standards was highlighted in the VicRoads submission to the Inquiry, which cited a 2007 GM Holden vehicle safety seminar where it was stated that the ADR braking requirements for a light vehicle are:

> … so ineffective that the vehicle would not be driveable.[4]

Recent developments include Brake Assist which enables a driver to apply full brake capacity and Anti-lock Braking Systems for motorcycles. MUARC, in their submission to the Inquiry, cited a paper presented at the *17th International Technical Conference on the Enhanced Safety of Vehicles,* Amsterdam, 4-7 June 2001, 'Active Safety Experiments with Common Drivers for the Specification of Active Safety Systems', that found through an emergency brake simulation study, that only half the drivers tested successfully applied sufficient braking force to enact a vehicle's emergency braking system.[5]

A Mercedes Benz paper presented at the *20th International Technical Conference on the Enhanced Safety of Vehicles,* Lyon, 'Real World Safety Benefits of Brake Assistance Systems', presented findings from an in-depth analysis of German crash data. A failure to affect full braking capacity was attributed to:

- the driver's braking reaction coming to late;
- braking that is not vigorous enough; and
- the driver misinterpreting the traffic situation, especially a forward vehicle's deceleration.[6]

New generation brake technologies are therefore being designed to assist drivers in enacting safe braking and, where necessary, initiate emergency braking.

Brake Assist Systems

Brake Assist

Brake Assist was designed to assist a driver's emergency braking, by detecting a driver's response to an emergency situation, and ensuring the application of the vehicle's full braking force.

Research undertaken by Mercedes Benz and presented in the paper, 'Real World Safety Benefits of Brake Assistance Systems', at the 2007 Enhanced Safety of Vehicles conference, showed that a vehicle's stopping distance on dry roads can be reduced by 45 per cent with Brake Assist. Further, a comparative study of Mercedes Benz cars with and without Brake Assist, showed a 13 per cent decrease in pedestrian impacts and an eight per cent decrease in rear end impacts when vehicles are fitted with Brake Assist.[7]

Brake Assist was originally introduced by Mercedes Benz in 1996 and introduced as a standard feature across their entire car range the following year.[8] In the course of this Inquiry, the Committee found that such a decision is rare, as it is normal practice to offer safety technologies first as optional extras, gradually expanding fitment of a technology down through a model range. It was therefore impressed upon the Committee, the importance of Brake Assist as a significant safety technology.

In Japan, Toyota is enhancing the Brake Assist function by combining it with a navigation based warning system. Using road map data and vehicle positioning, a driver is warned if they approach a stop sign and have not begun applying sufficient braking.[9]

Predictive research by Technische Universität Dresden, on behalf of the European Commission, using a sample of 712 pedestrian injuries from available real world crashes found that a Brake Assist system in combination with the pedestrian impact protection, required by the European Union since 2005, reduced the number of seriously injured pedestrians by 81. Of particular relevance to the Brake Assist element was that 56 impacts were prevented altogether.[10]

While Brake Assist can prevent crashes, the benefits also include a reduction in vehicle speed at impact, which correlates with a reduced risk of serious injury or fatality. The European Commission estimates that 1,100 pedestrian lives could be saved annually if Brake Assist was fitted to all cars.[11]

Table 3.2 compares the cars that manufacturers are fitting Brake Assist to in Australia. The manufacturers are listed according to sales as at March 2008.

Table 3.2 Vehicles Available in Australia with Brake Assist

Vehicle	Standard	Not Available
Toyota	Entire range except	Hilux
GM Holden	Entire range except	Barina, Viva, Epica
Ford	Fiesta XR4, Focus XR5 Turbo, Mondeo, New Falcon, Escape	Some Fiesta, Some Focus, Current Falcon, Territory
Mazda	Entire range except	MX-5, RX-8
Honda	Accord, CR-V, Civic Type R	Civic, Civic Hybrid, Accord Euro, Odyssey, Legend, S2000
Mitsubishi	Colt, Lancer, Grandis	Colt Cabriolet, 380, Outlander, Pajero, Triton
Nissan	Entire range except	Patrol Wagon
Hyundai	Sonata, Tiburon	Getz, Accent, Elantra, i30, Grandeur, Tucson, Santa Fe, iMax, iLoad
Subaru	Entire range	
Volkswagen	Golf GT Sport TSI and TDI, Jetta, Passat, Eos, Toureg, Multi Van, Caravelle	Polo, some Golf, New Beetle, New Beetle Cabriolet, Caddy Life
Kia	Magentis, Carnival, Grand Carnival	Rio, Cerato, Sportage, Sorento, Rondo
Mercedes-Benz	Entire range except	SLK-Class
BMW	Entire range except	3 series convertible, X5, Z4, Z4M
Suzuki	Entire range except	APV
Peugeot	Entire range	
Lexus	Entire range	
Jeep	Wrangler, Patriot, Cherokee	Compass, Grand Cherokee, Commandeer
Volvo Car	Entire range except	XC90, C30
Chrysler		Entire range

Source: Manufacturers' Websites, April 2008.

The table shows that a significant number of manufacturers are fitting Brake Assist to the majority of cars in their respective model ranges. Manufacturers, such as Ford, Honda, Hyundai and Volkswagen however, have only fitted Brake Assist to half their model ranges.

The European Commission has proposed a regulation for Brake Assist fitment to all new cars from 2009, using the standards stipulated in UNECE R13-H.[12] While ADR 31 is harmonised with UNECE R13-H, mandated fitment in Australia would require separate Australian legislation.

The Committee considers that Brake Assist is an important safety technology. However, while current market penetration could be

improved, the Committee is hesitant to recommend measures to hasten fitment in light of the enhanced safety benefits that are to be had from Pre-emptive Brake Assist.

Pre-emptive Brake Assist

Pre-emptive Brake Assist technology takes braking assistance one step further, becoming an interventional active technology that can initiate an emergency braking response independent of the driver, while retaining the safety benefit of standard Brake Assist.

Clause 2.20 of UNECE Regulation No. 13-H is a provision for this form of automated braking, noting:

> … a complex electronic control system where actuation of the braking system(s) or brakes of certain axles is made for the purpose of generating vehicle retardation with or without a direct action of the driver, resulting from the automatic evaluation of on-board initiated information.[13]

Pre-emptive Brake Assist works by continuously monitoring the space ahead of the vehicle for potential dangerous situations that may require emergency braking.

This continuous monitoring of the vehicle's forward path is achieved with short and long range scanning cameras and/or radars. The immediate area in front of the vehicle is monitored for events such as a child running out onto the road, or debris falling ahead of a vehicle. Long range scanning monitors the distance to, and speed of, a forward vehicle.[14]

To assess the braking demands required for safe stopping, the travelling speed is continually monitored compared to the distance of the vehicle ahead.

When this gap becomes too short, or a risk is detected, the driver is given an initial audible and/or visual warning. Concurrently the Pre-emptive Brake Assist system calculates the braking force required to stop and pre-charges the brake system.

If the driver responds to the warning and applies emergency braking, full braking force is applied, as with standard Brake Assist. However if the driver fails to respond to the warning, Pre-emptive Brake Assist will independently apply interventional braking.

The Insurance Institute for Highway Safety (IIHS) in the United States undertook a study of vehicle crashes between 2002-2006 and found that FCW with automatic braking (Pre-emptive Brake

Assist) and LDW show the most potential of new technologies to: 'avoid or mitigate crashes, including fatal ones.'[15]

Two European manufacturers, that already have Pre-emptive Brake Assist available, presented research papers at the 2007 conference on the Enhanced Safety of Vehicles.

The paper from Volvo, 'Collision Warning with Auto Brake - A Real-Life Safety Perspective', concluded that a combination of a camera for short range detection of vehicles or obstacles and a radar for long range monitoring was optimal as the two technologies use different methods to detect objects.[16] A camera can assess differences that a radar cannot.

The system used by Volvo limits the application of autonomous braking to one second and a conservative deceleration threshold of 3.9 metres/second^2 (m/s^2).[17] However, this braking is supplemented by a reduction in engine power, equivalent to removing one's foot from the accelerator pedal, with the potential to reduce impact speed by up to 15 km/h.[18] The stated intention of Pre-emptive Brake Assist is not to prevent a crash, but:

> ... reducing impact speeds and thus risk for consequences.[19]

The second paper, 'Real World Safety Benefits of Brake Assistance Systems', was presented by Mercedes Benz. Their system has a slightly longer autonomous braking period and marginally greater deceleration threshold at 4.9 m/s^2, but the same conservative intention of reducing impact rather than avoiding impacts.[20]

The timing sequence used by this system is that at:

- 2.6 seconds prior to a predicted crash a combined audible and visual warning is issued;
- 1.0 second later interventional braking is enacted.

Mercedes Benz claim that at 0.6 of a second before a crash the human capacity to respond has passed.[21]

The Committee experienced Pre-emptive Brake Assist on a test drive, during a visit to Mercedes Benz in Stuttgart, 14 September 2007. The 2.6 second experience is brief and if the driver did not respond to the audible warning the car soon stopped independently.

A benefit of this sequence is that by the time the driver can no longer enact emergency braking, Pre-emptive Brake Assist has been slowing the vehicle for one second and will continue to do so until impact. Testing of this system by the German Automobile

Association (ADAC) determined that the force of rear end collisions experienced by the vehicle that crashed was reduced by:

- 27 per cent for the driver;
- 30 per cent for the front passenger; and
- 45 per cent for rear passengers.[22]

Another system being used by a Japanese manufacturer, Honda, has a two stage braking application. There is an initial deceleration of 2.5 m/s^2 when there is two seconds until a predicted crash and 5.9 m/s^2 at one second before a crash.[23]

The range of deceleration thresholds selected by manufacturers for their autonomous braking technology indicates that manufacturers are taking a conservative approach when introducing independant active safety technologies.

However, these limits are required by UNECE R13-H Annex 3, clause 2.2.2 of which ADR 31/01 is harmonised, to achieve a minimum deceleration of 2.44 m/s^2.[24]

The European Commission supplied the Committee with comparative data during a meeting in Brussels, 7 September 2007. Based on crash data, the estimated potential for reducing fatalities and severe injuries from the fitment of Pre-emptive Brake Assist compared more favourably than ESC in Europe. The potential reduction in fatalities and severe injuries are compared in Table 3.3.

Table 3.3 European Comparative Reductions of Fatalities and Severe Injuries for Pre-emptive Brake Assist and ESC

Technology	Fatalities	Severe Injuries
Pre-emptive Brake Assist	6,800	48,500
ESC	2,100	20,000

Source: European Commission, 7 September 2007.

Dr Reinhard Schulte-Braucks, Head of Unit Automotive Industry, European Commission informed the Committee that Automated Emergency Brakes (Pre-emptive Brake Assist) was a technology that needed to be pursued.[25]

A more recent cost-benefit analysis presentation by the European Commission, June 2008, 'Cost-Benefit Assessment and Prioritisation of Vehicle Safety Technologies', determined that a cost-benefit assessment produced a 2.3 ratio, indicating a positive economic argument for the fitment of this technology. Further, if a Pre-emptive Brake Assist unit could be installed in a vehicle for approximately $750 then installation was economically justified.[26]

Comparative Availability of Pre-emptive Brake Assist

A 2007 Swedish literature review of safety technologies, *Intelligent Transport Systems (ITS) in Passenger Cars and Methods for Assessment of Traffic Safety Impact: A Literature Review*, by the Swedish National Road and Transport Research Institute, found that manufacturers fitting Pre-emptive Brake Assist were Honda, Nissan, Toyota, Mercedes Benz and Lexus.[27]

The Committee made a comparative study of Australia's 22 leading vehicle marques across four different markets to see how the availability of Pre-emptive Brake Assist technology in Australian cars compared with other leading economies. Table 3.4 lists those models available in Australia that are fitted with this technology in one or more of the markets studied.

Table 3.4 Availability of Pre-emptive Brake Assist

Vehicle	Australia	USA	Japan	UK
Toyota				
Avensis			Standard on some models	
Tarago	Standard/ Optional on some models		Optional on some models	
Prado			Optional	
CX-7			Optional	
Honda				
Civic			Optional on some models	
Civic Hybrid			Optional on some models	
Odyssey			Optional on some models	
Legend			Optional	Standard on some models
CR-V			Standard on some models	Standard on some models
Mercedes-Benz				
S-Class	Optional			
CL-Class	Standard			Standard
R-Class				Standard
Lexus				
LS	Standard	Optional	Optional	
GS	Standard	Optional	Standard/ Optional on some models	
IS	Standard	Optional	Optional	
SC				
LX	Standard	Optional		
Volvo Car				
S80		Optional		Optional
V70	Standard	Optional		Optional
XC70		Optional		Optional
Chrysler				
300C Sedan	Standard			
300C Touring	Standard			

Source: Manufacturers' Websites, April 2008 and *Japanese New Car Assessment Program, New Car Assessment*, Table of Safety Performance Comparison by Model, 2007.

Pre-emptive Brake Assist is a leading edge safety technology yet is unavailable on either Australian or comparable overseas models from Ford, GM Holden, Mitsubishi, Nissan, Hyundai, Subaru, Volkswagen, Kia, BMW, Suzuki, Peugeot or Jeep. No car manufactured in Australia is fitted with this leading edge technology.

Japanese manufacturers appear more willing to fit this technology than manufacturers in the United Kingdom or the United States.

Fitment by Volvo is restricted to only one model in Australia compared with three in the United States and the United Kingdom. Volvo data for Japan was from 2006 and the availability may have changed.

The fitment of this leading edge technology to cars sold in Australia is largely restricted to high end marques.

A 2008 European Commission presentation, 'Cost-Benefit Assessment and Prioritisation of Vehicle Safety Technologies', noted that the do-nothing scenario for Pre-emptive Brake Assist in Europe would see the market penetration rate of five per cent at 2005 only increase to 20 per cent by the year 2025.[28]

Therefore the European Commission intends to make Pre-emptive Brake Assist mandatory in European cars by 2015.[29]

The Committee considers that the fitment of Pre-emptive Brake Assist to cars is an uppermost priority and all necessary steps should be taken to ensure that this technology becomes a standard feature on Australian cars.

Brake Assist for Heavy Vehicles

Mercedes Benz is currently the only manufacturer fitting Pre-emptive Brake Assist to heavy vehicles and has been doing so since 2006. In 2007 Mercedes Benz won the European Commercial Vehicle Safety award for heavy vehicle pre-emptive braking.[30] However, the parent company of Mercedes Benz also owns Freightliner, Sterling Trucks, Western Star, Thomas Built Buses and Mitsubishi Fuso in which Pre-emptive Brake Assist technology is not fitted.

At a public hearing in Melbourne, 4 February 2008, Mr Lindsay Fox, Director, Linfox extolled the safety benefits of the Mercedes Benz's Pre-emptive Brake Assist technology in heavy vehicles and informed the Committee that Linfox had placed an order for 750 vehicles fitted with this technology.[31]

Unfortunately, it cannot be assumed that the availability of Pre-emptive Brake Assist to Volvo cars means that fitment to Volvo

heavy vehicles is around the corner, as they are two independent companies.

Brake Assist for Motorcycles

During the Overseas study tour, 25 August-14 September 2007, the Committee met with the Motorcycle Industry in Europe (ACEM) in Brussels, 7 September 2007. The Committee was informed that an in-depth analysis of motorcycle crashes titled MAIDS, commissioned by ACEM, indicated that Brake Assist provided little benefit for motorcycles as rider reaction time was often insufficient to enact a braking response.[32]

The lack of rider reaction time would appear to indicate a significant safety benefit from the development of a Pre-emptive Brake Assist system for motorcycles.

However, brake operation presents other potential risks for motorcycle riders. Too much brake pressure can destabilise the vehicle and insufficient braking can mean a rider fails to avoid, or mitigate, a crash. A 2006 MUARC report, *Intelligent Transport Systems and Motorcycle Safety*, found that:

> ... maximum braking force is rarely achieved in emergency stopping situations.[33]

The Committee, while disappointed at the lack of motorcycle specific safety technologies, is not surprised to find that Brake Assist is only offered on one touring motorcycle in Australia.[34]

Summary

The Committee sees great potential in Pre-emptive Brake Assist for all vehicle types. While it is being offered, availability on cars is inconsistent and varies between countries. Heavy vehicle fitment is limited to one marque despite the manufacturer producing a number of heavy vehicle marques in both Europe and the United States. Pre-emptive Brake Assist is not available for motorcycles.

The Committee considers Pre-emptive Brake Assist to be the most significant technology identified in this report and has made it its first priority for fitment. As such, a rapid increase in market penetration is required. Currently fitment is restricted to the higher end of the vehicle market for both cars and heavy vehicles. The importance of this technology and a corresponding limit in fitment has been recognised in Europe, which will require mandatory fitment by 2015.

The Committee considers that a similar approach is required in Victoria.

The current availability of Brake Assist on Australian cars indicates that a number of vehicle platforms are partially equipped with technology to support Pre-emptive Brake Assist. This includes Australian made cars from GM Holden and Toyota and the new Ford Falcon model, but not the Territory model.

Every existing model and new models arriving in the next 18 months will have completed a vehicle model life cycle by 2015, thereby ensuring that every manufacturer has the chance to upgrade to Pre-emptive Brake Assist technology.

In the interim, a sustained public education campaign to raise awareness of this technology and its significant safety potential may contribute to increased take up rates.

Recommendation

3. That VicRoads require the fitment of Pre-emptive Brake Assist to new cars and heavy vehicles, as a pre-requisite for registration from 2015.

Anti-lock Braking Systems for Motorcycles

Motorcycles braking requires more of a rider than braking of other vehicles. Rather than simply pressing the brake pedal hard in an emergency, as both car and heavy vehicle drivers do, motorcyclists are required to maintain wheel traction and vehicle stability.

Braking too hard can destabilise a motorcycle and potentially lock the rear wheel which can cause the motorcycle to slide, and the front wheel lock may cause the rear wheel to lift and potentially throw the rider over the front of the motorcycle.

Insufficient braking can mean a rider fails to avoid or mitigate a crash. The 2006 MUARC report, *Intelligent Transport Systems and Motorcycle Safety*, reported that: 'maximum braking force is rarely achieved in emergency stopping situations'.[35]

Anti-lock Brake Systems (ABS) monitor wheel rotation during braking and manage applied braking force to ensure full brake potential without wheel lock. This brake management allows a rider to confidently apply and maintain full braking pressure.

The European Commission has identified motorcycle ABS as the brake technology with potential to improve motorcycle braking.[36] Yet this development is a long way behind advancements in braking technology for other vehicle types. The UNECE has acknowledged,

in the 2005 document, *Statement of Technical Rationale and Justification* (31-GTRBR-05) that:

> Motorcycle brake regulations have not kept pace with the advancement of modern technologies.[37]

During a meeting with Dr Jost Gail from the German Federal Highway Research Institute (BAST) in Munich, 12 September 2007, the Committee was informed that the fitment of ABS to motorcycles had a cost-benefit ratio of four, presenting an economic justification for fitting ABS.[38]

An after market ABS for motorcycles is marketed by a Korean company.[39] The technology is fitted to the oil pressure line of the brake system. Oil pressure is monitored and restricted from reaching the pressure that would result in a vehicle's wheels locking. However this surrogate ABS system prevents a rider from having access to the full braking capacity of the motorcycle. While this may prevent wheel lock it also prevents the full braking capacity designed by the manufacturer and may potentially reduce vehicle safety.

The significance of ABS to motorcycles is illustrated by the number of safety technologies developed as a result of this technology. These include:

- Rear Wheel Lift-Off Protection (RLP) that adjusts rear wheel braking to accommodate the shift of load displacement from the rear to front wheel, ensuring that the speed of the rear wheel correlates with the front wheel.

- Roll angle sensors, which can provide additional inputs into the calculation of brake pressure application, to improve motorcycle cornering.[40]

The braking advantage of ABS has been proven in 2004 research, *Requirements Applicable to Future Motorcycle Brake Systems for Enhancing Riding Safely*, by the Automotive Engineering Faculty of Darmstadt Technical University commissioned by BAST. The research findings indicate that:

> ... the stopping distances achieved are shorter with ABS than they are without ABS ...

Further, the research recommends that:

> … for future motorcycle brake systems: ABS should be used on all two-wheeled vehicles wherever possible.[41]

In December 2006 the World Forum for Harmonisation of Vehicle Regulations adopted motorcycle ABS as a global technical regulation (GTR).[42]

While Australia is not a party to the 1998 Global Agreement on Global Technical Requirements, Australian Design Rule (ADR) 33 is partially harmonised with UNECE R13-H and includes a standard for ABS if the feature is fitted to a motorcycle.

Comparative Availability of Anti-lock Braking Systems for Motorcycles

Motorcycle ABS was first commercially released by BMW Motorrad in 1988, ten years after the technology was introduced to passenger cars. BMW subsequently released a second generation ABS in 1992 and an Integral ABS system in 2000. In 2006 BMW released a second generation Integral ABS which is available on most BMWs imported into Australia.[43]

Other manufacturers that have ABS available on some of their Australian model range include those listed below.

Manufacturers offering Anti-lock Braking Systems:

- BMW
- Ducati
- Honda
- Kawasaki
- Moto Guzzi
- Yamaha.

Mr Cameron Cuthill, General Manager, Motorrad BMW estimated at the hearing, 3 March 2008, that approximately four per cent of motorcycles in Australia were equipped with ABS.[44]

The presence of a vehicle standard for ABS within ADR 33 has not increased the fitment of ABS to motorcycles imported into Australia.

However at a public hearing, 3 March 2008, Mr Cuthill, General Manager, Motorrad BMW informed the Committee that ABS is not suitable on gravel surfaces and as a consequence: ‘most people riding off-road would prefer to ride with it off’.[45]

The Committee recognises that while ABS is not beneficial for off-road riding it provides improved safety for on-road motorcycles. Therefore the Committee considers increasing availability and fitment of ABS to motorcycles to be the highest priority for motorcycles. ABS should also be available for all off-road motorcycles as they can be ridden on-road as well, though the Committee would accept an on/off switch to allow off-road use without ABS.

Recommendation

4. That VicRoads require the fitment of Anti-lock Braking Systems to new motorcycles as a pre-requisite for registration from 2011.

Automatic Stability Control for Motorcycles

Motorcycles have only two wheels making stability significantly more important in both static and dynamic contexts. The safety of a rider is reliant upon the vehicle's stability.

To support motorcycle stability, BMW has developed Automatic Stability Control (ASC). ASC is the combination of Anti-Lock Braking (ABS) and Traction Control. The technology is designed to prevent uncontrolled spinning during acceleration and a potential loss of side force traction which can result in the rear wheel swerving out of control. Full acceleration may also cause the front wheel to lift off the ground. ASC detects wheel spin, or lift off, and intervenes in the rate of acceleration to ensure that both wheels maintain traction with the riding surface.[46]

As a proprietary technology, ASC is restricted to BMW motorcycles both in Australia and overseas. Other manufacturers would have to licence the technology or develop a similar product.

ASC was fitted to one BMW motorcycle model sold in Australia at the end of 2007. The technology is to be fitted more widely across the BMW range in 2008 reflecting overseas availability.

At a hearing, 3 March 2008, Mr Cuthill informed the Committee that BMW sales only accounted for two per cent of total motorcycle sales.[47] Therefore the current market penetration of ASC is insignificant.

The Transport Accident Commission (TAC) submission noted that there is no evidence currently available on the effectiveness of ASC technology.[48]

The Committee has found the lack of research and evidence pertaining to motorcycle safety technologies both an obstacle and a concern given the vulnerability of motorcyclists.

The Committee heard from both the BMW and Federal Chamber of Automotive Industries (FCAI) representatives, at public hearings on 3 March 2008 and 31 March 2008, that motorcycles are recreational vehicles and associated with lifestyles as opposed to being primary forms of transport.[49]

The Committee considers that the limited development of safety technologies for motorcycles demands more research that needs to be undertaken urgently in both the assessment of safety technologies and further development of safety technologies for motorcycles.

Recommendation

5. That VicRoads undertake research to ascertain the benefits of Automatic Stability Control for motorcycles and, if found to be significant, promote the technology widely to motorcycle riders.

Prime Mover and Trailer Compatibility

The safe braking of an articulated heavy vehicle is determined by the combined brake systems of the prime mover and the trailer. The two systems must be compatible.[50]

Three braking technologies have provided heavy vehicles with improved braking and vehicle safety. These are:

- Electronic Braking Systems (EBS);
- Anti-Lock Braking Systems (ABS); and
- Electronic Stability Control (ESC).

EBS replaces mechanical linkages and hydraulic lines for brake application with an electronic signal sent to the hydraulically actuated brake at the wheel. The electronic signal reduces the time it takes to signal and effect brake application. Trailer lag/push is eliminated from articulated vehicles when both the prime mover and the trailer are fitted with EBS.

A 2006 National Transport Commission (NTC) discussion paper, *National Heavy Vehicle Braking Strategy: Discussion Paper*, identified ABS as one technology with the potential to improve heavy vehicle road safety.[51]

The discussion paper acknowledged that while mandatory ABS for heavy vehicles had previously been unjustified, the cost-benefit ratio now justified the mandating of ABS for heavy vehicles.[52]

The Victorian Transport Association (VTA) submission identifies that a low standard of braking technology exists on Australian trailers. Their submission noted that:

> Australian manufactured trailers often have conventional pneumatic brakes with few fitted with ABS and EBS...[53]

The submission points out that a towing vehicle fitted with EBS and a trailer with a conventional braking system can:

> ... result in over-aggressive trailer braking...chronic wheel lock & dangerous instability.[54]

The non-fitment of advanced braking technologies to locally produced and pre-existing trailers negates the benefit of having those technologies fitted to a prime mover.

The Committee has found that an incompatible combination of one or more of these safety technologies on a prime-mover and trailer will result in reduced braking outcomes.[55]

Factors contributing to incompatibilities and exacerbating the issue are:

- independent trailer manufacturing;
- the longer service life of trailers compared with prime movers; and
- the swapping of trailers.

The type of brake systems fitted to heavy vehicles in Victoria is largely determined by international markets. Approximately equal proportions of prime-movers are imported from Europe, Japan and North America. Kenworth is the sole heavy vehicle manufacturer in Australia, manufacturing prime-movers.

The fitment of ABS to prime movers and trailers is mandatory in both Europe and the United States. However ABS is not a requirement of either ADR 35/02 Commercial Vehicle Brake Systems or ADR 38/03 Trailer Brake Systems. As such, regulations that require compatible braking would be redundant without a

correlating regulation to update the braking technologies required within the relevant vehicle standards.

However, the NTC, *National Heavy Vehicle Braking Strategy: Discussion Paper,* identified that the specification of ABS on imported heavy vehicles has increased the fitment rates in Australia.[56]

The Committee considers that VicRoads and the National Transport Commission ensure that only compatible articulated vehicle combinations be permitted to operate on the road to improve heavy vehicle braking capacity and therefore safety.

Recommendation

6. That, through the Australian Transport Council, the Minister for Roads and Ports pursues the introduction of regulations to mandate that prime mover and trailer combinations are fitted with compatible braking technologies.

Cause Targeted Technologies

Intelligent Speed Assistance

Speeding and inappropriate travel speeds are a primary factor in at least 30 per cent of road fatalities in Victoria each year.[57]

A number of submissions to the Committee prioritised technologies that would reduce speeding. This priority was central to submissions from Mr Pete Dolheguy, The Royal Humane Society of Australasia, Automotion Control System Pty Ltd and a joint submission from Mr Michael Paine, Vehicle Design & Research Pty Ltd and Mr Ian Faulks, Safety and Policy Analysis International.[58]

Mr Dolheguy, asked in his submission:

> As virtually every new vehicle, including motor cycles, are electronically controlled why not have all manufacturers preset a maximum possible speed of 130kph. [59]

The Federal Government's action plan, *National Road Safety Action Plan 2007 and 2008*, emphasises the role of speed as a significant factor in road trauma, commenting that:

> Speed reduction has a dual impact on road trauma because travel speeds influence the number of crashes that occur as well as the severity of crashes.[60]

The action plan has identified the safety potential of Intelligent Speed Assistance (ISAssist) stating that:

> There is evidence that systems with good user acceptability can provide significant safety benefits.[61]

ISAssist technology informs a driver of the speed limit for the road they are travelling on and warns them if they drive in excess of this limit. ISAssist can aid drivers to drive within the speed limit.

A 2007 conference paper by Ms Linley Crackel, 'Demonstration of Advisory Intelligent Speed Adaptation Technology in Western Australia', presented at the *2007 Australasian Road Safety Research Policing and Education Conference*, 17-19 October, Melbourne highlighted the advantages of ISAssist. These were identified as:

- improve adherence to speed limits;
- improve vehicle following distances at lower speed roads;
- reduce abrupt braking and variation in travel speeds;
- produce smoother approach speeds; and
- improve driver behaviour in interactions with conflicts.[62]

Appearing before the Committee at a public hearing in Melbourne, Dr Jeffrey Potter, Senior Manager Safety, National Transport Commission, indicated that ISAssist technology would assist a driver to stay within the speed limit.[63]

A 2003 Austroads report, *A Review of Literature and Trials of Intelligent Speed Adaptation Devices for Light and Heavy Vehicles*, found that ISAssist achieved a five km/h reduction in mean speeds. Importantly this was achieved without the driver displaying compensatory behaviour. However, the report found some evidence of driver frustration at reductions in lower overall speeds.[64]

External infrastructure supplies ISAssist systems with speed limit data. However for the safety benefit to be realised, infrastructure external to a vehicle needs to be established, infrastructure that largely does not exist in Victoria. The Committee has identified two

approaches for notifying a vehicle of the speed limit; data maps and transmitted data.

Data Maps

A data map is a digital road map of speed zones. By using a Global Positioning System (GPS) such as that used in satellite navigation systems, a vehicle's location can be identified and the speed limit noted. ISAssist would then cross reference this data with a vehicle's travelling speed to determine whether a vehicle is exceeding the speed limit.

The advantage of a data map/GPS system is that it requires minimal roadside infrastructure requirements. Therefore once a data map is available, a vehicle with the requisite on-board technology can start using the technology. The increasing popularity of after-market navigational systems and the rise in factory fitted systems to vehicles, is increasing the number of potentially ISAssist enabled vehicles.

However, there are a number of limitations to data mapping and GPS systems. These include:

- keeping data maps up to date;
- the accuracy of GPS to correctly locate a vehicle;
- commercially owned speed maps and indemnity;
- The complexity and calibration requirements of onboard equipment; and
- speed limit zone discrepancies, such as highways and parallel service lanes, roadwork sites or variable speed limit signs.

The quality of data maps is an integral enabler of GPS based ISAssist technology.

Transmitted Data

Roadside transmitters, replicating existing speed signs can relay more accurate speed limit information for a given location directly to an on-board receiver. There is no requirement for onboard GPS systems.

The disadvantage of this system is that it requires significant roadside infrastructure to ensure complete coverage of the road network. The required number of transmitters would equate to more than attaching a transmitter to each speed limit sign. Unsigned

roads such as suburban streets with a standard 50 km/h speed limit, or country roads, would require additional infrastructure.

A 2003 Austroads publication, *A Review of Literature and Trials of Intelligent Speed Adaptation Devices for Light and Heavy Vehicles*, estimated infrastructure costs for an ISAssist system using calculations based on a transmitter program in Sweden. Austroads estimate that one transmitter unit would cost $280.[65]

Intelligent Speed Assistance Trials

ISAssist has been trialled internationally and to a lesser degree in Australia.

Australia

In 1999 the TAC initiated a trial of safety technologies including ISAssist, within the SafeCar project. In total 15 cars were fitted with ISAssist. The 2006 Monash University Accident Research Centre (MUARC) evaluation of the SafeCar project, *On-Road Evaluation of Intelligent Speed Adaptation, Following Distance Warning and Seatbelt Reminder Systems: Final Results of the TAC SafeCar Project*, concluded that ISAssist could be:

> ... expected to reduce the incidence of fatal crashes by up to 8 percent and serious injury crashes by up to 6 percent.[66]

The report found that the decrease in travelling speeds did not result in an increase in travel times. The general consensus of drivers involved in the TAC SafeCar trial was that, in addition to being an effective technology, ISAssist would be accepted by the public.[67]

The Western Australian Office of Road Safety is currently conducting a trial to promote ISAssist technology and trial infrastructure operation. Fifty ISAssist units have been retrofitted to vehicles.[68] The Committee has been informed the trial is due for completion at the end of 2008.[69]

International

A European study, *SpeedAlert*, was conducted to establish a preferred version of ISAssist technology for Europe. While the study concluded that ISAssist technologies can make a real contribution to road safety, the study recommended that the driver should

always remain in control of the vehicle and that fitment and use should be voluntary.[70]

A motorcycle specific SpeedAlert system is to be trialled in Europe in 2008.[71] Unfortunately results from this trial will not be available before the report is tabled.

The European Transport Safety Council (ETSC) has cited research based on United Kingdom trials that indicate ISAssist can reduce the number of fatal crashes by eighteen per cent.[72]

An ISAssist trial conducted in Sweden that involved 10,000 private and commercial drivers found that, in addition to lowering top end travelling speeds, there was a high level of acceptance for ISAssist in urban areas.[73]

A trial currently being undertaken in Denmark is trialling an incentive based approach to implementing ISAssist technology called Pay as You Speed. Participants start with a credit, equivalent to a 30 per cent discount on their vehicle insurance. When they exceed the speed limit an audible warning occurs.[74] Third and successive warnings earn penalty points until the vehicle returns to, or below, the speed limit. Accumulated penalty points are subtracted from the insurance credit.[75]

A 2006 cost-benefit analysis for the European Commission, *Cost-Benefit Assessment and Prioritisation of Vehicle Safety Technologies*, concluded that ISAssist was a cost-effective safety technology.[76]

The extensive trialling of this technology suggests to the Committee that the technology should have undergone sufficient refinement to have a technology ready for wide scale fitment.

The effectiveness of ISAssist is dependant upon accurate and current speed limit information. The delivery of this information requires the necessary infrastructure needs to be established.

The Situation in Victoria

The Committee found that widespread application of ISAssist in Victoria has not progressed as VicRoads is yet to undertake the necessary mapping work. During VicRoads appearance at a public hearing, in Melbourne, 6 August 2007, Mr Gary Liddle, Chief Executive, stated that the cost of producing a Victorian speed limit data map was between $2 and $3 million.[77] A submission from the Western Australia Office of Road Safety noted that Western Australia had already produced and was maintaining a data map in support of an ISAssist trial.[78]

Presently road mapping is being undertaken competitively by private companies in Victoria. The Committee met with Dr Beckmann, Executive Director ETSC, in Brussels, 11 September 2007. Dr Beckmann informed the Committee that he believes competition between private companies would produce the best product.[79]

However the Committee considers that a speed zone data map is the extension of current speed limit road signage and as such is the Government's responsibility.

A current Danish trial has identified the maintenance of map data as a particular challenge, due to inter-departmental communication issues, time, funding resources, and IT skills.[80] For these reasons the Committee recommends that it should remain the responsibility of VicRoads to establish and maintain a road speed zone data map.

In support of the implementation of a data map ISAssist system for Victoria, the Committee suggests that the in-vehicle ISAssist unit should be capable of receiving data from transponders where temporary changes to a speed zone is effected, such as a road works site; or where speed limits vary such as the Western ring road.

The Committee understands from information received in a submission from the concurrent Inquiry into Improving Safety at Level Crossings, that such a system exists.[81] This system will ensure the positive attributes of both data methods benefit Victoria's ISAssist system.

The Committee considers that ISAssist technology presents a great opportunity to reduce speeding and thereby reduce the number of crashes and seriousness of injuries sustained in crashes.

The Victorian Government's 2008 road safety strategy action plan, *Victoria's Road Safety Strategy: First Action Plan 2008-2010* identifies the following actions they will undertake in relation to ISAssist. The action plan states the Victorian Government will:

> Implement systems that will allow intelligent speed assist technology to function across Victoria.[82]

Further, the action plan indicates that the Victorian Government will:

> Develop a global positioning system (GPS) based speed and hazard zone mapping system to integrate with intelligent speed assist systems.[83]

The Committee considers that much work needs to be undertaken if the Government is to complete these actions by 2010.

Intelligent Speed Adaptation

Intelligent Speed Adaptation (ISAdapt) moves beyond the warning function of ISAssist to an interventional technology which can limit the speed of a vehicle to ensure the speed limit is adhered to. While on-board functioning differs, this technology has the same external infrastructure requirements as ISAssist

The 2003 Austroads review, *A Review of Literature and Trials of Intelligent Speed Adaptation Devices for Light and Heavy Vehicles*, of ISAssist trials concluded that the fitment of ISAdapt technology to cars had higher predicted safety benefits than ISAssist alone.[84]

The ETSC has cited research based on United Kingdom trials that indicate a 37 per cent reduction in fatal crashes when ISAdapt technology is used.[85]

A 2004 French National Institute for Transport and Safety Research (INRETS) review of ISAssist/Adapt technology research, *Literature Review of Behavioural Effects*, found both forms of the technology affected lower speed variance. However the effect was greater with ISAdapt, resulting in a 40 per cent reduction in crashes compared with a ten per cent reduction when using ISAssist technology. The same report concluded that a warning pressure transmitted through the accelerator pedal against the driver's foot was more effective than auditory warnings.[86]

The 2003 Austroads review, found that while ISAdapt technology achieved a greater reduction in speeding, it was less acceptable to drivers. The report stated that:

> Overall, it appears that while the variable speed limiting systems are the most effective means of speed reduction when compared to variable speed alerting systems, speed limiting systems are deemed as the least acceptable by drivers ...[87]

The INRETS review supports this conclusion, citing research that the intrusiveness of interventional ISAdapt technology has been found to generate a degree of negative driver responses including tail-gating slower vehicles, running red lights and driving faster around corners.[88]

The Committee acknowledges that ISAdapt has the potential to affect greater compliance with the speed limit. However the priority is to introduce ISAssist technology into the vehicle fleet. The

Committee considers that the public will be more receptive to a warning based ISAssist system and therefore does not recommend that Victoria pursue the fitment of ISAdapt technology. However a voluntary option should be made available.

Once ISAssist technology has substantially penetrated the vehicle fleet, the Committee suggests that an investigation be undertaken to determine the benefits of further implementing ISAdapt technology.

Recommendation

7. That VicRoads:

a) map the speed zones of Victoria's road system by the end of 2009; and

b) fit transponders where variable or no speed limit exists, or the speed limit is temporarily changed to facilitate the implementation of Intelligent Speed Assistance technology.

An Alternative Technology

The Committee was advised of a speed limiting technology device being developed by the Ford Motor Company in the United States. MyKey is designed to limit the engine capacity of a vehicle according to the driver.

In Victoria the engine capacity of a motorcycle is limited for learner and probationary licence holders.

However, at a meeting in Brussels, 7 September 2007, ACEM informed the Committee that in Europe motorcycle restrictions are based on the tested output of a motorcycle model which is more accurate that judging potential output on engine capacity.[89]

MyKey type of technology would facilitate the regulation of motorcycle capacity in Victoria based on actual output instead of the somewhat variable capacity of an engine.

This technology has applications for probationary car drivers. It could be used to permit novice drivers to drive their parents' newer, safer vehicle, but at a lower capacity. The Ford Motor Company is hoping to introduce this technology in the United States in 2009 or 2010.[90]

The Committee suggests that VicRoads monitor the progress of this technology as an important safety tool with potential for young road users.

Monitoring Fatigue

The Transport Accident Commission (TAC) states on their website, www.tacsafety.com.au, that driver fatigue is responsible for twenty per cent of fatalities on Victorian roads.[91] National Transport Commission research, reported in *The Advertiser* in Adelaide, 26 March 2008, has shown that this increases to 30 per cent for heavy vehicle fatalities.[92] At a public hearing in Melbourne, 6 August 2007, Mr Ross McArthur, Manager, Vehicle Safety, VicRoads, stated that fatigue is a factor in 30 per cent of fatal crashes.[93]

Monitoring driver fatigue is a complex task and a number of directions are being explored in current research and development. A review in 2005, *Review of On-road Driver Fatigue Monitoring Devices* from the New South Wales Injury Risk Management Research Centre, University of New South Wales (IRMRC) found fatigue technologies being developed fell into three categories: fatigue monitoring; driver performance; and one that combines the two.[94]

The IRMRC review found research into measuring a driver's state of alertness explored the percentage of time a driver's eyes are closed, and the level of brain activity. The review also found, however, that a number of studies have revealed the difficulty in utilising eye and facial movements as a measure of fatigue. The difficulty is in determining at which point a driver is in an unsafe state and should be warned.[95]

During a meeting with Mr Dominique Cesari, Chair, European Enhanced Vehicle Safety Committee (EEVC) in Brussels, 10 September 2007, the Committee were informed that for accuracy, at least two measures of the driver's condition is requiried.[96]

The monitoring of driver performance can be tracked through other safety technologies, such as Lane Departure Warning (LDW) and Forward Collision Warning (FCW) systems. However the review by IRMRC made the distinction that these are not fatigue monitoring technologies but indicators of changes in the driver's state that are significant for road safety. The review also remarked that in an Australian context, no information is available on the effectiveness of either technology.[97]

The Conclusion from the European Commission's AWAKE research project is that fatigue monitoring technology: 'may significantly contribute to traffic safety'.[98] However the AWAKE project was a development project, identifying that sensor technology needs further development and differences between drivers presents considerable complexity in the development of this technology.[99]

Research undertaken by the United States Department of Transportationation, Federal Motor Barrier Safety Administration has reached a similar stage:

> This project lays the foundation for future work in the development and deployment of a drowsy driver detection system. The primary areas of future work are the development and testing of prototype detection systems and the integration of a warning system …[100]

Fatigue monitoring technology is still at an embryonic stage and further development is required. LDW technology was initially developed as a fatigue monitoring system.[101] However, some manufacturers are making available basic technologies that are intended to act as fatigue monitors.

The 2008 Ford Falcon has been fitted with a simple fatigue warning device that tracks the time in which a vehicle is continually driven. After a preset period, a warning advises the driver to rest.[102]

Volvo has released a dedicated technology, Driver Alert Control, which can monitor a vehicle's movement on the road and determine whether the driver is in control and therefore sufficiently alert.[103] The system appears to be a cumulative register of lane tracking movements within the tolerance of the LDW system.

The Volvo system uses a visual display that begins with five bars and indicates an increasing level of fatigue through a decrease in the number of remaining bars.[104] However this system would require a tiring driver to also monitor the indicator bars to be a really effective fatigue monitoring technology and therefore largely defeats the purpose of fatigue monitoring technology.

The Committee does not consider these two examples warrant recommendations encouraging strategies to broaden fitment. The Committee does however, consider them a positive indication of the willingness of manufacturers to pursue the development of this technology.

In the interim other technologies have been identified as surrogate fatigue monitoring technologies. A MUARC review of the TAC SafeCar project found that 86.5 per cent of participants thought that FCW technology could function as an alert for distracted or fatigued drivers.[105]

LDW can achieve fatigue monitoring through interpreting lane departure as an indication of driver drowsiness or having fallen asleep. If a driver was to lose concentration or fall asleep, steering slip and subsequent diversion of the vehicle from its lane would trigger a warning that would hopefully alert or wake the driver before

a crash occurs. This additional benefit of LDW increases its significance as a safety technology.

However the inadequacies of these surrogate technologies is that they alert a driver to an emergency situation, whereas fatigue monitoring would detect driver fatigue and potential risk of an emergency prior to the situation arising.

Research into Fatigue Monitoring

The Victorian Government's recently released action plan, *Victoria's Road Safety Strategy: First Action Plan 2008-2010* identifies fatigue monitoring technology as an action for research into its potential to reduce road trauma.[106]

Estimations in the 2006 European Commission's report, *Cost-Benefit Assessment and Prioritisation of Vehicle Safety Technologies*, found that a break-even cost for a fatigue monitoring unit, based on the benefits of the technology would be €710, approximately $1,160 per vehicle.[107]

An Australian company, Seeing Machines, is one group working on computer interpreted monitoring of visual data of a driver's facial and eye movements. The system being developed uses a camera to record eye and facial movement for computer analysis to determine fatigue levels.[108]

The submission by MUARC referred to development of a steering grip sensor.[109] The relaxing of a drivers grip is used as an indicator that a driver may be falling asleep.

At the VicRoads hearing, 6 August 2007, Mr McArthur referred to a pair of fatigue glasses that monitor eye movement and blinking as a measure of fatigue.[110] The glasses have two audible warning levels; that the driver is starting to tire and that the driver is now not fit to drive.[111]

An article in *The Advertiser*, 26 March 2008, reported the South Australian Road Transport Association Executive Director, Mr Steve Shearer, as stating technology such as these glasses are not yet proven.[112]

A more advanced fatigue monitoring system that tracks head and eye movement to detect distraction and levels of fatigue is being developed by Volvo for its heavy vehicles. However development is still at an experimental stage and their website states that this technology:

> … may be found in our trucks within the next two to 15 years.[113]

The Committee considers the development and fitment of fatigue monitoring technology to be vital for future road safety and supports the Victorian Government's commitment to assess the developmental potential of such technology.[114]

Alcohol Interlocks

In Victoria the provision for fitting alcohol interlocks to the vehicles of convicted recidivist drink drivers upon the reissuing of their licence has existed since 2002. An interlock prevents a vehicle being started if a driver's blood alcohol concentration (BAC) exceeds the legally permitted limit. Since 1 January 2007 interlocks have also been fitted to the vehicles of first time drink driving offenders aged under 26, or on a probationay licence.[115]

However, the MUARC submission argued that the technology currently being used in Victoria's recidivist program is expensive to install and maintain. MUARC believe that the fitment of interlocks makes it unsuitable for application within the wider community and would only have a minimal affect on increasing road safety.[116] This highlights the need for development of a suitable interlock for general application.

The technology used in this program requires regular servicing and associated costs.[117] Regular servicing allows calibration which permits data collected to be used as evidence. A system designed to prevent driving without evidentiary requirements would therefore require less maintenance and therefore less cost. However, the system would still need to be relaible and accurate to ensure trust in the technology.

Designs that would increase community acceptability are being developed which analyse BAC through a number of different methods including a driver's breath, perspiration or the air within a vehicle's cabin.

Nissan has made developments in alcohol interlock technology with a prototype vehicle included a sensor in the gear lever that determines alcohol content through the perspiration of the driver's palm.[118]

Saab has been developing an alcho-key since the early 2000s. At a meeting in Detroit with Mr Bob Lange, Executive Director, Vehicle Structure and Safety Integration, General Motors, during the overseas study tour, Mr Lange informed the Committee that, from the United States perspective, Saab's interlock technology was unviable.[119] This was affirmed for the Committee by Dr Susan

Ferguson, who specialises in alcohol-related road safety, at a subsequent meeting in Washington, Tuesday 4 September.[120] Both Mr Lange and Dr Ferguson stated that the main reason interlocks are not considered viable in the United States is that 40 per cent of the driving population are teetotal.[121]

The Committee does not consider that this rationale is applicable in Australia and, therefore, alcohol interlocks present good potential as a tool in increasing road safety. Though not a new technology, continuing refinements are creating designs that are increasingly suitable for general application.

In 2007, Volvo awarded a contract to an interlock supplier to develop a customised interlock for fitment to Volvo cars. Fitment in production vehicles is expected to start in 2008.[122]

Mr David Healy, Senior Manager, Road Safety, TAC expressed support for alcohol interlocks in an appearance at a public hearing of the Committee at a hearing in Melbourne, 6 August 2007. Mr Healy stated that the use of alcohol interlocks:

> ... really helps to break the nexus we believe between alcohol consumption and driving, using technology. We think it is a most worthwhile technology.[123]

Most interlock trials, beyond recidivist offender programs, have focused on commercial drivers. A 2005 Canadian trial has been documented in the paper, *A Pilot Interlock Program in Canada*. The paper notes that a number of European countries have implemented trials, with heavy vehicle drivers of both freight and public transport. The report also notes that a lack of enthusiasm in the United States has meant that no such trials have been undertaken.[124]

During the Canadian trial all drivers were within their BAC limit with the exception of one driver who repeatedly tested positive at the beginning of a morning shift. According to the paper, all other positive tests were the result of subjects playing with the system after work hours, and included several repeated breath tests.[125]

The European Commission's 2006 report, *Cost-Benefit Assessment and Prioritisation of Vehicle Safety Technologies*, has determined that alcohol interlocks are a cost effective safety technology.[126]

Dr Beckmann, Executive Director, ETSC, pressed upon the Committee at a meeting in Brussels, 11 September 2007, the importance of mandating the fitment of alcohol interlocks to vehicles. However this imperative is based on the amount of fatalities and serious injuries attributed to crashes resulting from drink driving rather than the availability of a suitable interlock.

The Government has identified alcohol interlocks as a target technology in their recently released strategy, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*. The Government has undertaken to extend Victoria's alcohol interlock program to young and inexperienced drivers and encourage voluntary fitment of interlocks by private motorists. The strategy will also encourage manufacturers to fit interlocks to new vehicles.[127] The Committee is concerned that this identified strategy found in the latest action plan lacks detail about how it will be undertaken and what technology will be promoted.

Since 2007, the Swedish Road Administration has required the fitment of alcohol interlocks on all fleet vehicles in its department.[128] This initiative is one that VicRoads, the TAC and VicFleet could readily implement in support of the Victorian Government's road safety strategy.

The Committee considers that any measure that reduces the incidence of drink driving should be explored. As such the Committee supports the initiatives found in the Government strategy to encourage voluntary fitment of interlocks by private motorists and the encouragement of manufacturers to fit interlock technology.

The Committee appreciates that these are high road safety goals, but considers that ten years is sufficient time to realise them. As a first step the Committee finds that trialling alcohol interlocks in an environment as close to the private fleet as possible is an appropriate starting place.

Recommendations

8. That VicRoads and the Transport Accident Commission fit and trial developmental alcohol interlocks to its vehicle fleet.

9. That the Department of Treasury and Finance fit the current alcohol interlock system used in Victoria to all Victorian Government fleet vehicles.

Driver Assist Technologies

Active Head Restraints

Head restraints were introduced to vehicle seat designs to mitigate neck, and predominantly whiplash, injuries. The term headrest is indicative of the static and largely unrecognised importance of head restraints as a passive vehicle safety technology.

The previous Road Safety Committee conducted an inquiry in 2003, and tabled the report, *Inquiry into Road Safety for Older Road Users*. That Committee found that:

> The main causes of whiplash are said to be poorly adjusted and poorly designed head restraints.[129]

In 2007, whiplash and neck sprain or strain injuries accounted for 28 per cent of injury claims accepted by the Transport Accident Commission.[130]

The difficulty in quantifying whiplash injuries was addressed in the 2006 report, *Whiplash Associated Disorders: a Comprehensive Review*, from the Centre for Automotive Safety Research (CASR), University of Adelaide. The report states that:

> The true incidence of whiplash is difficult to determine, as routine data may not adequately characterise or capture all cases ... However it is possible to say that the incidence of whiplash disorders in South Australia in 2001 was greater than 300 per 100,000 population ...[131]

While these types of crashes do not result in many fatalities, there are a great number of injuries with long-term effects. The Committee considers that technologies that can significantly reduce neck related injuries are important.

Manufacturers have taken varied approaches to the design of active head restraint systems, including developments of a dynamic seat back. Developments have generally addressed the absorption of forces transferred to an occupant through a crash, and the distance between the head and head restraint. The developmental shift to active head restraints has redefined a hitherto passive technology as an active technology.

Active head restraint designs fall into two categories. One approach moves the head restraint up and forward to shorten the distance between an occupant's head and the head restraint.[132] Another version is designed to absorb the transferred force from a crash by permitting a limited degree of backward rotation of the seat back and head restraint.[133]

The range of designs emerging recently into the market was recognised in the submission from MUARC and reiterated during discussions at a public hearing in Melbourne, 6 August 2007. The variety in active head restraint design highlights to the Committee

the need for a performance based measure to determine the effectiveness of active head restraints to mitigate injury in a crash.

Variations in design and performance were also identified by Dr Stuart Newstead, Senior Research Fellow, Statistician, Road Safety, MUARC at a public hearing in Melbourne, 6 August 2007. Dr Newstead explained that:

> ... a lot of the Japanese manufacturers claim to have anti-whiplash seats in their vehicles but they do not tell you anything about how the system works.[134]

The different developments have produced varied improvements in occupant safety by maintaining or shortening the distance between the occupant's head and head restraint during a rear impact crash. A United States study, co-written by staff from the Johns Hopkins University Applied Physics Laboratory and the Department of Transportation, National Highway Traffic Safety Administration (NHTSA), and presented at the *20th International Technical Conference on the Enhanced Safety of Vehicles* in Lyon, 'Performance of Seats with Active Head Restraints in Rear Impacts', used experimental studies to assess the safety benefits of active head restraints and found reduced neck injuries in line with real world findings.[135]

The study evaluated the different active head restraint designs fitted to United States variants of the Honda Civic, Nissan Altima, Saab 9-3 and Subaru Outback. One measure used in the study was the optional dynamic test that the United States uses to determine the Federal Motor Vehicle Safety Standard, US FMVSS 202a. One design did not meet the requirements of the standard.[136] This illustrated the point that not all active head restraint designs provide the same level of protection.

A data analysis by the United States Insurance Institute for Highway Safety (IIHS) confirmed that the range of active head restraint designs produce different levels of protection.[137] A 2002 IIHS review of insurance claims revealed a 43 per cent decrease in neck injury related insurance claims where the Saab active head restraint was fitted to Saab. Some General Motors and Nissan vehicles are also fitted with these restraints. A 49 per cent reduction was achieved by the Volvo system. [138]

However a more recent, 2005 IIHS review of insurance claims stemming from rear end crashes, found that the there is a 14-26 per cent estimated reduction in insurance claim rates resulting from crashes involving vehicles fitted with active heads restraints.[139]

The 2003 Road Safety Committee report, *Inquiry into Road Safety for Older Road Users* encouraged active head restraints to be given: 'more prominence in safety literature for new car purchasers'.[140]

At a public hearing in Melbourne, 29 October 2007, Mr Pierre Hultstrand, General Manager, Technical and Market Testing, Autoliv informed the Committee that whiplash protection may become a sixth star in European New Car Assessment Program (EuroNCAP) testing.[141]

Australian Design Rule (ADR) 22 mandates the fitment of head restraints to be fitted to vehicle seats. Additional dimension and shape requirements: 'contoured to decelerate horizontal movements', have been introduced.[142] However this additional requirement does not shorten the distance between the head and restraint, which has been shown to reduce the incidence of neck injuries.

NHTSA updated the head restraint regulation, FMVSS 202 in December 2004, to include an optional dynamic test for active head restraints. This update defined a voluntary standard for active head restraints as a developmental incentive.[143]

The lack of an ADR standard for active head restraints is a contributing factor to the disparity in occupant protection provided by various active head restraint designs.

Comparative Availability of Active Head Restraints

The Committee has identified that there is a range of active head restraint designs being fitted by vehicle manufacturers and that the safety of these various designs is not equal. This makes the comparison of availability between manufacturers and markets in other developed economies difficult. Therefore comparison of manufacturer fitment of active head restraints is indicative of a commitment to vehicle safety rather than a comparison of actual safety benefits.

Table 3.6, located in Appendix D, lists all models in which manufacturers state that an active head restraint is fitted.

Nissan, Hyundai, Subaru, Volkswagen, Mercedes Benz, BMW, Volvo and Kia set a good example fitting active head restraints widely across their model ranges in all four markets analysed. Mazda similarly fits active head restraints widely but they are standard in Australia while being an option in Japan.

Honda fit active head restraints to approximately half their models but this fitment rate reduces to approximately a third in Australia.

The Odyssey and Legend miss out despite nearly consistent fitment in the other three countries being compared. Similarly Peugeot also fit active head restraint to a majority of models in the United Kingdom and Japan but only half of those models when exported to Australia.

Fitment by local manufacturers is below the standard of these imported marques. The Toyota Motor Corporation fits active head restraints widely in Japan, on three models in the United States, one in the United Kingdom and none in Australia. GM Holden fit active head restraints to high end vehicles, the Calais, Statesman, Caprice and HSV. Ford fit an active head restraint on the Mondeo but only an 'advanced restraint module' on the imported Focus and locally manufactured Falcon.

The importance of extending fitment of active head restraints to all vehicles has been highlighted by research in the United Kingdom. Thatcham – the British Motor Insurance Repair Research Centre has found that small cars are the:

> ... least effective in saving the occupant from debilitating whiplash injury in the event of low speed rear end collisions.[144]

The Committee notes that the Government's new action plan, *Victoria's Road Safety Strategy: First Action Plan 2008-2010*, plans to raise awareness of, and create consumer demand for, active head restraints.[145]

However the Committee considers that without a vehicle standard for active head restraints, the disparity in actual safety provided by the range of designs will contribute to confusion in the market and therefore potentially reduce consumer perceptions of this technology as a safety feature. Therefore the Committee recommends that Australia consider adopting the dynamic test used in the United States to assess active head restraints on vehicles imported into Australia.

Recommendation

10. That the Minister for Roads and Ports make representation, at the Australian Transport Council, for the adoption of the dynamic test for United States vehicle standard FMVSS 202-33 as part of Australian Design Rule 3 – Seats and Seat Anchorages.

Lane Departure Technology

In 2007 there were 178 fatalities in Victoria as a result of crashes that involved a vehicle travelling in the opposing direction (56) or running off a straight road (122). These crash types indicate that a driver veering out of their lane was a significant contributing factor.[146]

The Swedish National Road and Transport Research Institute's 2007 report, *Intelligent Transport Systems (ITS) in Passenger Cars and Methods for Assessment of Traffic Safety Impact: a Literature Review*, reviewed safety technologies. The report indicated that while LDW technology was developed for heavy vehicles, the technology is now being fitted by car manufacturers.[147]

Lane departure technology continually references lane markings in relation to a vehicle's course, via a radar or camera within the vehicle. When a vehicle's movement out of a lane is detected, a warning is issued to the driver.

LDW technology is connected to a vehicle's indicator in order to discern between deliberate and unintentional lane departure. The technology warns a driver that they are veering out of their lane, as a prompt to refocus attention and correct their driving.

NHTSA believes that LDW technology: 'may have great potential to save lives' as single vehicle road departure crashes are the biggest contributor to road fatalities in the United States.[148] This crash type also represents the largest contributor to Victorian fatalities, particularly in rural areas.

During the overseas study tour, the Committee heard from Mr Ray Resendes, Intelligent Technologies Research Division, NHTSA, during a meeting in Washington, 4 September 2007. Mr Resendes stated that an integrated system of LDW, blind spot monitoring and FCW could prevent more than 48 per cent of crashes.[149]

In the United States, the Federal Motor Carrier Safety Administration (FMCSA) has developed voluntary operational requirements for LDW technology in heavy vehicles. The FMCSA maintains a list of available after-market LDW systems.[150]

The appropriateness of LDW signals was considered in a 2003 study by the Australian National University presented at the *Australasian Conference on Robotics and Automation* conference, 'Driver Assistance: Contemporary Road Safety'. The report found that warnings that vibrate through the steering wheel can:

> … trigger an effective and beneficial mental response to lane departure and made interpreting road conditions more immediate, even if the driver was not briefed on what the signal was for …[151]

Targeting the warning signal used has led some manufacturers to use a warning that mimics the sensation of driving over audio-tactile pavement markings or 'rumble strips'. These lane markings are a forerunner to in-vehicle LDW technology.

Research in the United States by the IIHS has found that audio-tactile pavement markings have produced a 20 per cent reduction in run-off-road crashes and 25 per cent in head-on and running into the side of parallel vehicles crashes.[152]

Audio-tactile pavement markings are already used on many roads suited to LDW technology. Highways with lower density traffic are more suited to LDW applications than are metropolitan or urban roads with higher traffic density that can obscure lane markings. LDW technology should increase the level of safety already provided by existing audio-tactile pavement markings.

The Committee notes however, that Victoria has many unsealed roads and many more with unsealed shoulders in speed zones up to 100 km/h that lack suitable lane markings to support LDW systems. The Committee recognises this and appreciates that LDW will not prevent lane departure crashes on all roads. Nevertheless the Committee considers that VicRoads should investigate ways to overcome this through modifications to roads surfaces to increase the appeal for manufacturers to offer the technology.

Recommendation

11. That VicRoads investigates appropriate roadside markings for unsealed roads and unsealed shoulders, that will increase the proportion of roads suited to application of Lane Departure Warning technologies.

A 2004 study commissioned by the Netherlands Ministry of Transport, Public Works and Water Management, *The Dutch Experience with Lane Departure Warning Assistant Systems: A Field Operational Test*, trailed 30 heavy vehicles and one bus with LDW technology.[153] The study examined human reactions to LDW technology and found positive acceptance amongst 75 per cent of tested drivers. However the study also noted that drivers tended to use the system to their advantage rather than changing their driving behaviour.[154]

Heavy vehicle manufacturer Scania has introduced LDW monitoring through steering wheel sensors that differentiate between a driver

who is actively steering and steering movements indicative of inattention to the driving task.[155]

The Committee met with the Japanese company Denso in Nagoya, 29 August 2007, as part of the overseas study tour. Denso produce a LDW system that uses a minimal counter-steering torque which also warns the driver through the steering wheel.[156] While this counter-steering does not correct the vehicle's direction, it indicates the potential of possible development of LDW from a warning system to an active vehicle safety technology.

Comparative Availability of Lane Departure Warning

In terms of which manufacturers fit lane departure technology, warning or assistance technologies, the Swedish National Road and Transport Research Institute has identified, in the 2007 report, *Intelligent Transport Systems (ITS) in Passenger Cars and Methods for Assessment of Traffic Safety Impact: A Literature Review*, that:

> LDW systems started to appear in series-produced cars in early 2002 in Japan, around 2004 in Europe and in 2005 in America. Nowadays Nissan, Honda, Lexus, Toyota, Infinity, Peugeot, Citroen, Audi, BMW and Mercedes offer such systems …[157]

The following table lists the availability of Lane Departure Warning. The table shows that availability is limited and that availability is restricted to more expensive models.

Table 3.5 Comparative Availability of Lane Departure Warning

Vehicle	Australia	USA	Japan	UK
Toyota				
Tarago			Optional on some models	
Honda				
Accord			Optional on some models	Standard on some models
Legend			Optional	Standard on some models
BMW				
BMW 5 series	Optional	Optional		Standard/ Optional on some models
BMW 6 series	Optional	Optional		Standard
Peugeot				
307 Touring	Standard			
Lexus				
LS			Optional on some models	
GS			Standard, Optional and N/A	
IS			Optional	
Volvo Car				
S80		Optional		Optional
V70		Optional		Optional
XC70				Optional

Source: Manufacturers' Websites, April 2008 and *Japanese New Car Assessment Program, New Car Assessment*, Table of Safety Performance Comparison by Model, 2007.

Heavy vehicle manufacturers, Scania and DAF, made LDW available in Australia in 2007. Other manufacturers that fit LDW include Freightliner, Iveco, Man and Mercedes Benz. The wide availability to heavy vehicles reflects the original focus behind the development of this technology. However, availability is generally not standard nor across an entire range.

Lane Departure Assistance Technology

As discussed in relation to Pre-emptive Brake Assist, manufacturers are cautious with regard to introducing interventional safety technologies. The release of warning based technologies first allows the technology to be evaluated before developing interventional versions. Despite this, technology suppliers and

manufacturers are now beginning to develop and fit Lane Departure Assistance (LDA) technology, which is a further development of warning based systems.

LDA goes beyond LDW technology by autonomously correcting a vehicle's steering if the driver does not react to an initial warning.

Siemens informed the Committee during discussion in Munich, 12 September 2007, that they were developing an LDA system which will utilise a vehicle's power steering to effect steering correction.[158]

The Committee is concerned that LDA might be considered by some drivers as a tool or prop and not drive according to the driving conditions.

This issue is addressed by the 2007 Swedish National Road and Transport Research Institute report, *Intelligent Transport Systems (ITS) in Passenger Cars and Methods for Assessment of Traffic Safety Impact: A Literature Review*, which notes that LDA technology used by Honda and Nissan does not allow automatic or hands-free driving. The report states that:

> ... the system will deactivate when it detects hands-free driving for a period longer than 15 seconds or 5 seconds during cornering.[159]

However the Committee remains concerned that five seconds is a long time while cornering and that this feature is potentially very dangerous.

Honda has released a counter-torque LDA system in the United Kingdom on the Accord and Legend models. It is not fitted to the same models in Australia.

In 2008 the Nissan Infiniti M model in the United States is available with a two stage LDW/LDA system. If a driver does not respond to an audible warning the vehicle will apply brake pressure to individual wheels to correct vehicle steering and return the vehicle to its lane.[160] This model is not available in Australia.

The Committee considers that lane departure technology has the potential to decrease the incidence of opposing direction and run-off-road crashes. The Committee recognises that this technology has applications in both heavy and light vehicles. However the Committee is concerned by the potential for LDW and more particularly LDA technology, to be abused. The Committee is nevertheless pleased that the recently released action plan, *Victoria's Road Safety Strategy: First Action Plan 2008-2010* has committed to investigating the introduction of LDW technology.[161]

The Committee would like this investigation to recommend the fitment of LDW technology.

Adaptive Cruise Control

Adaptive Cruise Control (ACC) is the combination of Forward Collision Warning (FCW) monitoring technology and the automated braking of Pre-emptive Brake Assist. ACC first became available toward the end of the 1990s.[162]

ACC enables the driver to set a following distance, in seconds, to the vehicle ahead, which is then maintained by automatic engine management, and where required, automatic braking. Advanced ACC systems allow 'stop-and-go' driving, in which a vehicle can be brought to a stand still and then commence driving as determined by the vehicle ahead – the driver need only steer.

The driver can override the ACC system at any time by activating the accelerator or brake, similar to standard cruise control technology.

While FCW and Pre-emptive Brake Assist are classified as active safety technologies, manufacturers market ACC as a driver comfort or convenience feature.[163] The 2007 Swedish literature review of safety technologies, *Intelligent Transport Systems (ITS) in Passenger Cars and Methods for Assessment of Traffic Safety Impact: A Literature Review*, by the Swedish National Road and Transport Research Institute, highlights the dual interpretation of ACC technology as both a safety technology and comfort feature. The report concludes that while the technology was first: 'regarded as a tool with potential to increase traffic safety' manufacturers have hesitated to market it that way, for fear of potential lawsuits in the event of a crash.[164]

A 2005 French National Institute for Transport and Safety Research (INRETS) report of behavioural responses to ACC technology, *Literature Review of Behavioural Effects*, identified that ACC is:

> … not designed to handle emergency braking situations …[165]

Manufacturers have limited braking capacity of ACC technology in line with the promotion of ACC as a comfort feature, but also as a cautious approach to new autonomous technology. The INRETS review reports that the deceleration available to an ACC system is limited.[166] The deceleration capacity is more moderate than for Pre-emptive Brake Assist because fluctuations in speed are constantly being monitored and responded to.

In their report, INRETS raised the concern of the driver's ability to switch from the relaxed driving state permitted by ACC to a driver-in-control mode as demanded by a critical driving situation.[167] The review of trials undertaken of ACC technology found that:

> ... drivers generally reacted later and/or with reduced safety margins when driving with ACC.[168]

However the review also found that most drivers were accepting of ACC technology.[169]

A NHTSA trial found that ACC technology was more effective than FCW technology at reducing tailgating. Reductions ranged from 60 to 70 per cent in both light and heavy freeway traffic.[170]

At a meeting with Siemens in Munich, 12 September 2007, the Committee were informed that the fuel economy benefits of ACC technology, especially for commercial vehicles, would provide a greater commercial selling point than the safety benefits.[171]

A 2006 analysis for the European Commission, *Cost-Benefit Assessment and Prioritisation of Vehicle Safety Technologies*, report found that ACC was currently not cost effective as a safety technology.[172]

The TAC submission cites research that found drivers demonstrated:

> ... significantly greater understanding of the driving environment with ACC.[173]

However a 2003 Austroads report, *Implications of Intelligent Transport Systems for High Risk Road Users and High Risk Situations*, suggested otherwise, noting that a downside of ACC was the potential for drivers to:

> ... trade off some of the benefits conferred by adaptive cruise control by driving faster, with shorter headways and spending more time in the fast lane.[174]

Another issue raised by the INRETS report, *Literature Review of Behavioural Effects*, was the possibility that a reduction in driver workload from using ACC could result in reduced driver attention.[175]

Adaptive Cruise Control for Heavy Vehicles

A collaborative study of heavy vehicle drivers' acceptance of ACC by NHTSA, Volvo Trucks North America and ACC technology suppliers, *Volvo Trucks Field Operational Test: Evaluation of Advanced Safety Systems for Heavy Trucks*, was presented at the 2007 conference on the Enhanced Safety of Vehicles. The paper found mixed results, notably that:

> About half of those interviewed said ACC helped them maintain safe following distance and improved reaction time. A few drivers reported that ACC made them more relaxed. However, some were uncomfortable with the system taking control away from the driver.[176]

As with cars, leading edge safety technologies typically appear first in the models from high-end heavy vehicle manufacturers. Volvo introduced ACC to its top vehicle model in 2003 and in 2007 released a revised ACC technology.[177] In Australia and the United Kingdom, Mercedes Benz makes ACC available as an option on its Actros heavy vehicle.[178]

The Committee has been informed by Isuzu, Australia's largest selling heavy vehicle marque, that ACC technology is available from Isuzu in Japan and could be available in Australia within two to five years.[179]

Two United Nations Economic Commission for Europe (UNECE) regulations currently address the independent aspects of acceleration and deceleration of ACC technology. UNECE R89 requires that a system shall not be capable of acceleration beyond that of the accelerator pedal's position. UNECE R13 permits braking via an electronic signal.

At a meeting with Bosch in Stuttgart, 13 September 2007, the Committee was informed that a vehicle's braking system determines the capacity of an ACC system. A manufacturer cannot simply add ACC but needs to also fit a leading edge brake system that can respond to the signals from an ACC system.

Comparative Availability of Adaptive Cruise Control

The Swedish National Road and Transport Research Institute 2007 report, *Intelligent Transport Systems (ITS) in Passenger Cars and Methods for Assessment of Traffic Safety Impact: A Literature Review*, found that car manufacturers fitting ACC now include: Audi, Mercedes, Lexus, Infinity, BMW, Jaguar, Range Rover, Toyota and Volvo.[180]

The Committee again notes that leading edge safety technologies are predominantly being fitted by manufacturers at the top end of the market. The following table lists manufacturers according to sales volume at March 2008.

Table 3.6 Availability of Adaptive Cruise Control

Vehicle	Australia	USA	Japan	UK
Toyota				
Aurion		Optional on some models		
Tarago			Optional on some models	
Ford				
Mondeo				Optional on some models
Mazda				
CX-7			Optional	
Honda				
Civic			Optional on some models	
Accord			Optional on some models	Standard on some models
Odyssey			Optional on some models	
Legend			Optional	Standard on some models
CR-V			Standard = on Zxi and Sli models NOT avail on all others	Standard on some models
Subaru				
Liberty			Standard/ N/A on some models	
Mercedes-Benz				
E-Class		Optional on some models	Optional	
S-Class	Optional		Optional	Optional
CLK-Class	Optional			
CLS-Class	Optional	Standard	Optional	Optional
CL-Class	Standard	Standard / Optional on some models	Optional	
SL-Class		Optional	Optional	Standard/ Optional on some models

Vehicle	Australia	USA	Japan	UK
M-Class		Optional		Optional
GL-Class		Optional/ N/A on some models	Optional	
R-Class	Optional	Optional		Optional
BMW				
BMW 3 series	Standard	Optional	Optional/ N/A on some models	Optional on some models
BMW 5 series	Optional/ N/A on some models	Optional	Optional	Optional/ N/A on some models
BMW 6 series	Optional	Optional	Optional	Optional
BMW 7 series	Standard/ Optional on some models	Optional	Standard/ Optional on some models	Optional
BMW M 6			Optional on some models	
Lexus				
LS	Standard	Optional	Optional	
GS	Standard	Optional	Standard, Optional and N/A	
IS	Standard	Optional	Optional	
SC				
LX	Standard	Optional		
Volvo Car				
S80	Optional	Optional	Optional	Optional
V70	Optional	Optional		Optional
XC70	Optional	Optional		Optional
Chrysler				
300C Sedan		Standard/ Optional on some models		

Source: Manufacturers' Websites, April 2008 and *Japanese New Car Assessment Program, New Car Assessment*, Table of Safety Performance Comparison by Model, 2007.

The above table reinforces the observation that ACC is only available in Australia on high-end vehicles. While this is a concern to the Committee, of greater concern is the non-fitment or de-specification of ACC from selected models from mid-range vehicle manufacturers. Most notable is Honda which makes ACC available widely in Japan and on a number of vehicles in the United Kingdom, but not to equivalent Australian models.

As of August 2007, 37 Japanese vehicle models or 21 per cent of the new vehicle range in Japan was available with ACC.[181]

While Japanese and European manufacturers make ACC available, there is a disparity in availability of this technology by respective manufacturers in Australia.

The Committee acknowledges that ACC technology demonstrates positive road safety potential. The Committee has, however, traditionally been cautious in regard to vehicle safety technologies that reduce the driver's participation in driving. This caution is also reflected in the approach vehicle manufacturers have taken in classifying ACC as a convenience technology.

Therefore, at this stage, the Committee reserves judgement until the market can generate sufficient real world data on ACC and evidence of changes in driver behaviour.

In the meantime the Committee recommends that the existence and availability of this technology be promoted to raise public awareness of the safety potential.

Recommendations

12. That the Transport Accident Commission identify on which vehicles Adaptive Cruise Control is available, and promote this information through the www.howsafeisyourcar.com.au campaigns.

13. That VicRoads promote Adaptive Cruise Control technology to heavy vehicle drivers through the Transport Safety Group.

Pedestrian Protection

In 2007 41 pedestrians were killed on Victorian roads.[182] Pedestrians are highly vulnerable to serious injury and death when struck by a vehicle.

A 2007 conference paper from the Centre for Automotive Safety Research, University of Adelaide, 'A Comparison of the Pedestrian Passive Safety Performance of the New Vehicle Fleet in Australia, France and the United Kingdom', presented at the *Australasian Road Safety 2007 Research Policing and Education Conference* compared the pedestrian safety of vehicles in Australia to France and the United Kingdom. The paper stated that:

> … pedestrians struck by new vehicles in Australia are 65 per cent more likely to be struck by a 0 or 1 star car than pedestrians in France and 33 per cent more likely than pedestrians in the UK.[183]

The promotion of pedestrian protection in Europe through draft legislation and EuroNCAP testing has prompted European manufacturers to include pedestrian protection in car designs.[184]

A pedestrian hit by the front of a vehicle is exposed to hard points under the bonnet, behind the bumper, along the windscreen edge and at the A pillar, near the door edge. Technology is one approach being used to reduce, or remove hard points and reduce the risk posed to pedestrians.

In 2002, the Australasian New Car Assessment Program (ANCAP) introduced a pedestrian impact test as additional safety ranking criteria. [185] The intent of this test is to raise awareness of pedestrian safety as an important aspect of vehicle safety and encourage the development and fitment of pedestrian friendly safety technologies.

Pop-up bonnets that increase the distance between the contact surface and the engine are currently available on Australian versions of the Honda Legend and Citroën C6.[186]

A paper presented by Hyundai Researchers at the 2007 conference on the Enhanced Safety of Vehicles, 'The Study on Developing Active Hood Lift System for Decreasing Pedestrian Head Injury', detailed their research into pop-up bonnets. The paper concluded that a pedestrian's head injury could be reduced significantly.[187]

That Hyundai are conducting this research indicates that they are developing pedestrian protection technology that will likely be available in the near future.

Also presented at the conference on the Enhanced Safety of Vehicles, by the Biomechanical Systems Transport and Safety, Institut de Mécanique des Fluides at des Solides, was a concept that launches a dampened flexible protective panel over the windscreen and A pillars when impact with a pedestrian is detected. This research from France concludes that if the required propulsion time for the panel can be achieved: 'it decreases significantly the risk of head trauma' for pedestrians.[188]

Airbags have also been explored as a means of softening the windscreen surround. Autoliv, a seatbelt and airbag manufacturer, has developed airbags that similarly provide protection from hard points in the vehicle structure surrounding the windscreen. Autoliv envisage these twin airbags will be part of a pedestrian protection system which includes a deformable hood.[189]

The MUARC submission identified technical development in a pedestrian protection technology that includes pre-tensioned spring-loaded bonnets, also constructed from thin, deformable material.[190]

The European Commission is currently consulting stakeholders on a proposed Global Technical Regulation for pedestrian protection.[191]

The Committee considers that pedestrian protection is a vital vehicle safety consideration and that design attention is long overdue. However the Committee also recognises that a range of technical approaches are still being developed and applied. Therefore the Committee considers that pedestrian crash testing undertaken by ANCAP is the most constructive tool for encouraging development and fitment of pedestrian protection technology.

Recommendation

14. That the Victorian Government request from the Australasian New Car Assessment Program the promotion of pedestrian protection ratings alongside occupant protection ratings.

Blind Spot Monitoring

A deficiency of all vehicles is the limited field of vision available behind the driver or rider. Larger vehicles have larger blind spots, while the smaller the vehicle the greater the vulnerability to vehicle blind spots. The sign 'If you can't see my mirrors I can't see you' on heavy vehicles highlights the safety implications of vehicle blind spots. However, even with equivalent sized vehicles, one vehicle can also be obscured by another's blind spot.

Side vehicle blind spots are important when considering lane changes and when merging with traffic.

However it is difficult to ascertain the role of vehicle blind spots in crashes. The TAC online crash database includes the following crash types: vehicles travelling in the same direction, overtaking and vehicle manoeuvring.[192] It is possible that a crash classified as one of these types was due to a vehicle being in a driver's blind spot, but this cannot be determined.

For cars, rear blind spots are largely restricted to reversing applications, but rear blind spots are relevant for heavy vehicles and light commercials when driving in traffic.

Vehicle technologies that utilise sensors have been developed to monitor both side and rear vehicle blind spots.

Blind spot monitoring uses sensors to detect when another vehicle enters a driver's side blind spot. A signal indicates to the driver that another vehicle occupies the driver's blind spot.

Committee members experienced a version of this technology during the overseas study tour visit with Mercedes Benz, 14 September 2007. The Mercedes Benz system uses a visual warning. A bright red triangle illuminates on the relevant side view mirror to signal to the driver that a vehicle is occupying the blind spot on that side of the vehicle. If a driver activates the indicator for that side of the vehicle, an audible alarm is sounded and the red triangle will flash.[193] When the blind spot field is vacated the triangle disappears.

Volvo has elected to locate the signalling light inside of the side rear view mirror, inside the cabin of the car. Potentially the positioning of the light inside the cabin could provide a distraction when not relevant to the driver's requirements.

The warning is only registered by the driver if a lane change is being considered and the mirror is viewed. Otherwise the information goes unperceived by the driver and does not add information to the driving workload.

This system is currently available on cars from Mercedes Benz and Volvo. The Committee is unaware of any heavy vehicle and motorcycle applications.

The rear blind spot of a vehicle can be monitored by proximity sensors that provide audible warnings, and/or a visual gauge or a camera with a screen located in the vehicle or cab, displaying the obscured field of vision.

Honda has developed a prototype rear view camera for motorcycles as part of the Advanced Safety Vehicle program in Japan. The system is designed to remove the central blind spot obscured by the rider in side mounted mirrors.[194]

In the United States, the IIHS reviewed all recorded vehicle crashes between 2002-2006, to asses the potential benefits of five safety technologies, including blind spot monitoring. The IIHS found that blind spot monitoring did not have the same potential as FCW with automatic braking (Pre-emptive Brake Assist) and Lane Departure Warning (LDW) simply because not as many fatal crashes are relevant to this technology.[195]

Currently, rear parking sensors are being increasingly fitted to cars. During a meeting with Mercedes Benz in Stuttgart during the overseas study tour, the Committee witnessed two variations of prototype reversing technology that utilised both a camera and sensors. The computer generated steering instructions are

graphically overlayed on to the visual image of the car's rear blind spot.

Parking sensors and cameras are also available as an after market product.

Comparative Availability of Blind Spot Monitoring Technology

A 2007 Swedish National Road and Transport Research Institute report, *Intelligent Transport Systems (ITS) in Passenger Cars and Methods for Assessment of Traffic Safety Impact: A Literature Review*, found that:

> The first manufacturer with this system in series-produced cars was Volvo. ... General Motors is developing a system ... It is expected that other manufacturers could possibly start introducing the system in 2008.[196]

Blind spot monitoring is only available on a few vehicles. Volvo is by far the leading proponent of this safety technology. It is available on all models as an option, costing $1,200 in Australia.[197] However, in Australia the S40 and S60 models are not available with blind spot monitoring, whereas the technology is available on the S40 in the United States and in the United Kingdom, where the S60 is also available with this technology.

The Committee appreciates the safety potential of blind spot monitoring technology for all vehicle types and considers that this technology could be easily adapted for heavy vehicles and motorcycles, and easily fitted to all vehicles in subsequent model upgrades.

Many vehicle manufacturers produce more than one vehicle type, that is Honda produce cars and motorcycles and Volvo produce cars and heavy vehicles. The Committee encourages all manufactures to develop and fit blind spot technology to cars, heavy vehicles and motorcycles.

Passive Technologies

Seatbelt Technologies

Seatbelts remain the most effective safety technology available to car or heavy vehicle occupants. The significance of the technology is evident in the continuing development of seatbelt technologies.

Despite seatbelt wearing rates in Australia being high, approximately 95 per cent for the front seat occupants in cars, one

in five fatalities were not wearing a seatbelt.[198] The compliance rate for heavy vehicle drivers where a lap/sash seatbelt is available is significantly less, at 30 per cent.[199] While seatbelt wearing is mandatory for coach passengers where available, police crash investigation records show compliance rates of less than 20 per cent.[200]

Seatbelt Reminders

The number one strategic objective of the Federal Government's *National Heavy Vehicle Safety Action Plan 2005-2007*, was to increase seatbelt usage by heavy vehicle drivers.[201] One way to achieve this is through seatbelt reminder systems.

Seatbelt reminders are designed to prompt a vehicle occupant to fit their seatbelt. A more strident technology is seatbelt interlocks that prevent vehicle ignition while the driver and/or other occupants remain unbelted.

Monash University Accident Research Centre (MUARC) claims that seatbelt reminders can be expected to save Australia $335 million in injury costs per annum.[202]

The Australian standard for seatbelt reminders is in clause 5.5 of Austraian Design Rule (ADR) 69 – Frontal Impact Occupant Protection. The minimum standard is a continuous or flashing 'Visual Indictor' that lasts four seconds or longer. An additional audible signal is permitted.[203]

The Committee is concerned that this minimal requirement is not sufficient to persuade those not inclined to wear seatbelts to do so.

It appears that the Federal Government share the Committee's concerns. The Federal Government action plan, the *National Road Safety Action Plan 2007 and 2008* has identified seatbelt reminders as a priority action area. The action plan commits:

> The Australian Government to continue high-level liaison with the vehicle industry to encourage inclusion of effective seat belt reminder systems in Australian vehicles and achieve cooperative agreement on improved performance beyond existing ADR requirements.[204]

An earlier Victorian Government road safety strategy, *arrive alive!* stated that seatbelt reminders should be included: 'within vehicle standards'.[205] However the subsequent strategy and action plan, released after the Federal action plan, *Victoria's Road Safety Strategy: First Action Plan 2008-2010*, only proposes to raise awareness of intelligent seatbelt reminder systems.[206]

The Committee has been informed by VicRoads that a seatbelt reminder Regulatory Impact Statement was dismissed in favour of a commitment from manufacturers to increase fitment of this technology. However the Committee understands from VicRoads, that this commitment is not being met and that the issue is to be revisited.[207]

If manufacturer commitments to vehicle safety have indeed not been met then the Committee expects that regulatory measures be taken, to ensure the fitment of advanced seatbelt reminders so that fatalities and serious injuries sustained in crashes on Victorian roads is reduced.

The 2006 MUARC report, *On-Road Evaluation of Intelligent Speed Adaptation, Following Distance Warning and Seatbelt Reminder Systems: Final Results of the TAC SafeCar Project*, found that a population that already demonstrates a high seatbelt wearing rate is open to seatbelt reminder systems.[208]

The Committee appreciates that the benefit for a population that has already achieved high fitment rates is going to be less than a country with a lower fitment rate. However, given that one in five car fatalities are not wearing a seatbelt, and the high rates on non-compliance in heavy vehicles, there remains an important safety benefit for Australia.

The MUARC review noted however that a seatbelt reminder does not affect behavioural change, making the increased fitment of advanced seatbelt reminder a requirement to ensure the greatest safety benefit.

A paper from the Swedish Road Administration, Karolinska Institutet, Folksam Research and MUARC, 'Intelligent Seatbelt Reminders: Do They Change Driver Seatbelt Use in Europe', presented at the 2007 conference on the Enhanced Safety of Vehicles, found that the seatbelt wearing rate in cars fitted with reminders was 97.5 per cent, compared to 85.8 per cent without reminders.[209]

The report also found that the level of audio and visual warnings affected the success of seatbelt reminders with the authors finding that wearing rates achieved with 'mild reminders' was 93.2 per cent.[210]

While there is a range of research into the effectiveness of seatbelt reminders, no quantifiable conclusions are available, as the systems tested function differently.

It is assumed that a longer and more obtrusive seatbelt warning will achieve higher rates of seatbelt wearing. However, a balance is required to prevent active non-seatbelt wearers from disabling more

advanced systems and invalidating all attempts to increase seatbelt wearing.

There is support for more advanced seatbelt reminders in Victoria. Mr David Healy, Senior Manager, Road Safety, TAC expressed support at a public hearing in Melbourne, 6 August 2007. He stated that:

> It is a very simple technology but one which we deem to be very useful in the context of helping to improve the safety of occupants on our roads in the event of a crash.[211]

The European Commission's 2006 report, *Cost-Benefit Assessment and Prioritisation of Vehicle Safety Technologies*, has determined that seatbelt reminders are a cost effective safety technology.[212]

A 2004 Australian Transport Safety Bureau (ATSB) report, *Benefits of Retrofitting Seat Belt Reminders to Australian Passenger Vehicles*, found that a: 'more "aggressive" reminder system' would increase seatbelt wearing rates and therefore an associated retrofit program was warranted.[213]

The Committee is concerned that a potentially significant vehicle safety initiative was not pursued because of the minimum vehicle standards for seatbelt reminders.

The minimum ADR requirement of seatbelt reminders has allowed manufacturers to subjectively define advanced seatbelt reminders. For example, the Ford Motor Company's BeltMinder system is promoted as an important safety technology because it continues to sound an audible reminder beyond that required by vehicle standards.[214]

Given the subjectivity of claims about the seatbelt reminders that manufacturers fit, the Committee considers that the ANCAP assessment of a vehicle's seatbelt reminder systems is the best indicator of the technologies available. This however does not permit comparisons to the same models in the Unites States, United Kingdom or Japan.

ANCAP began awarding points for advanced seatbelt reminders, which contribute towards a vehicle's star rating in 2003. Three points are awarded to vehicles that fit advanced seatbelt reminders for every seat. Two points are offered for fitment to both front seats and one point for driver's seat only.[215]

Table 3.7 lists the vehicles that had been tested and awarded the additional three points as at April 2008.[216]

Table 3.7 Manufacturers fitting Seatbelt Reminders for all Seats

ANCAP assessed vehicles with Seatbelt Reminders on all seats		
Citroen C6	Honda Legend	Mazda 6
Mercedes C-Class	Mercedes A-Class	Mercedes B-Class
Mini Cooper	Subaru Outback	Peugeot 207
Peugeot 308 (not base variant)	Subaru Liberty	Volvo S40

Source: Australian New Car Assessment Program 2008 correspondence, 04 April 2008.

EuroNCAP similarly awards additional points for advanced seatbelt reminders that meet EuroNCAP standards. The 2007 EuroNCAP publication, *Seat Belt Reminder Assessment Protocol*, outlines the requirements of advanced seatbelt reminder systems required to receive these points. The document also indicates that:

> In future, up to two additional points may become available to reward very sophisticated systems with enhanced capability. Such capability is not yet defined.[217]

A draft amendment to the standard covering seatbelt reminders, UNECE R16 was issued in July 2007. The amendment proposes the requirement of an advanced two-stage seatbelt reminder system. The first stage being a visual warning after the ignition is engaged, followed by a second stage audible warning if the driver remains unbelted once the vehicle is travelling more than 10 km/h.[218]

As ADR 69 is not harmonised with UNECE R16, a 2006 amendment was adopted to: 'align more closely with the international standard'.[219]

While the Committee considers advanced seatbelt reminders to be an important safety technology, the Committee recognises that consumers are not readily going to allow availability or fitment of this technology to sway a vehicle purchase. Therefore the Committee considers that the current Victorian Government's road safety strategy, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*, does not go far enough and considers that the standard for seatbelt reminders should be strengthened.

Recommendation

15. That the Minister for Roads and Ports make representation, at the Australian Transport Council, the adoption of the draft amendment to United Nations Economic Commission for Europe Regulation 16 as part of Australian Design Rule 69 – Full Frontal Impact Occupant Protection.

Repeatable Seatbelt Pre-tensioners

The first, mechanically locking, seatbelt pre-tensioners were enacted when the sudden force of a crash was transferred to a pendulum mechanism within the seatbelt retractor, mechanically locking the seatbelt.

Seatbelt pre-tensioning has advanced from mechanical locking mechanisms, through a single use pyrotechnic device, which fires and draws down the buckle when triggered, via the vehicle's electronic control unit, to electric motor controlled, repeatable seatbelt pre-tensioning.[220]

Repeatable seatbelt pre-tensioning is the leading edge development in seatbelt technology. Seatbelt pre-tensioning can now be applied whenever a critical situation is detected and not restricted to a crash scenario. Further, seatbelt pre-tensioning can be released when a critical situation is averted or abates. What was classified as a passive safety technology can now be reclassified as an active technology.

The potential of repeatable seatbelt pre-tensioning to integrate active and passive technologies was identified by Ms Yngve Håland, Autoliv Research, at the 2006 *IRCOBI Conference*, Madrid, 'The Evolution of the Three Point Seat Belt from Yesterday to Tomorrow'. Ms Håland stated that repeatable seatbelt pre-tensioners: 'integrate passive and active safety systems'.[221]

Repeatable seatbelt pre-tensioning has been integrated into the Pre-emptive Brake Assist system used by Mercedes Benz and tested by the Committee in Stuttgart on 14 September 2007.

Repeatable seatbelt pre-tensioning is a potential driver warning device. The tightening of the belt could function as a warning to a driver that a road hazard or risky situation is present and that they need to identify it and/or respond to a warning signal and adjust their driving as appropriate to the circumstance.

Currently the minimum requirement of ADR 4, harmonised with UNECE R16, is a manual locking mechanism. The only reference to repeatable seatbelt pre-tensioning is that retractors using an:

'external signal or power source' to activate seatbelt locking should lock: 'automatically upon failure or interruption' of this pre-tensioning trigger.[222]

The Committee consider that while basic mechanical locking mechanisms provide important occupant restraint in the event of a crash, the ability to link pre-tensioning to leading edge active and passive safety technologies, will provide increased safety.

Repeatable seatbelt pre-tensioners are available to one Toyota model in Australia, the Tarago. A similar isolated example of availability is on the Honda Legend in the United Kingdom.

The availability of this technology is not readily promoted by manufacturers. Mercedes Benz is one manufacturer who does fit this technology, and the Committee is only aware of this because they experienced the technology in a test drive during the overseas study tour.

Rear Seats

Despite pyrotechnic, pre-tensioning seatbelts being increasingly fitted to front seats, the minimum ADR requirement is for mechanically locking pre-tensioning seatbelts.[223] Predominantly rear seats are fitted with mechanical retractors.

While the fitment of seatbelt pre-tensioning technology that exceeds ADR requirements is one example of market led safety developments, the minimum standard permits the ongoing fitment of below grade technology to rear seats.

There is no significant research available on the injury risk of rear seat car occupants. A 1991 MUARC study, *Passenger Cars and Occupant Injury*, found a low frequency of rear seat occupancy injury rates. The report concluded that the low incidence of injury, 13 per cent of studied crashes, to rear seat occupants meant that it:

> ... probably reflects the frequency with which these seating positions are occupied in vehicles on the road, but may also indicate slight differences in injury susceptibility across these different seating positions.[224]

While low occupancy will generate lower cost-benefit analysis ratios for justifying fitment decisions of seatbelt technology, the Committee considers rear seat passengers, the required seating position for children, to be equally as important as front seat passengers.

The Committee is disappointed that the majority of rear seatbelts are tensioned by outdated mechanical retractors and hopes that as

manufacturers increasingly fit repeatable seatbelt pre-tensioners that they do so for all seat positions.

Recommendation

16. That the Minister for Roads and Ports make representation, at the Australian Transport Council, that all seatbelts, in all seating positions, in new vehicles be fitted with repeatable seatbelt pre-tensioning by 2015.

Four and Five Point Seatbelts

In recent years the lap (or two attachment point) seatbelt for the middle position of rear seats in cars has been increasingly replaced by a lap/sash or three-point seatbelt. The same improvements have been occurring in heavy vehicles.

Seatbelts with four or five attachment points are referred to as a harness seatbelt, such as those used by racing car drivers, and provide greater protection than standard three point seatbelts. The MUARC submission stated that:

> A higher level of safety may be provided by a four-point belt as it holds the occupant in place more securely …[225]

While on the overseas study tour, the Committee met with staff at the National Crash Assessment Center at The George Washington University, 5 September 2007. At this meeting, Professor Kennerly Digges, Research Director, Vehicle Safety and Biomechanics Research, identified the potential of four-point seatbelts to provide far-side protection in side impact crashes.[226] In far-side impacts and roll over crashes, an occupant often slides out from under a three-point seatbelt.[227] This is due to the lack of seatbelt restraint for the shoulder not secured by the sash.

Dr Joseph Kanianthra, Associate Administrator, Vehicle Safety Research, NHTSA, informed the Committee at a meeting in Washington on 4 September 2007 that NHTSA was researching a four-point seatbelt with a buckle that could be clipped from either side.[228]

Autoliv have investigated an equivalent five-point seatbelt that comprises two seatbelts, a standard lap-sash and a second sash only seatbelt from the opposite shoulder, forming a crossover seatbelt configuration.[229] However market research gauging the acceptance for this product by Autoliv was not positive. Their research found that:

> ... the need to buckle up an extra belt was unfortunately found to be a hurdle in selling this 2+3 point belt system.[230]

Autoliv's Australian operations currently produce a four-point racing harness that meets the Australian standard AS/NZ 2596.

The Ford Motor Company in the United States has fitted four-point belts to two concept vehicles, having found acceptance of this technology that differs from Autoliv's findings. Ford state on a website promoting the concept vehicles that:

> ... some consumers perceive four-point belts to be safer, as well as more comfortable and, depending on their design, easier to use than traditional three-point belts.[231]

However, at a meeting with the Ford Motor Company, in Detroit, 31 August 2007, the Committee were informed by Dr Stephen Rouhana, Senior Technical Leader, Biomechanics and Occupant Protection Group, that while development of a four-point seatbelt continues, the design needs more development work to achieve a design suitable for pregnant women.[232]

The investment into this technology is questioned. Mr Bruce Priddle, Vehicle Assurance and Homologation Manager, Ford Motor Company of Australia Ltd, stated at a public hearing on 8 October 2007 that current research and development into seatbelt enhancements is:

> ... really getting very close to the point of spending a lot of money for very little incremental return.[233]

While not a requirement, ADR4/04 permits the fitment of harness seatbelts.[234]

Though four and five point seatbelts provide increased occupant restraint and improved safety, the Committee does not consider that current development of this technology has produced a proven design which can be recommended.

The development of four and five point seatbelts is predicted to increase safety but a feasible design for general market fitment, is still to be developed. Victoria is in a position to lead this development. The presence of an international seatbelt company, Autoliv in Melbourne, which currently manufactures racing harness seatbelts, together with three car manufacturers and one heavy

vehicle manufacturer, makes this a possibility. The benefits would be twofold, providing improved safety and delivering the potential for significant profits from a product that could be fitted internationally.

The Committee considers that an opportunity exists for Victoria to be involved in the development of a harness seatbelt design.

Inflatable Seatbelts

Inflatable seatbelts combine the safety features of airbags with seatbelts to protect an occupant's torso. The dispersal of loads applied to the chest in a crash addresses thoracic injuries where seatbelt load limiting and/or airbags are not fitted.

The Ford Motor Company in the United States has developed the Interceptor concept vehicle which has inflatable seatbelts fitted in the rear seat positions.[235]

In the Australian context, the Committee sees the potential for inflatable seatbelts as a means to increase safety for rear seat occupants.

The Committee considers inflatable seatbelts to be a promising technology and suggests that VicRoads maintain a watching brief on developments of this technology.

Child Restraint Systems

Child Restraint Systems (CRS) are additional seats designed to protect children safely in a vehicle. Various CRS provide protection for children up to the age of six years.[236] In Australia the attachment of a CRS is achieved by threading a two or three point seatbelt trough the body of a CRS and a top tether strap that attaches to the rear of the vehicle.

Research commissioned by the Royal Automobile Club of Victoria (RACV) Ltd in 2004 estimated that more than 95 per cent of Australian children travel in a CRS.[237]

Despite this, a *Herald Sun Sunday* article, 30 March 2008, 'Child's Play', quoted MUARC Senior Research Fellow Dr Judith Charlton, as saying that: '73 per cent of children do not travel in appropriate restraints'.[238]

This was reinforced by MUARC at a public hearing in Melbourne, 6 August 2007 where Dr Newstead stated that mis-fitment of CRS in Australia is similarly, in the vicinity of 70 per cent.[239]

The Victoria Government's action plan, *Victoria's Road Safety Strategy: First Action Plan 2008-2010*, released February 2008, identifies an intention to undertake a targeted campaign to encourage child restraint use.[240] The Committee notes however that use is a broad category and can be extended to include the choice, correct installation of, and fitting of a child to, a correct child restraint system.

The choice, installation and fitment of a CRS is an international safety issue with both the United States and the European Union have recently developed new standards. Both systems are currently being assessed by Standards Australia to determine the potential safety benefits compared to the existing standard in ADR 34 - Child Restraint Anchorages and Child Restraint Anchor fittings.

LATCH (Lower Anchors and Tethers for CHildren)

Intended to standardise and make installation easier the LATCH child restraint system was mandated in the United States in 2002. The LATCH system comprises a top tether and two lower loop anchorages located between the seat cushion and seat back of the rear seat.[241]

The United States Department of Transportation National Highway Traffic Safety Administration (NHTSA) originally estimated that the LATCH system would reduce the incidence of misuse and improper instalment of CRS by half.[242] However following introduction of the LATCH system, a further review by NHTSA found confusion amongst users of the new system.[243]

Thirteen per cent of users not utilising the outboard LATCH positions did so because the centre rear seat is considered to be the safest position for a CRS. In the majority of vehicles centre position LATCH installation points are not supplied due to limited spacing. Some users had adapted the LATCH system by using the inboard strap from both side positions to enable use of a centre position.[244]

Despite negative findings about the use of the LATCH system the survey found that competent users preferred the new system over the conventional seatbelt attachment.[245]

ISOFix

The European standard, ISOFix is similar in concept to LATCH but uses a different lower anchorage design. The original ISOFix system had only the two lower attachment points. While these two points provided protection from rotational movement, some forward movement was evident in crash testing. As a result a third

attachment point was added and could be either a top tether strap or a: 'rigid support leg between the front of the child restraint and the floor of the car'.[246]

The ISOFix system uses a rigid push-fit connection to anchor points located between the cushion and seat upper. To assist correct instalment, many ISOFix CRS have inbuilt indicators to assist with correct instalment.[247]

However, given the rate of incorrect instalments currently recorded in Australia, the need for users to learn a new installation method is predicted to increase the challenge of correctly fitting a CRS. One manufacturer's website in highlighting the changes associated with ISOFix acknowledges this new challenge. The Britax website states that:

> The rules for using an ISOFIX car seat can seem quite confusing so make sure you fire questions at your retailer when purchasing …[248]

UNECE R44 adopted ISOFix as the standard for child restraint systems in 2005.

A 2004 presentation by CLEPA 'Side Impact and Ease of Use Comparison between ISOFIX and LATCH', reviewed two studies of sample groups using ISOFix. Ease of instalment was considered a positive aspect of the ISOFix system with 84 per cent of users favouring the new system over conventional seatbelt methods of CRS fitment. The review found that correct fitment was lower for rear-facing instalments.[249]

Australia

ADR 34 regulates child restraints in Australia. This ADR remains non-harmonised with the equivalent UNECE R44. The Federal Department of Infrastructure, Transport, Regional Development and Local Government is currently involved in an international working group testing the ISOFix and LATCH standards. This involvement is assisting Australia's own assessment in considerations of adopting a new standard.

A paper presented by staff from the Federal Government's Department of Transport and Regional Services at the 2007 conference on the Enhanced Safety of Vehicles, 'Investigation of Lower Anchorage Systems for Child Restraints in Australia', outlined an Australian review of both ISOFix and LATCH standards.

The non-requirement of a top-tether strap – mandatory in Australia since the 1970s – is the primary objection to harmonising ADR 34 with UNECE R 44.[250]

A further issue being considered is the lack of lower anchorage points in the centre position of most vehicles. Effectively both new systems prevent a centre positioning of a CRS. The 2004 RACV report, *Safety Innovations for Australian Child Restraints*, identifies the centre rear position as the safest position for a CRS.[251] The current standard, ADR 34 permits the centre locating of a CRS.

However, at the time of writing there was an expectation that Australia would adopt the ISOFix standard. The Standards Australia website quotes Mr John Tucker, Chief Executive Officer, Standards Australia, reporting in 2004 that:

> It is expected that the next revision of the standard will include the rigid system or ISOFix system ...[252]

Yet the interim 2007 conclusion of the Federal Department of Infrastructure, Transport, Regional Development and Local Government, reported at the 2007 conference on the Enhanced Safety of Vehicles, was that adjustments, including equivalent top tether strap requirements, would be required before Australia was willing to accept either new standard along side, or in place of, ADR 34.[253]

The paper, 'Investigation of Lower Anchorage Systems for Child Restraints in Australia' concluded that:

> Mounting of child restraints using flexible LATCH straps does not seem to offer any safety improvement over the use of the adult 3-point seatbelt and may reduce the level of safety in some instances.
>
> Mounting of child restraints using rigid ISOFIX anchorages offers some safety benefits over the use of the adult 3-point seatbelt, but may increase the risk of neck and chest injury compared to some child restraint systems currently in use in Australia.[254]

The revision of ADR 34 has been a lengthy process, but it is expected that a new restraint standard for child seats will be in place by the end of 2008. In addition to considering the ISOFix/LATCH systems, the review is expected to make it a requirement that children up to 10 years of age travel in an approved booster seat.[255]

However the Committee can not see how either standard can replace the existing ADR 34 due to the lack of a central mounting position. The Committee accepts that either of the two standards, with the requirement of a top tether strap could be permitted as an option for Australia.

The United States Department of Transportationation announced this year a system of ranking the ease of properly installing a CRS, recognising and promoting the importance of correct installation.[256] The Committee considers that such a program will have greater safety outcomes than a campaign limited to encouraging child restraint use as outlined in the *Victoria's Road Safety Strategy: First Action Plan 2008-2010*.

Statistics show that nearly seven out of 10 CRS are incorrectly installed in Australia, thereby negating the safety provided by child restraints and clearly highlights the need for a program that increases the rate of correct instalment.

Furthermore, such a program will be necessary if a revised Australian Design Rule 34, expected in 2008, introduces a new or alternative CRS standard. Therefore the Committee considers parents or guardians should be encouraged to have their CRS fitted correctly by an accredited installer. Subsidising the cost of fitting the CRS at an accredited fitting station is an effective way of encouraging this.

Recommendation

17. That VicRoads:

- **publish a guide ranking the ease of installation for all child restraint systems to promote correct installation; and**

- **subsidise the cost of having a child restraint system installed at VicRoads approved fitting stations.**

Motorcycle Airbags

In 2007 45 motorcyclists were killed on Victoria's roads and this figure has remained constant for the past five years.[257] The vulnerability of motorcyclists is greater than vehicle occupants who benefit from extensive structures.

The greatest risk for a motorcyclist is from secondary impacts after the rider or pillion has been thrown from the motorcycle. Airbag technology has been explored for rider protection. Designs have been developed that release either from the bike or from within a rider's jacket.

Vehicle Airbag

Currently Honda has the only commercially available motorcycle airbag. The size of a motorcycle and the cyclist's riding position on the large Honda Gold Wing made it feasible for an airbag system.[258] Four crash sensors mounted on each leg of the front fork register an impact and the airbag is fully deployed within 0.06 of a second.[259]

A 1996 report from MUARC, *Motorcycle Crash Countermeasures: Literature Review and Implementation Workshop*, found that:

> In general, airbags have been found to be most effective in 90 degree collisions with a stationary car. Oblique collisions or collisions with a moving car tend to result in the rider sliding around the side of the bag ...[260]

In response to these findings, Yamaha focused on developing a restraint that maintains a motorcyclist's riding position in the early phase of a frontal crash.[261] The result has been a prototype design that includes a reinforcement plate that positions the airbag to also provide lumbar support and help maintain the rider in the riding position.[262]

At a public hearing in Melbourne, 3 March 2008, Mr Cameron Cuthill, General Manager, Motorrad, Australia and New Zealand, BMW, discussed airbags and stated that limited application makes the high costs of developing and fitting motorcycle airbags unjustified at this stage.[263]

Mr Stuart Strickland, Managing Director, Honda Australia MPE Pty Ltd, informed the Committee at a public hearing, 31 March 2008, that the airbag equipped Honda Gold Wing will be available in Australia on the 2008 model. Mr Strickland stated that: 'the Gold Wing is Honda's first step' in motorcycle airbag technology.[264]

However, Mr Greg Snart, National Technical Manager, Honda Australia MPE Pty Ltd pointed out that:

> The problem you have got with the airbag ... is the amount of componentry that is needed for the system to operate properly. Of course you have got to have somewhere for the airbag to deploy. Your average motorcycle has a fuel tank directly in front of the rider. With the Gold Wing, the fuel tank is actually set down into the frame ...[265]

A motorcycle design has to accommodate the fitment of an airbag and the size of the vehicle limits the available space for fitment. The Committee does not consider this to be sufficient reason to rule out

airbags as unviable. Adoption of new technology will however require a greater degree of vehicle redesign. The Committee appreciates that manufacturers may initially believe that this does make airbags fitment unviable.

Airbag Jackets

The advantage of wearable airbags is that they offer a motorcyclist protection from secondary impacts following separation from the motorcycle.

The concept is similar to an inflatable emergency life jacket available on planes and boats. The airbag is located between the motorcycle jacket and the lining and connected to the motorcycle via a ripcord. In the event that a rider is separated from their motorcycle, the ripcord triggers the inflation of the airbag.[266]

There are some design restrictions, including the size of garment, which limits the airbag volume.

The Transport Accident Commission (TAC) submission states that these jackets are available in Australia for approximately $900.[267]

A more advanced wearable airbag is being developed by overseas motorcycle protective wear manufacturer, Dainese. The manufacturer's website promotes the successful testing of the jacket in a real life situation during a motorcycle grand prix race.[268] The jacket deploys a large, 37 litre volume airbag which is inflated from an aerodynamic appendage on the jacket. The airbag inflates to provide protection for the chest, shoulders and neck. The company is initially marketing the technology for racing motorcyclists.[269]

The quality of wearable airbags is not restricted by requirements to comply with vehicle standards. This may enable rapid development or result in products with minimum safety value. The Committee heard from Mr Ray Newland, Motorcycle Manager, Federal Chamber of Automotive Industries (FCAI), at a hearing in Melbourne, 31 March 2008, that there are significant hurdles to having standards for protective clothing.[270]

Mr Newland, reported that Standards Australia had indicated that Australia would be better served adopting European standards.[271] However these standards do not require wearable airbag jackets.

The Centre for Accident Research and Road Safety (CARRSQ) at the Queensland University of Technology, has completed the first stage of an investigation, funded by VicRoads, into the viability of a star rating system that provides consumer information about the level of safety provided by protective clothing for motorcyclists. This

approach to safety accreditation is being considered because the adoption of European standards would still require significant funding for both testing and enforcement of the standard and therefore, a long lead time to be operational.[272]

The Committee is encouraged by the initial developments in airbag technology for motorcyclists, both vehicle and clothing based. However the most immediate promise comes from the work being undertaken at CARRSQ. The Committee supports this initiative and the safety benefits that the findings could provide for motorcyclists and road safety.

Daytime Running Lamps

Many environmental factors contribute to diminished driving conditions, such as sun glare, torrential rain, fog and illumination. Poor driving conditions reduce the conspicuity of all vehicles.

To improve vehicle conspicuity during daylight hours, Daytime Running Lamps (DRLs) operate during daytime driving. DRLs can be hardwired to a vehicle's ignition, or switched on by sensors that recognise diminished driving conditions.[273]

The TAC submission highlighted that in cars, DRLs can also increase a driver's peripheral perception and ability to judge vehicle distances.[274]

An Australian paper by Mr Michael Paine, Mr David Paine, Mr Jack Haley and Ms Samantha Cockfield, 'Daytime Running Light for Motorcycles', presented at the *19th International Technical Conference on the Enhanced Safety of Vehicles* in Washington DC, 6-9 June 2005 found that, if the safety benefits of DRLs achieved in Europe could be achieved in Australia, then 11 per cent of all fatal crashes and 15 per cent of all other crashes could be prevented.[275]

The European Commission has stated that DRLs have a high potential to increase road safety. The Safetynet project of the European Commission: Directorate-General Transport and Energy, 2007 report, *Road Safety Performance Indicators Country Comparisons*, noted in comparing the fitment of DRLs that:

> ... the most important characteristic is the DRL legislation. There are differences in whether or not DRL is obligatory, recommended or neither ...[276]

Manufacturers in the United States began fitting DRLs to cars in 1995 and in the United States, General Motors has been fitting DRLs to cars as standard safety technology for more than 10 years.[277] In Australia high end GM Holden cars are fitted with fog

lamps, but the driver needs to switch them on. Fitment decisions in the United States have permitted robust evidence for an analysis of the safety benefits of DRLs.

Daytime Running Lamps Research

A 2004 NHTSA study of road crash data found that vehicles fitted with DRLs had a:

- five per cent reduction in opposite direction crashes between cars;
- 23 per cent reduction in fatal opposite direction crashes between a motorcycle and a car; and
- 12 per cent reduction in fatalities for vulnerable road users.[278]

During the Committee's overseas study tour, 25 August to 14 September 2007, the Committee met with NHTSA in Washington on 4 September 2007. During discussions Ms Stephanie Binder, General Engineer (Human Factors), Vehicle Safety Research, informed the Committee of her ongoing research which indicated that drivers allow larger gaps for motorcycles with DRLs switched on. At the time of writing this report had not yet been released.[279]

The submission from the TAC noted that the effectiveness of DRLs is dependant upon the latitudinal position on the earth's surface where the technology is operating. The TAC quote estimates that if Victorian vehicles had DRLs fitted, road fatalities would be reduced by sixteen per cent due to Victoria's latitude.[280]

A 2003 Austroads report: *Implications of Intelligent Transport Systems for High Risk Road Users and High Risk Situations*, reviewed international DRL studies and concluded that, in general, DRLs reduce the number of crashes. However the report noted that there was a lack of Australian research and that to date estimates of the safety benefits for Australia had relied heavily on international research. As such, the report was inconclusive as it did not provide sufficient evidence in an Australian context.[281] The report does not make reference to vehicle types.

In Western Australia research found that vehicles with DRLs were more than eight times safer than those without.[282] Subsequently a publicity campaign was undertaken to encourage drivers and riders to switch their lights on during the day. The Royal Automobile Club of Western Australia (RAC) recommends that vehicles have their dipped headlights on during the day.[283]

The previous Road Safety Committee's 2003 report, *Inquiry into Road Safety for Older Road Users*, also supported DRLs, suggesting that:

> ... it is good safety practice to use parking lights during the day and headlights as soon as daylight reduces, as well as during rain and fog.[284]

At a hearing for that Inquiry, Dr Laurie Sparke, then Manager of Advanced Engineering, GM Holden stated that:

> Driving with lights on during daylight hours will reduce pedestrian crashes, completely preventing a significant number of injuries. Most importantly, it is a safety strategy that could be introduced immediately, using a public campaign to promote the use of parking lamps during daylight driving.[285]

However, this advice has been contradicted in a 2003 RACV/NRMA report, *A Review of Daytime Running Lights*. The report states that:

> They are sometimes used on moving vehicles during daylight. This may be on the mistaken understanding that they improve conspicuity during marginal lighting conditions. However, visual ergonomics suggests that parking lights are totally inappropriate for such circumstances and, in Australia, motorists should be discouraged from using parking [lights] on any moving vehicle.[286]

Another submission to the this Inquiry, from Mr David Skewes, Streets Ahead Pty Ltd, expanded the case for DRLs based on the low cost of standard fitment.[287] The European Commission has assessed a cost-benefit ratio 1:1.8 for DRLs.[288]

The Committee has found that standard fitment of DRLs while common in the United States is not a common feature in the United Kingdom or Australia.

The Committee considers that the solution to this conflicting evidence is for manufacturers to fit dedicated DRLs to all vehicles, including heavy vehicles and motorcycles, sold in Victoria.

Daytime Running Lamps for Motorcycles

In 1992 DRLs became a legislated requirement for motorcycles in Australia, however this standard was subsequently rescinded in 1996.[289] Currently ADR 76 Daytime Running Lamps outlines requirements for DRLs if fitted to a vehicle. This regulation is fully

harmonised with United Nations Economic Commission for Europe (UNECE) Regulation 87.

Confusingly, ADR 13 Installation of Lighting and Light-signalling Devices on other than L-Group Vehicles, which is harmonised with UNECE R48, stipulates that if a motorcycle is fitted with DRLs they should be automatically switched on with the engine. However it is also a requirement that this function can be switched off without the use of tools.[290]

According to Mr Paine and colleagues in the paper, 'Daytime Running Lights for Motorcycles', presented at the 2005 conference on the Enhanced Safety of Vehicles, the reversal in legislation in Australia was:

> ... due mainly to pressure from motorcycle lobby groups.[291]

As a result of previous and current ADRs the lighting of most motorcycles ridden in Australia is hardwired to the vehicle's ignition.[292]

The Motorcycle Council of New South Wales considers that the benefits of DRLs in Europe will not transfer to Australia as lighting conditions in Australia are brighter.[293]

Research presented by the Japanese Automobile Research Institute at the 2007 conference on the Enhanced Safety of Vehicles, 'Study on Improving Two-Wheeled Vehicle Conspicuity', indicated that improved motorcycle conspicuity as a result of DRLs may be reduced by extending the use of DRLs to larger vehicles.[294]

This view is challenged by the European Transport Safety Council (ETSC) which cites Swedish research that finds:

> ... the safety of powered two wheelers will not be compromised by such a measure due to increased car visibility.[295]

The final 2001 report for the European Commission PROMISING project, produced by the Netherlands Institute for Road Safety Research (SWOV), *Promotion of Mobility and Safety of Vulnerable Road Users*, concludes that the safety benefit for bicyclists and pedestrians of cars fitted with DRLs outweighs the drawbacks. The report states that:

> There is no doubt that the benefits of this measure clearly exceed the costs.[296]

Despite the toing-and-froing with the Australian vehicle standards and DRLs, technological development continues. At a meeting at the National Crash Assessment Center, George Washington University, 5 September 2007, Ms Randa Samaha, Research Scientist informed the Committee that Honda has developed a prototype motorcycle that is fitted with additional lights on the handles and foot pedals.[297]

Daytime Running Lamps for Heavy Vehicles

The commercial freight company, Linfox, on their website cites research that DRLs affect up to an 11 per cent reduction in severe multi-vehicle crashes. For this reason they have implemented a company policy for DRLs.[298] All fleet vehicles are required to drive with headlights on where DRLs are not fitted.

The Committee recognises the significance of a leading transport company, such as Linfox, requiring DRLs across its heavy vehicle fleet and considers that all heavy vehicle operators should do likewise.

Future Direction

Evidence is building for a case for the use of DRLs on all vehicle types and in particular motorcycles. The effectiveness of motorcycle DRLs when other vehicles are also using DRLs is a point of dispute in road safety research. The Committee considers it important that research be undertaken to determine the potential effect on motorcycle safety by the use of DRLs by cars and heavy vehicles.

At the same time the Committee is aware of concerns about the effect on motorcycle conspicuity if other vehicles were to widely use DRLs.

The previous Road Safety Committee recommended in the 2003 report, *Inquiry into Road Safety for Older Drivers* that:

> ... VicRoads investigate all the issues associated with the possible safety benefits of daytime running lights.[299]

A subsequent report in 2004, *Inquiry into the Country Road Toll*, reported that the:

> ... Government response, tabled in Parliament, April 2004, supported the principle of the recommendation and directed that VicRoads provide a report to the Government on the issues relating to the safety benefits of daytime running lights. The Committee is unaware of the progress of the investigation.[300]

The Committee considers that the low front profile and correlating low conspicuity of motorcycles make DRLs an important motorcycle safety technology.

However the current Committee understands that VicRoads has still to complete this investigation. VicRoads failure to undertake work recommended by the Committee, that has been supported by the Victorian Government, undermines both road safety and the work of the Committee. The absence of previously recommended research prevents the Committee from fully analysing the fitment and use of DRLs on motorcycles, cars or heavy vehicles in Victoria. Therefore it seeks again that this research be completed.

Recommendation

18. That VicRoads investigates all the issues associated with the possible safety benefits of Daytime Running Lamps.

Warning Standards

Audible, visual, vibrating and counter steering warning signals have all been used by different systems released into the vehicle market.

The use of different warning signals by manufacturers for the same warning technology raises the issue of a need for standardised warnings for each technology. A lack of uniform warning signals presents a potential source of driver distraction and a conflicting interpretation of warning information.

There are currently no ADRs regulating these technologies directly. However, this may change in the case of Lane Departure technology if Australia were to adopt the draft UNECE Regulation 79 as the Committee recommends in Recommendation 1.

While draft international standards accept vibrating and/or audible warnings, specific warnings for a technology must be clearly distinguishable from warnings generated by other vehicle safety systems.[301]

The Committee considers that it is important that safety technologies use a standard warning for each active technology, such as for seatbelt reminders or blind spot warnings. This would ensure that the ability of a driver to instantly recognise warnings and

discern the required driving adjustment is transferable between vehicles.

The opportunity to establish vehicle standards for warnings needs to be progressed now before the level of market penetration makes it impossible.

Recommendation

19. That the Minister for Roads and Ports promote, at the Australian Transport Council, the standardisation of warning signals used by manufacturers.

Summary of Findings

- The Committee has found Pre-emptive Brake Assist to be the technology with the greatest safety potential, making it the highest priority technology.
- Anti-lock Braking Systems for motorcycles is the highest priority technology and should be fitted to all new motorcycles, with the technology capable of being switched off on off-road motorcycles.
- Articulated vehicles must have equivalent braking technology fitted to the prime mover and the trailer.
- It is imperative that VicRoads establish an electronic data map for Victoria to support the implementation of Intelligent Speed Assistance technology.
- In most cases the Australian Design Rules are not relevant to the technologies identified in this chapter, providing no effective level of safety beyond pre-existing minimum levels.
- There remains the potential for some technologies to be abused, however it appears that the potential safety benefits outweigh this negative facet.
- Leading technologies are not widely available in Australia and typically less available than overseas. Where technologies are available they are predominantly restricted to high end marques and models.
- Safety technologies for heavy vehicles and motorcycles are not well promoted, making information pertaining to availability difficult to obtain.
- Technologies such as pop-up bonnets exist to help protect pedestrians.

- Despite the focus on available and developing active technologies there remains further potential in passive technologies that is being investigated.

- Warning systems used by driver assistance technologies are not uniform and this may be detrimental to road safety. Australian Design Rules or equivalent vehicle standards must be reviewed to ensure uniformity.

- That warning based active safety technologies are beginning to evolve into intrusive or autonomous technologies and while vehicle standards have not been reviewed for the former it is important that developing next stage active technologies be regulated.

Recommendations

3. That VicRoads require the fitment of Pre-emptive Brake Assist to new cars and heavy vehicles, as a pre-requisite for registration from 2015.

4. That VicRoads require the fitment of Anti-lock Braking Systems to new motorcycles as a pre-requisite for registration from 2011.

5. That VicRoads undertake research to ascertain the benefits of Automatic Stability Control for motorcycles and, if found to be significant, promote the technology widely to motorcycle riders.

6. That, through the Australian Transport Council, the Minister for Roads and Ports pursues the introduction of regulations to mandate that prime mover and trailer combinations are fitted with compatible braking technologies.

7. That VicRoads:

a) map the speed zones of Victoria's road system by the end of 2009; and

b) fit transponders where variable or no speed limit exists, or the speed limit is temporarily changed to facilitate the implementation of Intelligent Speed Assistance technology.

8. That VicRoads and the Transport Accident Commission fit and trial developmental alcohol interlocks to its vehicle fleet.

9. That the Department of Treasury and Finance fit the current alcohol interlock system used in Victoria to all Victorian Government fleet vehicles.

10. That the Minister for Roads and Ports make representation, at the Australian Transport Council, for the adoption of the dynamic test for United States vehicle standard FMVSS 202-33 as part of Australian Design Rule 3 – Seats and Seat Anchorages.

11. That VicRoads investigates appropriate roadside markings for unsealed roads and unsealed shoulders, that will increase the proportion of roads suited to application of Lane Departure Warning technologies.

12. That the Transport Accident Commission identify on which vehicles Adaptive Cruise Control is available, and promote this information through the www.howsafeisyourcar.com.au campaigns.

13. That VicRoads promote Adaptive Cruise Control technology to heavy vehicle drivers through the Transport Safety Group.

14. That the Victorian Government request from the Australasian New Car Assessment Program the promotion of pedestrian protection ratings alongside occupant protection ratings.

15. That the Minister for Roads and Ports make representation, at the Australian Transport Council, the adoption of the draft amendment to United Nations Economic Commission for Europe Regulation 16 as part of Australian Design Rule 69 – Full Frontal Impact Occupant Protection.

16. That the Minister for Roads and Ports make representation, at the Australian Transport Council, that all seatbelts, in all seating positions, in new vehicles be fitted with repeatable seatbelt pre-tensioning by 2015.

17. That VicRoads:

- **publish a guide ranking the ease of installation for all child restraint systems to promote correct installation; and**

- **subsidise the cost of having a child restraint system installed at VicRoads approved fitting stations.**

18. That VicRoads investigates all the issues associated with the possible safety benefits of Daytime Running Lamps.

19. That the Minister for Roads and Ports promote, at the Australian Transport Council, the standardisation of warning signals used by manufacturers.

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Chapter

4

Stability Control and Curtain Airbags

Electronic Stability Control (ESC) and curtain airbags are widely recognised as significant vehicle safety technologies. ESC was first introduced in 1995 and curtain airbags became available in 1998.[1]

ESC acts to prevent run-off-road crashes, which account for more than 30 per cent fatal crashes in Victoria.[2]

Curtain airbags deploy from the roof liner and provide head protection for both front and rear occupants, extending to a third row in larger vehicles and have the capacity to reduce the degree of injury in a side impact crash by close to 45 per cent.[3]

The Victorian Government has acknowledged the significant safety provided by ESC and curtain airbags through the proactive initiative to make both safety technologies standard fitment in new vehicles registered in Victoria as part of the recently announced *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*.[4] The Federal Minister for Infrastructure, Transport, Regional Development and Local Government announced on 22 July 2008 that Australia had adopted the new Global Technical Regulation (GTR) on ESC systemsindication from other States and Territories that they will implement similar initiatives should ensure national fitment. A subsequent Regulation Impact Statement will assess the case for establishing an Australian Design Rule.[5]

The standard fitment of ESC will guarantee that Australia catches up with other developed economies, in particular Europe and the United States, which have made similar steps to mandate ESC through the respective regulations, United Nations Economic Commission for Europe (UNECE) Regulation 13 and United States Federal Motor Vehicle Safety Standard (US FMVSS) 126.[6]

However, neither the Premier's announcement, nor the Government's Road Safety Strategy stipulates the vehicle types in which ESC and curtain airbag fitment will be required. The Committee has confirmed that this initiative only applies to new cars.[7] This means that drivers of vans, light commercials and heavy vehicles will miss out on the safety benefits of standard fitment. However, neither the Premier's announcement, nor the Government's Road Safety Strategy stipulates the vehicle types in

which ESC and curtain airbag fitment will be required. The assumption is that it will only be required for cars. Yet, tThe Committee considers that ESC is an equally important safety technology for commercial and heavy vehicles.

Electronic Stability Control

ESC acts to prevent loss of control type crashes. Loss of control is experienced when the back of a vehicle slides sideways, affecting the vehicle's direction, or when the front wheels lose grip with the driving surface and results in the vehicle continuing along one trajectory, despite intended steering in an alternate direction.

Sensors mounted on the vehicle compare the intended steering direction (steering angle) and the actual vehicle direction (yaw angle) 25 times per second.[8] When a discrepancy in steering and yaw angles is identified, ESC is designed to correct the loss of control through the calculated application of braking to one or more wheels.[9]

The previous Road Safety Committee's 2005 report, *Inquiry into Crashes Involving Roadside Objects*, recognised the 'considerable promise' of ESC as a vehicle safety technology.[10] The Committee also noted in a subsequent 2006 report, *Inquiry into Driver Distraction*, that:

> ... the installation of ESC to all new Victorian government vehicles should be investigated.[11]

However, that Committee also identified concerns regarding potential negative effects of ESC technology. These concerns relate to possible behavioural and attitudinal effects amongst drivers, who may use ESC as an excuse to drive more recklessly or carelessly, safe in the knowledge that the vehicle has ESC that will protect them.[12]

The requirement for a standard of non-ESC stability is necessary to insure that a vehicle maintains a level of safety in the event that ESC should fail. The Committee considers that this requirement should form a part of any future Australian Design Rule for ESC.

Evidence supporting the safety value of ESC was released by the Monash University Accident Research Centre (MUARC) in a 2007 report, *Preliminary Evaluation of Electronicric Stability Control Effectiveness in Australasia*. The report was based on available crash data from Australia and New Zealand and comprised a sample of 7,699 ESC specified cars and 203,186 non-ESC cars that crashed between 2001 and 2005.[13]

The report shows that, within Australia and New Zealand, there has been a 32 per cent reduction in the risk of single vehicle crashes in which the driver was injured while driving a vehicle with ESC. A greater safety benefit was found for 4WDs at 68 per cent reduction in risk, compared with cars at 27 per cent.[14]

Internationally, a 2007 United Kingdom Department for Transport study, *Effectiveness of Electronic Stability Control Systems in Great Britain*, found that between 2002 and 2005, ESC reduced fatalities for car crashes in the United Kingdom by 25 per cent. The report concludes that this indicates that:

> ... there is a significant difference between crash involvement of ESC equipped and non equipped cars.[15]

The number of significant studies both in Australia and internationally demonstrating the benefits of ESC warrants the Victorian Government's decision to require fitment of ESC to all new vehicles by 2011.

The Committee appreciates that manufacturers need a lead in time to fit ESC to every model within their ranges. However, in the interim, efforts to increase the current fitment rates of ESC in new vehicles needs to be sustained. In January 2007 the fitment rate in Victoria was 25 per cent and while it increased due to the TAC campaign, new vehicles are still being purchased without ESC, despite its availability.[16] Therefore the Committee recommends that the TAC continue to raise awareness in order to generate increasing demand for ESC. This will further encourage manufacturers to make this technology available.

Recommendation

20. That the Transport Accident Commission continue to promote Electronic Stability Control.

Electronic Stability Control for Heavy Vehicles

The Committee considers that the fitment of ESC to heavy vehicles, including associated trailers, should be made mandatory, in line with *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*.

Both VicRoads and the TAC submissions to the Inquiry identified ESC as a high priority technology for heavy vehicles.[17] Thirty per cent of heavy vehicle crashes are due to loss of control.[18]

Europe has mandated ESC for heavy vehicles from 2010 providing a precedent for the inclusion of heavy vehicles in the Premier's recent announcement that ESC will be a mandatory requirement by 2011.[19]

A Bosch paper, 'Light Commercial Vehicles - Challenges for Vehicle Stability Control', promoting ESC at the *20th International Technical Conference on Enhanced Safety of Vehicles* in Lyon, 18-21 June 2007, claimed that the majority of commercial vehicles between 2.8 and 7.5 metric tons in Europe were now available with ESC.[20] In comparison, Isuzu is the leading heavy vehicle brand in Australia, but Isuzu does not fit ESC to any of the vehicles within this Gross Vehicle Mass range.

The fitment of ESC to heavy vehicles imported into Australia is at present determined by where the vehicle is manufactured. ESC fitment is higher on European manufactured heavy vehicles than those from the United States, Japan or Australia.[21]

The Committee was concerned to learn that Kenworth, Australia's sole manufacturer of heavy vehicles, currently manufacturers and exports one model with ESC, but does not make ESC available on that model in Australia.[22] Kenworth has only fitted ESC in Australia for demonstration purposes.[23]

Electronic Stability Control for Articulated Trailers

It is crucial to recognise that the safety benefits of ESC for heavy vehicles comprising a prime mover and articulated trailer(s) also requires ESC technology to be fitted to the trailer.

The requirement for trailers to have brake technology that matches the prime mover in order to realise the maximum safety potential of the technology, was addressed in Chapter 3.

The safety potential of ESC will not be achieved in articulated heavy vehicles unless all prime movers and trailers are fitted with the technology. Therefore the Committee concludes that the mandatory requirement for fitment of ESC in the Victorian Government's *Victoria's Road Safety Strategy: Arrive Alive 2008-2017* must be interpreted to include heavy vehicles and articulated trailers.

Recommendation

21. That VicRoads ensures that, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*, commitment to mandate Electronic Stability Control by 2011 includes all new heavy vehicles and heavy vehicle articulated trailers.

Car Trailer Stability Assist

Opel, a European subsidiary of General Motors, has extended ESC technology to trailers that are used with passenger cars. The technology is known as Trailer Stability Assist (TSA).

TSA functions in the same way as ESC, monitoring trailer yaw and applying the brakes to the car and/or trailer to rectify excesses in yawing movement. [24]

TSA extends the safety benefits of ESC to vehicles towing trailers and caravans. The technology specifically targets lateral vehicle movement generated through the towed trailer or caravan.

In 2007 TSA was fitted as standard to four Opel models when a factory tow hitch was selected. One of these models is imported into Australia as the Holden Astra. However numerous inquiries made by the Committee to Victorian GM Holden dealers were unable to confirm the availability of TSA on Australian Astras.

It may be that this supplementary technology to stability control is available but not promoted by Australian importers. The Honda Accord Euro, released in May 2008, will be fitted with TSA technology.[25] Bosch Australia has informed the Committee that while this technology is available in Australia, no local manufacturers have chosen to fit TSA to locally manufactured cars.[26]

The Committee is concerned that technologies that extend the function of ESC, and may further increase the safety benefit of this technology, are not being promoted in Australia despite availability.

Recommendation

22. That the Transport Accident Commission promote vehicles fitted with Trailer Stability Assist on the Crash Avoidance Features webpage on the www.howsafeisyourcar.com.au website.

Market Recognition of Stability Control Technology

Throughout this Inquiry the Committee has been concerned that the multiple acronyms and trade names used to market ESC by vehicle manufacturers may be causing confusion and hindering the successful promotion of ESC.

As can be seen from the table over, in Australia, at least seven different trade names are used for ESC.

Table 4.1 Acronyms for Electronic Stability Control

Name	Acronym	Manufacturer
Active Stability Control	ASC	Mitsubishi
Dynamic Stability Control	DSC	BMW, Ford, Jaguar, Land Rover, Mazda
Dynamic Stability And Traction Control	DSTC	Volvo
Electronic Stability Program	ESP	Audi, Chrysler, Holden, Mercedes, Saab, Volkswagen
Vehicle Dynamic Control	VDC	Nissan, Subaru
Vehicle Stability Assist	VSA	Honda
Vehicle Stability/Swerve Control	VSC	Lexus, Toyota

Source: www.howsafeisyourcar.com.au, 3 July 2008.

The European ChooseESC! website lists twenty-three different trade names for ESC in Europe alone.[27]

Illustrating this confusing situation, the Ford Motor Company uses different names across continents, with Dynamic Stability Control used in Australia, Electronic Stability Program in Europe and AdvanceTrac in the United States.

The Canadian Government shares the Committee's concern and has reviewed the multiplicity of marketing names for ESC. The outcome has seen the Canadian Department for Transport announce that in Canada, ESC will be the standard acronym.[28]

The Federal Chamber of Automotive Industries (FCAI), the Tranpsort Accident Commission (TAC) and MUARC, are representative of a range of institutions that already use ESC as the generic identifier for electronic stability control technology.

The Committee supports the use of ESC as the standard acronym for electronic stability control and recommends that an education campaign be launched to advise the public, with the aim to increase consumer recognition of the product, to enable them to request it when purchasing a new vehicle.

Recommendation

23. That the Transport Accident Commission explain the different acronyms used for Electronic Stability Control, and that ESC be promoted as the standard name of stability control technology as part of the Electronic Stability Control campaign.

Curtain Airbags

Following a crash, curtain airbags unlike front airbags remain inflated. This design is intended to offer head protection during a side impact and/or rollover, and prevent an occupant being ejected from the vehicle.[29]

The TAC submission cites evidence from the United States that head protecting airbags can reduce the risk of fatalities by 37 per cent in near side impact crashes.[30]

The MUARC submission states that curtain airbags reduce the acceleration force experienced by the head in an impact by 70 per cent.[31]

The crash impact measurement for a head injury is measured in Head Injury Criterion (HIC). A HIC measurement of 5,000 is sufficient to cause a fatality. One manufacturer's testing has shown that curtain airbag technology can reduce the HIC measure by 90 per cent, to below 600 in the cars tested.[32]

While side airbags provide increased safety for vehicle occupants, the size, design and positioning limits the available safety benefit. Curtain airbags provide greater head protection that is extended to rear passengers.

There is no Australian Design Rule (ADR) requirement for curtain airbags. Mr Robert Judd, Technical Development Manager, Autoliv, informed the Committee at a public hearing in Melbourne, 29 October 2007, that the current fitment rates of curtain airbags is only ten per cent.[33]

However TAC data shows that the fitment of curtain airbags to vehicles sold in Victoria to be greater, at 33 per cent in 2007. Significantly this is up from only 3.6 per cent in 2002.[34]

Australasian New Car Assessment Program (ANCAP) testing has shown that curtain airbags are an effective safety technology, providing head protection in pole tests. Newspaper reports such as 'Star Turn Puts us up With the Best' in *The Australian*, 9 November 2007, repeat ANCAP's message that the standard fitment rates of curtain airbags in all vehicles is preferable.[35]

During the overseas study tour, 25 August to 15 September 2007, the Committee heard that there was an official agreement between the United States Department of Transportationation and vehicle manufacturers to fit curtain airbags in all new cars by 2010.[36] However it is a point of contention as to whether manufacturers have made a voluntary commitment, or whether a review of the applicable vehicle standard will implicitly require this safety technology.[37]

At a meeting with Dr Joseph Kanianthra, Associate Administrator, Vehicle Safety Research, Department of Transportation National Highway Traffic Safety Administration (NHTSA), in Washington, 4 September 2007, the Committee was informed that NHTSA does not have an agreement with manufacturers to fit side curtain airbags to cars.[38]

In a meeting with the National Agency for Automotive Safety and Victims' Aid in Tokyo, 28 August 2007, the Committee was also informed that the Toyota Motor Corporation will have introduced curtain airbags to all Toyota cars by September 2007.[39] As at June 2008, all Toyota models, except the Avensis, are available with curtain airbags.

The achievement of the Victorian Government's strategy, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*, initiative to require standard fitment of curtain airbags in passenger cars by 2012 will be the first such measure in the world. The Committee congratulates the Victorian Government as this initiative is synonymous with Victoria's international leadership in mandating the fitment of seatbelts.

The Committee supports this initiative to increase the number of vehicles providing occupants with side crash protection.

Recommendation

24. That the Transport Accident Commission continue to fund and produce a campaign to promote curtain airbags to increase fitment rates of curtain airbags until the beginning of 2012.

Summary of Findings

- The Victorian Government commitment to mandatory Electronic Stability Control by 2011 must include cars, light commercials, heavy vehicles and articulated trailers used by prime movers fitted with this technology.

- While ESC and curtain airbags are to become mandatory in Victoria, efforts to encourage greater rates of fitment cannot be allowed to abate in the meantime simply because these technologies will eventually be fitted to all vehicles.

Recommendations

20. That the Transport Accident Commission continue to promote Electronic Stability Control.

21. That VicRoads ensures that, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*, commitment to mandate Electronic Stability Control by 2011 includes all new heavy vehicles and heavy vehicle articulated trailers.

22. That the Transport Accident Commission promote vehicles fitted with Trailer Stability Assist on the Crash Avoidance Features webpage on the www.howsafeisyourcar.com.au website.

23. That the Transport Accident Commission explain the different acronyms used for Electronic Stability Control, and that ESC be promoted as the standard name of stability control technology as part of the Electronic Stability Control campaign.

24. That the Transport Accident Commission continue to fund and produce a campaign to promote curtain airbags to increase fitment rates of curtain airbags until the beginning of 2012.

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Chapter

5

Strategies to Encourage Fitment

The Australian new car market is reputed to have the greatest number of brands and models of any developed economy.[1]

This suggests that market competition would therefore be strong, with increased fitment of safety technologies as vehicle manufacturers and importers aim for a market advantage.

Unfortunately, the Committee have seen evidence that the opposite is just as often the case, with manufacturers and importers removing or not installing technologies – presumably to reduce the vehicle cost.

The net result is that Australia is falling behind the standard of vehicle safety available in other leading economies, such as Japan, the United Sates and Europe.

VicRoads in their submission to the Inquiry informed the Committee that:

> In comparison with other developed economies, Australia is lagging behind in the adoption of important vehicle safety technologies.[2]

While the Committee accepts that the dynamics of a competitive vehicle market can affect positive outcomes for fitment rates, the Committee does not consider that the vehicle industry and market alone is introducing leading edge safety technologies to Australian vehicles quickly or widely enough.

As discussed in previous chapters, one reason that Australia's position lags behind world standards is that Australian vehicle standards, the Australian Design Rules (ADRs) are similarly failing to keep pace with developments in safety technologies.

The public cannot be solely responsible for increasing the fitment of vehicle safety technologies. Based on current evidence the Committee considers that market forces and minimal ADRs requirements are neither sufficient to deliver, nor effective

mechanisms to guarantee, the fitment of leading edge technologies comparable with other leading economies.

New technologies are usually offered either as an option or as a standard fitment. An option increases the purchase price of a vehicle and may present sufficient disincentive to a prospective buyer.

However if a safety technology is not available as a standard item in a vehicle, then the availability as a stand-alone option is preferable to one that is bundled with non-safety technologies.

Another factor influencing the availability of safety technologies that is of greater concern to the Committee is the practice of de-specifying. De-specification is the practice of not offering the safety technologies that are available on comparable overseas vehicle models.

A manufacturer's decision to fit a technology is only made if they think the market will pay for the technology. This profit motive is evident in the higher availability of safety technologies toward the luxury end of the vehicle market.

While these technologies are eventually fitted to the lower end of the market, the trickle down of safety technologies from high end vehicle models to the low end may take up to 20 years according to the VicRoads submission.[3]

The Committee does not accept that established vehicle safety technologies, such as the fitment of Electronic Stability Control (ESC) to cars, which was first released in 1995, should still be absent from vehicles thirteen years later.[4] Similarly, curtain airbags which have been fitted to passenger cars since 1998 have only achieved a 25 per cent fitment rate nationally, though slightly higher in Victoria, at 33 per cent in new cars by 2007.[5]

As such, the Committee is pleased to see that this unacceptable situation is being addressed by the Victorian Government through the new road safety strategy *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*.

During the course of this Inquiry it became evident to the Committee that vehicles being offered to Victorian purchasers, both privately and commercially are not fitted with leading edge safety technologies. Furthermore, Australia represents less than one per cent of the global vehicle market and this severely restricts any potential influence Victorians can have on the market direction of global vehicle design and specification.[6]

The Committee has sought to determine through this Inquiry why manufacturers do not provide Australians with the safest vehicles

available internationally, and how this decision by manufacturers is justified. Is it a result of:

- low regulatory vehicle standards;
- that the consumer is uninformed or does not adequately demand world-class safety levels;
- manufacturers do not need to fit technologies to be competitive;
- another reason all together; or
- a combination of the above.

To blame any one party for this state of affairs prevents the development of effective strategies to encourage an increase of safety technology fitment.

There is an important role for Government to play in introducing strategies to ensure that the fitment of safety technologies catches up with and keeps pace with other developed economies. The Committee identifies in this chapter a number of strategies for Government to implement in support of safer vehicles.

The Federal Government's *National Road Safety Plan 2007 and 2008* has identified the issue of specification and that leading edge technologies have only been: 'provided in a minority of new vehicles sold in the last few years'.[7]

However, despite identifying this shortfall in vehicle safety no significant improvements have yet been made by the Federal Government since the safety plan began in 2007. It has required the leadership of the Victorian Government to initiate universal fitment of Electronic Stability Control and curtain airbags.

Impediments to Vehicle Safety Technology Fitment

Modern vehicles are being produced with an increasing array of technologies and concept models at motor shows promise even more technology. Yet not all these technologies are making rapid appearances in Australian vehicles.

Market Availability of Vehicle Safety Technologies

The stages from concept through development to manufacture and then fitment to a vehicle all add to the time it takes for a safety technology to make it to market, often limited to the upper end of the fleet.

However once a technology is fitted to one vehicle model that technology is then available, at least to that manufacturer, for fitment across the model range. Understandably models are updated at different times and thus updated fitment may be staggered, but if the manufacturer is willing they can rapidly fit a technology across a vehicle range.

This potential has been demonstrated by Mercedes Benz who, upon seeing the safety benefits, installed Brake Assist across their entire range one year after its release on a high end variant.[8]

The typical practice of progressively releasing technology downwards through a vehicle range extends to parent company directives that determine whether a subsidiary company manufacturing in Australia has access to the same technology. The Committee was informed by Mr Ian Butler, Director, Integration and Safety Engineering, GM Holden Ltd, that there is:

> ... a global process where we as engineers go in and get the budget we need to engineer the cars that General Motors wants to put in all the regions around the world.[9]

Mr Bruce Priddle, Vehicle Assurance and Homologation Manager, Ford Motor Company, Australia Ltd, at a hearing, 8 October 2007, discussed with the Committee the decision making process for Ford. Mr Priddle stated that once technologies have been:

> ... developed to be what we call implementation ready then you can start to look at various product programs and say, 'Will we have that feature and engineer it into our product or not?'[10]

Similarly inconsistencies exist between vehicles imported to Australia and the specification of overseas variants of the same model. While theoretically a manufacturer fitting a technology to a model for the Japanese market can fit that same technology to an equivalent model to be the exported to Australia, this is not always the practice. Examples of this practice, known as de-specification, are provided below.

The Committee also found that there is a difference between available and availability. While a vehicle may be available with a safety technology as an option in a safety package, the dealer and/or importer may not keep a stock of vehicles with the safety options. When imported orders can take up to three months, there is a real disincentive for consumers to opt for safety features.

A submission to the Inquiry from the Royal Automobile Club of Victoria (RACV) Ltd, provided data regarding the take up of optional safety technologies. The submission noted that:

> ...sales rates of optional safety packages are typically below the ten percent mark.[11]

At a public hearing in Melbourne, 19 November 2007 Mr Ben Hershman, Product Planning Manager, Hyundai, confirmed that the selection of the safety option pack on the i30 model was ten per cent.[12]

However it is unknown whether these figures indicate if the lack of availability of safety optioned vehicles is a cause, or the result of, a lack of consumer demand.

Increased fitment of safety technologies is becoming easier for manufacturers as technologies overlap. A multifunctional application of sensor technology makes the fitment of a suite of safety technologies potentially more feasible than fitting only one product. For example pre-emptive Brake Assist, Forward Collision Warning (FCW) systems and Adaptive Cruise Control (ACC) all use forward directed radar. This overlapping technology is occurring in some vehicle models already.

During the Committee's overseas study tour, 25 August-15 September 2007, the Committee met with the Nissan Motor Corporation. Mr Tetsuo Hesegawa, Group Manager, Vehicle Safety, Vehicle Engineering Group, Nissan Motor Corporation, informed the Committee that crash technologies should be fitted to vehicles according to that market's crash profile.[13] The Committee applauds this rational approach to fitment of safety technologies and considers that the targeted fitment of technologies would potentially deliver the greatest safety benefit.

The Committee considers that while manufacturers are responsible for increasing the levels at which technologies are fitted to Australian vehicles, the suitability of these technologies in the Australian context should precede the market rationale of fitment. Further research is required to identify the appropriate technologies from the list prioritised by the Committee in table 3.1. The Government should collaborate with vehicle manufacturers to determine the safety technologies that would benefit Victorian and Australian drivers the most.

Recommendation

25. That VicRoads analyse crash data and the Used Car Safety Ratings data to determine a crash profile for the Melbourne metropolitan area, regional centres and country regions, and then determine the safety technologies most suited to addressing these crash profiles. This information should be shared with vehicle manufacturers to encourage fitment of technologies that would help reduce Victorian crashes.

Cost of Technologies

Cost was a repeated theme in evidence presented before the Committee. In particular, the cost pressure on manufacturers and importers in introducing and fitting safety technologies to Australia vehicles.

A paper, from PSA Peugeot Citroën, 'Performance of an Improved ABS and Expected Safety Benefits', presented at the *20th International Technical Conference on the Enhanced Safety of Vehicles* in Lyon, 18-21 June 2007 argued against universal fitment of ESC on small cars. The authors noted that:

> ... to install it as a standard equipment on small cars will make them more expensive and then slow down the modernisation of the car in the street which is the most efficient way to improve safety.[14]

This problem of pricing vehicles out of the market was identified by Mr Hershman, Hyundai Motor Company Australia, at the hearing. Mr Hershman stated that:

> The problem we have is that if you have a $30,000, $35,000, $40,000 motor car and you want to add – shall we take $1,290 as a number, or $1,000, there is a smaller impact on a recommended retail price. If you do that to a car that is $14,990 and you add $1,000, you immediately can say goodbye to the potential consumer.[15]

At the same hearing, Ms Jasmine Stringer, Company Secretary and General Counsel, Mazda Australia, identified for the Committee the safety issues that support the optional fitment of technologies as opposed to standard fitment on low-end vehicles. Ms Stringer stated that:

> ... if you make new vehicles with all these technologies and all the bells and whistles too expensive, people will buy a vehicle that is five years older and perhaps has not some of these things because you have priced yourself out of the market.[16]

However the VicRoads' submission argued that once a technology is fitted to one model, the development cost has been spent and the cost of extending fitment down the range is reduced. Acknowledging that the cost of different technologies varies, VicRoads noted that cost is not 'overly prohibitive' when sufficient market demand is deemed to warrant investment in a technology.[17]

Mr Ross McArthur, Chair, Technical Committee, Australasian New Car Assessment Program (ANCAP) at a hearing in Melbourne, 4 February 2008, extended the argument stating that technologies available to ANCAP for testing are already in the market. According to Mr McArthur they have already been developed, with the cost of development already spent.[18] Therefore, he argues, the incurred costs of fitting a technology are only the production costs.

Despite the arguments, the Committee has learnt that some manufacturers, including Hyundai, Toyota and Mazda have been offering ESC as an option on low end models since early 2008.

The Committee recognises that cost is not the only factor affecting the availability of technologies. However, if manufacturers were to fit safety technologies as standard, cost would not be a factor affecting fitment decisions.

Cost-Benefit Analysis

A benefit and cost analysis can calculate the reduction in death and injury as a result of the fitment of a technology compared with the cost to manufacture and fit to a vehicle. Dividing the benefit by the cost produces the cost-benefit ratio. A higher benefit number equates to greater safety benefits for lower cost.

Monash University Accident Research Centre (MUARC) also identifies that an accurate cost-benefit analysis is important in presenting sound arguments for convincing companies, fleets and regulators that the benefits to be achieved from safety systems outweigh the costs.[19]

A cost-benefit analysis of some leading safety technologies has been undertaken by the European Commission.[20] The following table shows the cost-benefit ratios for technologies prioritised by the Committee, and assessed by the European Commission.

Table 5.1 European Commission Cost-benefit Analysis (2006)

Technology	Cost-benefit ratio	Break even cost
Post-crash communication		180€
Brake Assist		460€
Seatbelt reminders	7.6	
Intelligent Speed Assistance	3.3	
Daytime Running Lamps	1.8	
Lane Departure Warning	1.7	
Adaptive Cruise Control	0.4	

Source: Directorate General, Enterprise and Industry (European Commission) meeting held 7 September 2007.

It is important to remember that these results were based on variables for a European context and is only intended as a guide.

The VicRoads submission noted that Western Australian government research in 2002 found that cost-benefit analysis may complicate the selection of safety technologies for fitment. The submission noted that:

> In Australia there is some confusion or uncertainty as to the actual cost-benefit trade off of various options and so inappropriate decisions might be made.[21]

Seatbelt pre-tensioners provide an example of the role cost-benefit analysis plays in the fitment of technologies. A cost-benefit based rationale is that the rear seat of a passenger vehicle is less frequently occupied than the front seats resulting in less value attributed to fitting pre-tensioners to these seat positions. Therefore the combination of less benefit due to less frequent use and increased cost from fitting a more expensive item produces a low cost-benefit ratio and subsequently low fitment.

The Committee identified this technology in Chapter 3 and recommended that despite this rationale, rear seat occupants are entitled to equal protection and therefore equivalent technology.

The greater the cost-benefit ratio, the more convincing the argument in favour of fitting a technology. Therefore manufacturers are more likely to fit safety technologies with a ratio equal to or greater than one due to the ability to economically justify fitment.

However the catch with cost-benefit analyses is that the benefit is delivered in the form of financial savings to Government budgets for emergency services, hospitals, recuperation and lost productivity, whereas cost is incurred by the manufacturer and passed on to the consumer.

The difficulty in calculating accurate cost-benefit analyses was discussed in Chapter 1.

The Committee considers that cost-benefit analysis is an important tool in identifying the viability of technologies but recognises that accurate analysis is often difficult, especially in regard to developmental technologies.

Fitment Decisions

The Committee has identified market readiness and cost as factors informing the specification decisions made by vehicle manufacturers and importers.

The outcome of these decisions can be de-specification, the non-inclusion of technologies on vehicles imported into Australia, that are specified on similar models in other advanced economies.

At the 2004 Road Safety Research, Policing and Education Conference in Perth Mr Eric Howard, the then General Manager of Road Safety, VicRoads, asked whether it is:

> ... acceptable that new cars in Australia not provide safety features currently widely available in Europe and North America?[22]

The Free Market

The vehicle industry believes that an unrestrained market is the best means of delivering vehicles that are fitted with leading edge technologies.

It was reported in *The West Australian* newspaper, 1 September 2007, that the Federal Chamber of Automotive Industries (FCAI) viewed:

> The spread of ESC is a good example of competitive market forces and consumer demand driving the spread of new safety technology…[23]

The FCAI submission represents the industry's perspective to the Inquiry and defends the primacy of free market forces that guide fitment by highlighting the large amount of funding that manufacturers invest in the development of safety technologies.[24]

During the overseas study tour, the Committee met with representatives from the Japanese Ministry of Land, Infrastructure and Transport in Tokyo, 27 August 2007. During the meeting the

Committee were informed that market forces are the favoured method for determining fitment of vehicle safety technologies in Japan.[25]

In the United States, the Ford Motor Company has demonstrated the willingness of the industry to advance increased fitment of safety technologies by licensing their seatbelt reminder system to other manufacturers at 'no cost'.[26]

Despite such examples, the European Union campaign, ChooseESC!, has argued that the proportion of new vehicles being fitted with ESC indicates that market forces are not sufficient to ensure safety technologies are fitted.[27]

The VicRoads submission expressed scepticism that manufacturers can be relied upon to fit leading edge safety technologies soon enough to improve vehicle safety and prevent current rates of crashes, serious injury and associated road trauma. VicRoads commented that:

> Vehicle manufacturers cannot be relied on to continually improve vehicle safety.[28]

De-specification

The Committee received contradictory evidence regarding the practice of de-specification from a number of sources.

The RACV submission stated that:

> ... Australian car makers and importers are less likely to fit safety technologies as standard equipment across their model ranges, in comparison with some developed markets, including the United States and the United Kingdom.[29]

The practice of de-specification was reinforced at a public hearing, 4 February 2008, by Mr McArthur, Chair, Technical Committee, ANCAP. Mr McArthur stated that:

> De-specifying – in other words, bringing vehicles into the country with less safety features than they have overseas – is still a problem.[30]

The Transport Accident Commission (TAC) submission, however, recognised that the cost imperative in a competitive market can influence decisions to de-specify vehicles. However, despite an

appreciation for this market based rationale, the TAC views de-specification of safety features as unacceptable.[31]

Mr Mark Jackman, ESP Project Manager, Bosch Australia, stated at a public hearing in Melbourne, 29 October 2007, that the decision-making process rests with the manufacturer. Mr Jackman stated that:

> ... de-specification is not taking place outside of the manufacturer. What is happening is the manufacturer is deliberately de-specifying.[32]

At a public hearing Mr Butler, Director, Integration and Safety Engineering, GM Holden Ltd, explained how the market perception of a vehicle determines how it is specified. He stated that:

> You need to be careful in terms of committing absolutely that, if a feature is done in one market, it will absolutely inevitably follow into another market.[33]

Mr Ashley Sanders, Manager, Certification and Regulation Compliance Department, Product Engineering Division, Mitsubishi Motors Australia Ltd at a public hearing was clear that Mitsubishi did not de-specify their vehicles. Mr Sanders stated that:

> We do not have a policy of de-specifying vehicles. I will show that with some of the statistics ...[34]

Yet, VicRoads provided two and half pages of disparities between similar makes and models in Australia and the United Kingdom as evidence.[35] This evidence is reproduced in Appendix E. Despite the evidence, VicRoads stated in their submission that they did not consider the practice of de-specification to be widespread but that its continuing practice had:

> ... a real potential to inhibit the reduction of crash rates and risks of injuries ...[36]

Contradicting claims of de-specification the FCAI dismissed claims of this practice before a public hearing in Melbourne, 4 February 2008. Mr Andrew McKellar, Chief Executive, FCAI, stated that in regard to the de-specification of ESC:

> I have seen those claims and I have seen those reports, and I must say I am not aware of any instance.[37]

The Australian Automobile Association (AAA) submission included evidence of the de-specification of passenger cars being imported into Australia. The comparative tables of side head/curtain airbags are reproduced here.

Table 5.2 Comparison of Availability Side Head/Curtain Airbags on Small and Medium Passenger Cars

Vehicle Make/Model	Australia	European Union	United States
Ford Fiesta			
Ford Focus (i)			
Holden Astra			
Holden Barina			
Honda Civic			
Honda Jazz			
Hyundai Accent			
Hyundai Elantra			
Hyundai Getz			
Kia Rio			
Mazda 2 (i)			
Mazda 3			
Mazda 6			
Mitsubishi Lancer			
Peugeot 307			
Subaru Impreza (i)			
Subaru Liberty (i)			
Suzuki Swift			
Toyota Corolla (i)			
Toyota Camry			
Toyota Yaris			
VW Polo			
VW Golf			

Source: Derived from Australian Automobile Association, Table 5.1 Submission to Inquiry, 27 July 2007.

Table 5.3 Comparison of Availability Side Head/Curtain Airbags on Small and Medium Passenger 4WDs/SUVs

Vehicle Make/Model	Australia	European Union	United States
Honda CR-V			
Ford Escape			
Mazda Tribute			
Mazda CX-7			
Mitsubishi Outlander			
Nissan X-Trail			
Subaru Forester			
Toyota RAV4			
Holden Captiva			
Subaru Outback			

Key	
Available on all variants	
Available on some variants	
Not available on any variant	
Not sold in that market or data not available	

Source: Derived from Australian Automobile Association, Table 5.2 Submission to Inquiry, 27 July 2007.

The AAA submission stated that the problem of de-specification is that it is:

> ... widespread, and given the proven benefits of features such as ESC and side/curtain airbags, this situation is far from satisfactory.[38]

The Committee considers that there is sufficient evidence to support the claims that vehicles sold in Australia are being de-specified. Denials and counter claims from manufacturer's and importers justifying disparities in vehicle safety technology specifications do not satisfactorily disprove the practice of de-specification.

Mr Wayne Watson, Engineering and Compliance Manager, Mazda Australia stated at a public hearing in Melbourne, 19 November 2007, that Mazda make available the full range of safety technologies, which are offered at the factory, across their vehicle range. All safety features made available to Mazda for Australia bound models are standard, except on base models in which they are offered as a safety option package.[39]

This is an important point though and is at the centre of disparities between technologies made available in Australia. At a public hearing,19 November 2007, Mr Lindsay Smalley, Senior Director, Honda Australia explained that what seems to be de-specification is actually the availability of a technology at one factory and not another. Therefore a Honda exported to Australia may originate from a Thai factory with less capacity for fitting safety technologies than a factory in Japan or Europe.[40]

The capacity of factories in Australia to fit leading edge safety technologies is also of great concern to the Committee. In June 2008 GM Holden Ltd announced the cessation of engine production. This followed the withdrawal of Mitsubishi as a manufacturer in February 2008 and Ford Australia's announcement in 2007 that it too was ceasing the manufacture of engines in Australia.

The Committee refuses to accept that factory capacity should limit the safety of vehicles imported into Australia when other factories are manufacturing a vehicle fitted with more safety technologies. The Committee considers it an excuse for importing, or locally manufacturing, vehicles that are not specified to the same standard as those of other leading economies.

As seen in Chapter 3, there are unfortunately many examples of de-specification. One example highlights the Committee's concern at this practice. The Honda Accord and Legend car models are class leaders in fitting leading edge safety technologies. In the United Kingdom both models are available with Lane Departure Warning (LDW) technology, Adaptive Cruise Control (ACC) and the Legend is also fitted with a pop-up bonnet for pedestrian protection. In addition the Legend is also fitted with Pre-emptive Brake Assist.[41]

However, the same models in Australia, including the Accord EURO lack all of these leading edge safety technologies, with one exception. The Honda Legend model does come with a pop-up bonnet.[42]

Active head restraints were another technology subject to de-specification. The significance of de-specifying this technology is that it is contained within the seat structure, not requiring any integrated wiring or computer programming. The advanced seats are not fitted to as many Toyota or Peugeot branded vehicles in Australia as in other markets. See Appendix E for comparative data of active head restraint fitment.

During the overseas study tour the Committee held meetings with EuroNCAP in Brussels and Bosch in Stuttgart in September 2007. During both meetings the Committee heard that de-specification is also an issue in Europe.[43]

While de-specification of leading edge technologies is an issue, the Committee recognises that the relatively small number of vehicles where these technologies are being made available limits the effects of de-specification. Of greater concern to the Committee is the practice of de-specifying the twin established safety technologies discussed in Chapter 4, ESC and curtain airbags.

The practice of de-specification was illustrated for the Committee by Mr McArthur, Chairman, Technical Committee, ANCAP, at a hearing, 4 February 2008. Mr McArthur described how Volvo, perceived as a leader in vehicle safety, was de-specifying ESC from vehicles imported into Australia. He cited Mr Peter Cornelis, President, Volvo, as admitting that Volvo was not fitting ESC as standard in Australia because of cost issues. This case was a motivator in ANCAP changing the requirements of their rating system to include ESC as a prerequisite to being awarded a five star crash rating.[44]

The problem is not limited to cars. Evidence from Mr David McInnes, Group Manager, Environment and Climate Change, Linfox at a public hearing, 3 February 2008, informed the Committee that digital tachographs, a required fitment in Europe, are removed from commercial heavy vehicles imported into Australia and replaced, at increased cost, with a 'dummy' unit. [45]

The RACV attribute the practice of de-specifying to one policy reason of encouraging sales of: 'higher cost model variants or equipment packages'.[46] VicRoads however believe that low fitment rates in Australia are due to low consumer demand. The VicRoads submission states that:

> … it is the view of VicRoads that a lack of consumer demand for vehicle safety technologies is the key reason.[47]

The VicRoads submission supports this claim by reference to VicRoads research that has found consumers allocate a lower priority to safety compared with style and comfort.[48]

The assumption that mandated fitment of technologies in other developed economies will result in those technologies also being fitted to vehicles imported into Australia is proved unfounded by the evidence of de-specification given to the Committee.

Bundling

Bundling is another marketing practice that affects the fitment of safety technologies to vehicles sold in Australia. Bundling can be explicit, such as selling a safety technology with a luxury item in the

one option, or implicit, whereby safety technologies are only offered on high end variants of a model, or as standard and only as an option on lower end model variants.

In an article that appeared in the *Herald Sun* newspaper, 8 February 2008, motoring editor Paul Glover, reported that the FCAI has acknowledged the practice of bundling. The FCAI used ESC as an example, stating that while the technology costs approximately two hundred dollars to fit:

> ... companies have been forced to package it with other treats, often including alloy wheels, to persuade buyers to spend more.[49]

The TAC submission supported this comment, stating that where ESC was optional, it was in some cases:

> ... bundled into a package with non safety-related features such as leather seats or CD-stackers.[50]

A motoring review of the Nissan Micra in the *Herald Sun* newspaper, 25 January 2008, reported that curtain airbags were bundled with alloy wheels and a six stack CD system.[51] Another review, of the new Honda Accord in *The Age* newspaper, 27 February 2008, noted that:

> A $6500 Luxury pack adds features including eight-way electric driver's seat adjust, 17-inch alloys, side-curtain airbags, and leather replacing the velvet seat covers.[52]

The Committee finds the practice of bundling safety technologies with non-safety features to be immoral.

The bundling of safety technologies together however, can benefit vehicle safety and costs to vehicle owners. A paper presented at the 2007 conference on the Enhanced Safety of Vehicles, 'Volvo Trucks Field Operational Test: Evaluation of Advanced Safety Systems for Heavy Trucks', found that bundling safety technologies resulted in a greater reduction in vehicle crashes and subsequent associated costs.[53] This provides an economic justification for bundling safety technologies.

The Committee considers that while bundling may increase overall profit margins on vehicle sales, it more than likely acts as a deterrent, to consumers and the fitting of safety technologies.

The Committee is concerned that both de-specification and bundling are affecting the fitment of leading edge vehicle safety technologies.

The alternative to de-specifying or bundling, is to increase the fitment of safety technologies and differentiate a vehicle upwards. An example of this is the Mazda 6 that was released in 2008. The Mazda campaign states that vehicles come with no optional safety packages as all models come with the same safety technology.[54]

The Committee considers that fitment disparities resulting from de-specification and/or bundling are unacceptable and reinforce the inadequacies of market forces in relation to road safety. The continuing practice necessitates other mechanisms in order to achieve the fitment of priority safety technologies.

It was suggested to the Committee by Dr Jörg Beckmann, Executive Director, European Transport Safety Council (ETSC) in a meeting in Brussels, 11 September 2007, that where standard fitment of a technology is not made available, in this particular example ESC, then making the technology available as an option in every model within a manufacturer's range is the next best outcome.[55]

Strategies to increase the fitment of safety technologies require the Government to be more active in its support for established mechanisms such as ANCAP, and to develop new initiatives in areas such as compulsory insurance, vehicle registrations, fleet purchasing and by lobbying the Federal Government for changes to Australian Design Rules (ADRs) and legislation.

The Committee considers the practice of bundling safety technologies with non-safety features to be an unethical practice and recommends that the Victorian Government act to discourage this practice.

Recommendation

26. That the Victorian Government develop and implement strategies to strongly discourage retailers from bundling safety technologies with non-safety features.

Advised Timing of Fitment

In most instances, vehicles being driven and ridden on Victorian roads have an average life-span of more than ten years. This average age of the Victorian vehicle fleet makes the immediate fitment of leading edge safety technologies an important issue. Every vehicle that is not fitted with an important safety technology today, will be a less safe vehicle for at least another ten years.

The average life-span for motorcycles is slightly lower at 9.3 years and increases to over eleven years for articulated heavy vehicles, buses and rigid light vehicles. Of great concern to the Committee is that the average age for rigid heavy vehicles is 17.3 years.[56]

The long-term implications of not fitting safety technologies concerns the Committee, which sought advice from high volume vehicle manufacturers and importers regarding when they would be fitting these technologies.

Evidence however was not forthcoming by manufacturers and importers who were unwilling to reveal information considered to be commercially sensitive.

Mr Peter McGregor, Divisional Manager, Product Management, Toyota Motor Corporation Australia, was clear on this point, stating that:

> This Committee hearing is on the public record and I need to keep that in mind as I respond in terms of the information I give my competitors.[57]

Local manufacturers GM Holden Ltd and Ford Motor Company Australia Ltd, at their respective hearings, 8 October 2007 offered vague or no indication of the safety technologies they would be releasing in the next five to ten years. Mr Priddle, Vehicle Assurance and Homologation Manager, Ford Australia stated that:

> ... technologies are developed in one part of the enterprise and then they will either take on a life of their own, or it will be discovered that they are only suitable for a particular region of the world. My guess is that those systems which are more interactive with the vehicle, the environment and the driver are more likely to be more globally applicable.[58]

Mr Ian Butler, Director, Integration and Safety Engineering, GM Holden Ltd, stated that:

> I cannot tell you what wonderful things are coming, but I can certainly assure you that there is very close focus on that.[59]

A presentation from Mr Doug Soden, Manager, Product Planning, Toyota Motor Corporation Australia, at a hearing, 29 October 2007, indicated that ACC was an existing technology, affirming the Committee's interpretation that, where a manufacturer can fit a technology to one vehicle, it is considered available.[60]

However only the Tarago is fitted with Toyota's Pre-Collision systems, which includes Repeatable Seatbelt Pre-tensioning in Australia and no Australian Toyotas are fitted with ACC. Fatigue monitoring technology is identified as a future technology but no indication was given to a predicted availability.[61]

Mr Ashley Sanders, Manager, Certification and Regulation Compliance Department, Product Engineering Division, Mitsubishi Motors Australia Ltd indicated at a public hearing in Melbourne, 29 October 2007, that while ACC was the 'next frontier' in vehicle safety technologies, he understood that Mitsubishi's system was still not yet: 'mature enough to introduce to large volume manufacture'.[62] Mr Sanders also made reference to LDW and the requirement for uniform lane markings to enable system use and that Mitsubishi installed fatigue warnings in all locally manufactured vehicles.[63]

Mr Smalley, Senior Director, Honda Australia Pty Ltd predicted, at a public hearing in Melbourne, 19 November 2007, that ACC would be available on Australian Honda vehicles in: 'a 2013 type time frame'.[64]

Mr Wayne Watson, Engineering and Compliance Manager, Mazda Australia indicated at a public hearing, 19 November 2007, that collision avoidance systems, including LDW and ACC would be a mature technology within five years. He also stated that the cost effectiveness of these technologies would be an issue.[65]

Mr Ben Hershman, Product Planning Manager, Hyundai Motor Company Australia, at a public hearing in Melbourne, 19 November 2007 stated that ACC was being released in the United States and was being considered for other markets.[66] An article in *The West Australian* newspaper, 13 February 2008, indicated that the Hyundai Genesis will be released with ACC in Korea in 2008. The article reports that the Hyundai Australia director of sales and marketing stated that it would be unlikely to be available in Australia before 2010.[67]

Mr Stuart Strickland, Managing Director, Honda Australia MPE Pty Ltd implied that airbags may be fitted to other Honda motorcycles, stating that fitment of an airbag to the Gold Wing was Honda's first step.[68]

Findings

The Committee finds that while market demands may inform fitment decisions, vehicle manufacturers ultimately decide which leading edge technologies they fit to vehicles sold in Australia.

The Committee accepts that while there may be variances in the capacity of global production facilities, there is a role for the local

representatives of international vehicle manufacturers to actively lobby their respective parent companies for access to, or increases in capacity of, production lines to include, globally available, leading edge vehicle safety technologies.

The next step then is to encourage the increased and universal fitment of leading edge safety technologies to Australian vehicles.

Strategies to Encourage the Fitment of Safe Vehicle Technologies

On 16 February 2008, *The West Australian* newspaper reported that:

> ... inside the next year or two, many Australian buyers will refuse to buy cars which put safety features on optional extras lists. There are many strong factors driving this trend: pressure from the likes of the Victorian Government for electronic stability control to be mandatory, campaigns for safer cars by the RAC, pressure from the motoring media and the example set by a number of car makers.[69]

Shifting public perception and the fitment practices of manufacturers and importers will however require sound strategies and an increased priority on safety from manufacturers, the Government, motoring bodies and the consumer.

An outcome that the Committee does not want to see is a divide of the market into vehicles with leading edge safety features and a lower segment with only minimum regulated standards. At a meeting with Bosch in Stuttgart, 13 September 2007, the Committee were informed that they considered this divide to be a real possibility.[70]

The Committee is concerned that this divide may already exist in Victoria.

Australasian New Car Assessment Program

The Australasian New Car Assessment Program (ANCAP) and equivalent programs in the United States, Japan and Europe were established to use empirical crash test results as a means of influencing vehicle design and accelerate safety improvements. Crash ratings, easily interpreted by the number of stars allotted have provided consumers with independent information regarding a vehicle's safety. Speaking in 2005 at *The 7th European Transport Safety Lecture*, Professor Claes Tingvall, then Chairman of EuroNCAP noted how encouraging the results on non-regulated crash testing had been in improving vehicle safety.[71]

EuroNCAP, with which ANCAP testing is aligned, has announced changes to the rating system for 2009. Instead of individual ratings for adult, child and pedestrian protection, one overall rating will be awarded for a vehicle's safety.[72]

The new rating will also be extended to include whiplash protection testing and award points for the fitment of Intelligent Speed Assistance/Adaptation (ISA) technologies and Electronic Stability Control (ESC).[73]

However the testing continues to use an average adult male to represent the adult population, excluding young people, women and the elderly. This criticism of crash testing was raised by Professor Kennerly Digges, Research Director, Vehicle Safety and Biomechanics Research of the National Crash Assessment Center at The George Washington University, 5 September 2007.[74]

Mr Hee-Loong Wong, Senior Manager, Product Engineering, Hyundai Motor Co Australia raised the issue of manufacturer's designing for United States NCAP crash testing requirements at a public hearing, 19 November 2007.[75] Mr Wong criticised the program stating that manufacturers produce vehicles to pass tests not to provide safety. Mr Wong noted that:

> I know of a make of vehicle that can meet Euro NCAP five star but to go to US it cannot make US five star because you have a full crash barrier. It is designed specifically for the offset crash test and when it hit the American barrier, full crash, full barrier, it could not do it. That is why it is not sold in America.[76]

Despite this suggestion of probable design influence and discrepancies between international NCAP testing programs, the Committee considers that ANCAP has a key role in improving and promoting safer vehicles.

Stars-on-Cars

The United States Department of Transportation stars-on-cars program became mandatory on 1 September 2007. The program requires showroom vehicles to carry a sticker indicating the crash rating for that vehicle.[77] ANCAP announced a similar, but voluntary stars-on-cars initiative towards the end of 2007.[78] Through this program ANCAP is making available star rating stickers and promotional material for all new vehicles that have been tested and awarded a four or five star crash test rating.

Subaru, whose entire range achieves a five star rating, is using ANCAP's stars-on-cars material. However the Committee heard evidence from a number of manufacturers and importers who

provided a negative appraisal of either the stars-on-cars initiative, or ANCAP's crash testing program more generally, and have refused to participate in the program.

Mr Ian Butler, Director, Integration and Safety Engineering, GM Holden Ltd, said at a public hearing, 8 October 2007, that a stars-on-cars program oversimplified the complexity of vehicle safety.[79] Mr Butler stated that:

> Ultimately I think we would always argue from a Holden viewpoint that that whole safety technology picture is so complicated that to reduce it to a few stars on a car is not a good thing to do.[80]

Mr Ashley Sanders, Manager, Certification and Regulation Compliance Department, Mitsubishi Motors Australia Ltd, raised the issue at the hearing, 29 October 2007, that crash ratings were not consistent and that a vehicle tested in 2007 and a vehicle produced with the same specifications in 2008 could be awarded a different rating.[81]

Mr Wong, Senior Manager, Product Engineering, Hyundai Motor Co Australia, informed the Committee, at the hearing, 19 November 2007, that the stars-on-cars concept is 'misleading'.[82]

Mr Watson, Engineering and Compliance Manager, Mazda Australia stated at the hearing, 19 November 2007, that Mazda have not been very supportive of the stars-on-cars program. He commented that Mazda would be reluctant to see the program mandated, stating that:

> You almost need your university education to understand the full extent of what a stars-on-cars would give you.[83]

Mr Smalley, Senior Director, Honda Australia Pty Ltd, responded at the same hearing that:

> We will need to check fairly carefully on that program. … In principle I would not have a problem looking at that.[84]

The Committee heard from Dr Stuart Newstead, Senior Research Fellow, Statistician, Road Safety, MUARC, at a hearing, 6 August 2007, that there was a more cooperative relationship between the vehicle industry and EuroNCAP in Europe compared with the confrontational style of relationship in Australia.[85]

The criticisms of ANCAP's initiative contrasts with Subaru's position and leads the Committee to conclude that a refusal to take part in the program would not occur if a manufacturer's or importer's vehicle range scored five stars. However the voluntary nature of the program limits its influence.

The success of the stars-on-cars program will depend on how ANCAP managers the traditionally confrontational relationship with manufacturers whose products score less than five stars.

The difficulty encountered by the Committee in locating information about the availability of safety technologies, raises the pertinent issue of accessible information for the public.

At the public hearing, the Committee were informed by Mr McArthur that ANCAP has $2 million in annual funding. With this funding ANCAP have to purchase test vehicles, perform crash tests and publicise findings. ANCAP promotes crash test results through its website, two major launches with brochures annually and six smaller releases of test results.[86]

Despite the limited resources, ANCAP's success is in part measured by the amount of free publicity crash test results generate. Mr McArthur stated that the promotion of star ratings is an:

> ... ongoing process where we are trying to step up our communications and publicity campaign, and we are putting more money into it than we did.[87]

The Committee considers that more funding would allow more vehicles to be crash tested, broadening the relevance of ANCAP ratings to more buyers, and increase ANCAP's ability to undertake more promotion of results and raise public awareness further.

While the Committee recognises that ANCAP is a national body, the provision of increased funding from ANCAP's Victorian members, VicRoads, the TAC and the RACV can help the promotion of ANCAP in Victoria and hopefully encourage similar funding commitments from other States.

Recommendation

27. That VicRoads and the Transport Accident Commission provide sufficient funding, over the next five years, to implement the Australasian New Car Assessment Program Stars-On-Cars program in Victoria.

Cost of Technologies

If the vehicle industry is to be permitted to operate in a market free of regulation, it has to demonstrate that safety technologies are made affordable. The United States Department of Transportation, National Highway Traffic Safety Administration (NHTSA) argues that affordability is necessary to: 'foster deployment of these features'.[88] This was illustrated for the Committee in a meeting with the Ford Motor Company United States in Detroit, 31 August 2007, where the Committee were informed that Ford had recognised the importance of safety and were attempting to absorb the cost of fitting technologies.[89]

This disincentive is exacerbated in small cars at the less expensive end of the market, where the cost of safety features produces a greater proportional increase in vehicle price. That is, if the technology is offered on low end vehicles in the first place.

As discussed earlier low take up rates highlight the need for technologies to be made standard fitment. A voluntary commitment by one manufacturer to fit a technology could make their vehicles more expensive. This could serve to benefit another manufacturer that does not fit the technology and therefore incur the additional expense.

Examples of promoting a vehicle based on the fitment of safety technologies include the new Lancer, which has class leading safety features, and in May 2008, Hyundai ran an advertising campaign based on statistics from MUARC research into ESC.

The Consumer

The consumer is the target for vehicle marketing and decisions to fit safety technologies. The hypothesis is that consumer demand for vehicle safety is the impetus for manufacturers to fit technology. Thus one ANCAP aim is to inform and raise the public awareness of vehicle safety amongst prospective consumers.

However the chicken and egg analogy of market supply and consumer demand needs to be circumvented if strategies to increase fitment of vehicle safety technologies are to be successful.

Yet evidence suggests that safety is not the first priority for all consumers. The VicRoads submission stated that:

> ... consumers do not regard vehicle safety as important as features such as style, comfort features or price.[90]

A 2007 survey by NRMA Insurance found that most consumers ranked safety as their third priority behind price and fuel consumption. Only one in three drivers considered safety their first priority.[91]

The previous Road Safety Committee's 2003 report, *Inquiry into Road Safety for Older Road Users* revealed that older drivers are less knowledgeable about leading edge safety technologies and prefer comfort over safety.[92] The report concluded that older drivers needed to be educated about safety, while acknowledging that cost often prohibited the purchase of new vehicles.[93]

Younger drivers have different expectations and requirements but are often similarly constrained by the cost of a vehicle. The importance of vehicle safety is especially pertinent to young people because of their increased crash risk.

This is supported by evidence from the TAC website that:

> While 18 to 25 year olds represented 14% of licenced drivers, they accounted for 28% of all drivers killed on Victoria's roads.[94]

Professor Jack McLean, then Director, Road Accident Research Unit, University of Adelaide appeared on the ABC radio program, *The Health Report*, 26 November 2001, and identified the importance of car selection for young and first time drivers. Professor McLean spoke of the misapprehension of parents when buying a cheap car for their child and the importance of young drivers to drive safe cars. He illustrated this on the program stating:

> I frequently hear parents say that 'We're going to help David buy a cheap, small car, so he can get to uni. David should be driving the family car with the airbags and the parents driving the cheap, small car. Because David is the one at high risk of being hurt.[95]

The Committee acknowledges that consumers need to be educated about the importance of safety technologies and encouraged to make safety their first priority when purchasing a vehicle.

Raising Public Awareness

To change consumers' focus means raising the public's awareness about road safety and the potential for safety technologies to provide increased safety.

The RACV in their submission state that:

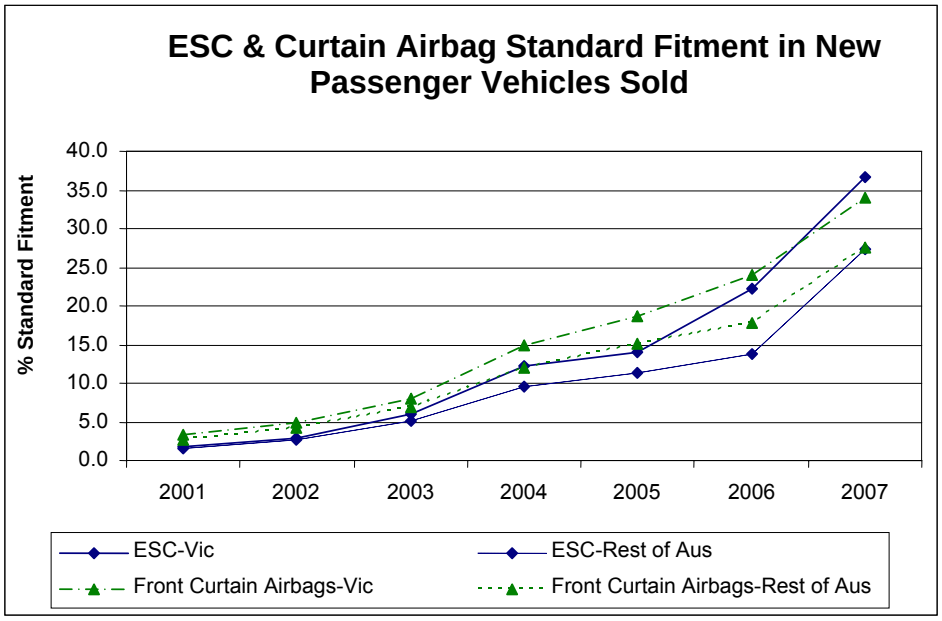
> ... there appears to be a lower degree of awareness and understanding of newer technologies ...[96]

The TAC has a statutory requirement to promote road safety and the prevention of crashes, making the promotion of vehicle safety technologies a priority for the TAC.[97] This makes the TAC central to strategies to improve public awareness.

As such, the TAC ran two advertising campaigns, each targeting two established vehicle safety technologies – ESC and curtain airbags. These campaigns built on the broader www.howsafeisyourcar.com.au campaign.

Evidence provided by the TAC indicates that both campaigns were successful in contributing to increased fitment of both technologies. This success demonstrates the potential for raising awareness about the availability and increasing the fitment of safety technologies. The graph below compares fitment in Victoria with the rest of the country and was supplied by the TAC, this evidence demonstrates the success and importance of the two campaigns.

Graph 5.1 Standard fitment of Electronic Stability Control and Curtain Airbags



Source: Transport Accident Commission correspondence 19 June 2008.

The TAC web page Buying a Safe Car has two priority lists of features and technologies to look for when buying a car. The Committee recommends that these priorities be updated. Presently the page suggests that people look for a four star rated car but the Committee considers that everyone should be aiming for a five star

car.[98] The Committee would also like to see Pre-emptive Brake Assist added to the list alongside ESC and curtain airbags.

Other safety technologies are listed elsewhere on the website, the Committee considers they could be included on this page as a third list, to raise public awareness of the technologies that have limited availability and require greater consumer demand to encourage increased fitment.

The Committee also recommends that the website be reviewed to encourage greater use.

Efforts to raise public awareness for vehicle safety is at times inhibited by the messages conveyed in vehicle reviews found in the motoring section of newspapers and automotive magazines.

The Federal Government *National Road Safety Plan 2007-2008* identified that not all motoring journalism makes a positive contribution, stating that:

> There has been a tendency in some areas of motoring journalism to attempt to undermine speed management and other safety interventions. It is important to establish stronger links with this sector to promote sound understanding of the scientific and research basis for road safety interventions.[99]

Informed motoring journalism can make a significant contribution to increase public awareness of safety technologies and their availability. Vehicle reviews are an example of improvements in recent times. The fitment of safety features is regularly cited as a point of differentiation, more recently with the non-fitment, or in some cases the de-specification of ESC.

In Japan, the New Car Assessment Program (JNCAP) produces an annual publication detailing all current crash tests, descriptions of leading edge technologies and a detailed list of all available vehicles and the safety technologies fitted. The report can be purchased by consumers for ¥1,000 (approximately $10). A brief 24 page booklet, containing the latest crash test results is distributed for free.[100] This example is indicative of the potential for increased methods of raising public awareness and informing consumers.

The Committee finds that existing campaigns to raise public awareness require improved coordination in order to maximise and sustain the promotion of vehicle safety in the public eye.

Recommendation

28. That the Transport Accident Commission review and expand the website, www.howsafeisyourcar.com.au and promote the following technologies:

- **Pre-emptive Brake Assist**
- **Lane Departure Warning**
- **Adaptive Cruise Control**
- **Pedestrian Protection**
- **Active head restraints**
- **Repeatable Seatbelt Pre-tensioning.**

Insurance Incentives

The vulnerability and increased crash risk of young drivers is a significant reason for ensuring they have access to vehicles fitted with safety technologies. Some novice drivers are lucky enough to have parents with newer cars and if allowed to drive them, can benefit from improvements in the safety features. However, this benefit is diminished due to insurance excesses imposed due to the age of the driver.[101]

Pay-as-you-drive insurance is one insurance approach being used overseas that could reduce insurance premiums and make safer vehicles more accessible. For example, Norwich Insurance in the United Kingdom will fit a Global Positioning System (GPS) for free to an insured's vehicle, that allows the insurance company to log actual driving and charge insurance according to risk level accorded to the travel time and route.[102]

Active safety technologies mean that both the vehicle and occupants are protected from road crashes. This is a significant development for insurance providers, with their liability benefiting from lower claims. Therefore the Committee considers that a discounted insurance premium based on the fitment of active safety technologies, designed to prevent or mitigate crashes, is justified.

The availability of new vehicles for less than $15,000 provides a viable alternative to used cars. While vehicles in this price category are small, they can potentially incorporate leading edge technologies. However as discussed previously, the price of safety options can diminish the advantage of a low vehicle price and potentially redirect a consumer into the used car market.

Strategies to encourage the purchase of safer vehicles in the low end of the new vehicle market, and from within the used car market, can be achieved through insurance premium incentives.

The Committee considers that Government supported insurance incentives would best be delivered through the TAC and discounted compulsory third party insurance. The Committee encourages private insurance companies to similarly offer premium discounts for safer vehicles, justifiable based on a calculated decrease in the likelihood of claims being made.

The Committee considers that vehicle insurance offers a significant opportunity to make safer vehicles more affordable for consumers and subsequently improve the safety level of the Victorian vehicle fleet.

Insurance based strategies are relevant for heavy vehicles and motorcycles also, but there is a difference in the consumers targeted. Heavy vehicles are predominantly fleet or commercial purchases. The purchase of the safest vehicles available has facilitated the Linfox company in becoming self-insured two years ago. In the following two years the number of crashes per million work hours has gone from 37 down to single figures.[103]

A demarcation in the safety levels of heavy vehicles was identified by Mr Lindsay Fox, Director, Linfox at a public hearing, 4 February 2008. Mr Fox stated that their staff drivers benefit from brand new vehicles while owner operators drive older and correspondingly, less safe vehicles, due to cost constraints, otherwise they are burdened by greater loan repayments on newer (and safer) vehicles.[104]

The Committee considers that where the burden of operational expenses is restricting the affordability of safe vehicles for owner operators, steps need to be taken to make vehicle safety more affordable. Insurance premium discounts could contribute to making the purchase of safer vehicles a more economically attractive option for operators.

In terms of insurance incentives for purchasing safer motorcycles, the Committee was informed by Mr John Bolitho, Senior Manager, Legal Policy, TAC, at a public hearing, 6 August 2007, that the uptake of safety technologies has been identified as important by motorcycle insurers. Mr Bolitho stated that:

> ... Insurance Australia Group is very concerned that manufacturers have been slow to adopt technology ... Swann Insurance issues 75,000 policies a year and they have recently announced on 3 August that they have an initiative of their own to try to increase the uptake because of the amount of money they are

> having to pay out for property damage for motorcycles that are involved in single vehicle accidents. They see they have a role through distributors, dealerships and their own property insurance to influence that market.[105]

The Committee applauds this initiative from Swann Insurance. This initiative demonstrates the effective and mutually beneficial potential of insurance companies to effect improvements in vehicle safety. The Committee encourages all private vehicle insurers to take a proactive approach to increasing vehicle safety through reduced premium standards.

The Committee considers that the Transport Accident Commission could discount compulsory third party insurance, based on the savings that safety technologies can potentially deliver, to similarly encourage uptake of safety technologies.

Recommendations

29. That the Transport Accident Commission undertake economic modelling to establish discounts for compulsory third party insurance premiums according to the safety features fitted to vehicles.

30. That the Victorian Government collaborate with private insurance companies to encourage insurance incentives for safer vehicles.

Sanctioned Fitment of Safety Technologies

Presently, drink driving offenders may have an alcohol interlock compulsorily fitted to their vehicle once their licence is reissued. The Committee is of the view that a similar program for recidivist speeding offenders warrants investigation. An Intelligent Speed Adaptation (ISAdapt) system could be used in a similar manner as alcohol interlocks are for drink driving programs. Professor Brian Fildes, Chair, Road Safety, MUARC, confirmed at a public hearing on 6 August 2007 that such an option was possible with ISAdapt.[106]

Speeding is also an issue for commercial drivers of heavy vehicles. A 2003 Austroads report, *A Review of Literature and Trials of Intelligent Speed Adaptation Devices for Light and Heavy Vehicles*, has previously identified ISAdapt as a technology suited as a sanction for recidivist speeders.[107] Commercial drivers who have lost their licence for speeding might be permitted to resume their work by agreeing to have ISAdapt technology fitted to their vehicles.

The Committee considers this ISAdapt technology provides a suitable tool for targeting recidivist and excessive speed offenders.

Recommendation

31. That once Intelligent Speed Adaptation technology becomes available, Victoria Police, the Department of Justice and VicRoads, develop and trial a program to target recidivist speed offenders and drivers/riders caught exceeding the speed limit by 30 km/h.

Government

The Government can play a vital role in improving vehicle safety, one that is potentially more effective than any other stakeholder. This has been demonstrated by the Victorian Government's commitment in *Victoria's Road Safety Strategy: Arrive Alive 2008-2017* standard fitment of ESC and curtain airbags.

A number of avenues are open to the Government to achieve increases in the fitment of vehicles safety technologies.

At a public hearing, 29 October 2007, Mr Jackman, ESP Project Manager, Bosch Australia, informed the Committee that when the Swedish Government recognised the limits of public education as a means of effectively increasing fitment rates of safety technologies, the Swedish Government intervened to ensure a large uptake of ESC.[108] This political will resulted in a 91 per cent fitment rate of ESC in 2006, the highest of any country in the world.[109]

A requisite role for Government was identified by vehicle stakeholders. Mr Doug Soden, Manager, Product Planning, Toyota Motor Corporation Australia commented at a public hearing, 29 October 2007, that:

> There is a responsibility on car manufacturers but there is also responsibility on the government …[110]

The Committee is encouraged that the Victorian Government is taking a leading role in ensuring Australian vehicles are fitted with important safety technologies. However more work is needed to ensure that Victoria catches up with countries that have a higher penetration of vehicles fitted with leading edge safety technologies. Achieving improved fitment will require leadership and financial commitment from the Victorian Government.

The need to harmonise ADRs with international standards in the form of United Nations Economic Commission for Europe (UNECE) Regulations was identified in Chapter 2 and is seen by key road safety stakeholders, particularly from the vehicle industry as the key role for the Federal Government.

However there is a role for government beyond harmonising vehicle standards.

Regulation

As discussed earlier in the report, regulation can ensure fitment of available technologies. Regulation is a valid strategy to ensure that fitment rates in Australia do not fall further behind other developed economies.

In some instances, the process of reviewing, or implementing new, ADRs and the practice of harmonisation are not sufficient to ensure Australia benefits from leading edge safety technologies. The compliance costs associated with gaining approval for new technologies have been cited as a reason manufacturers choose not to make technologies available in Australia or the reason for delays.

A cover story in the *Drive* section of the Melbourne newspaper *The Age*, *Economy Class: Are Our Design Regulations Killing Innovation*, 14 June 2008, reported that safety technologies such as brighter LED brake lights and Adaptive Cruise Control were delayed due to compliance issues.[111]

The Committee appreciates that regulation of technologies is not favoured by the vehicle market. For other strategies to be effective, manufacturers have to demonstrate active commitment to voluntary undertakings and more broadly, increase the fitment of safety technologies to Australian vehicles. Regulatory intervention is used in Europe and the United States where the performance of market forces are deemed inadequate.

The Committee recognises that legislative measures require the Government to have a robust process for identifying those technologies that should be targeted.

Government Support

During the overseas study tour and during a public hearing the Committee were informed that Government subsidies to encourage the purchase of vehicles fitted with safety technologies had been proven ineffective, being quickly absorbed into vehicle prices.[112]

The German Federal Highway Research Institute informed the Committee at a meeting, 12 September 2007, that tax discounts or road cost incentives have not proven to be effective methods of encouraging the fitment of vehicle safety technologies.[113] Mr Smalley, Senior Director, Honda Australia Pty Ltd, commented at the hearing, 19 November 2007, that initial savings from such

schemes would be quickly absorbed into vehicle prices, negating the effectiveness of the incentive.[114]

While the Committee agrees that Government subsidising of vehicle purchases would be quickly negated by increased profit margins it considers that reductions in compulsory third party premiums in Recommendation 29 is justified. Associated costs would be offset by reductions in insurance costs due to lower claims correlating with safer vehicles. The Committee considers that this measure is a valuable tool for the Government in providing support for the purchase of safer vehicles at the lower price end of the market.

Fleet Vehicles

A number of submissions to the Inquiry raised the merits of companies and Government Departments who purchase a large number of vehicles annually and the potential influence they can exert in terms of increased demands for safer vehicles.

The Victorian Government's vehicle fleet (VicFleet), administered by the Department of Treasury and Finance, provides an opportunity for Government leadership by example.

The fitment of leading edge safety technologies to VicFleet vehicles would have a beneficial flow-on effect. Fleet vehicles are updated, usually within two to three years, at which point safer vehicles are made available to the buying public.

The potential influence of fleet purchasing was raised by the Victoria Police, Australian Automobile Association, and the TAC as a key avenue available to Government for encouraging vehicle manufacturers to fit available safety technologies.[115]

A submission from Streets Ahead Pty Ltd who specialise in fleet risk management suggested that government fleets only buy five star crash rated vehicles as an incentive for local manufacturers to produce five star rated vehicles.[116]

This approach was promoted as a market based alternative to regulation.

However the Committee heard from Mr Owen Gwynne, Director, Service Delivery, Government Services Group, Department of Treasury and Finance, at a public hearing, 13 August 2007, that VicFleet, the Victorian Government's fleet organisation considers safety as one of four priorities when choosing a fleet vehicle. The other priorities are the environment, local industry and government efficiency. More importantly Victorian government fleet vehicles only accounts for 0.5 per cent of total national vehicle sales.[117]

Mr Ken Thompson, Director, Research and Communications, Australasian Fleet Managers Association (AFMA) informed the Committee at a public hearing, 13 August 2007, that their members have a combined fleet of 800,000 vehicles, purchasing 75 per cent of locally produced vehicles annually and account for more than 50 per cent of vehicle registrations in Australia.[118]

Public transport buses, coaches and taxis are other vehicle fleets whose safety significance is important due to their commercial use in moving people and extensive in-traffic service.

Fleet vehicles are a significant opportunity to affect increased fitment of leading edge safety technologies.

While the Government will require ESC by 2011 and curtain airbags 2012, all VicFleet vehicles should have these safety technologies as standard fitment as part of a commitment to employee Occupational Health and Safety (OHS). Furthermore, VicFleet should be selecting the safest vehicles available, if need be, going beyond Australian manufacturers to ensure access to all available safety technologies.

Promotion of vehicle technologies for road safety, necessitates that VicFleet set an example by purchasing vehicles fitted with available technologies identified by the Committee.

As a starting point all VicFleet cars should have a five star ANCAP crash rating. Supporting this safety objective, available optional safety packages should be selected for fitment to all vehicles purchased. The Committee suggests that similar measures be supported through AFMA.

The selection of safety technologies can have other benefits for fleet operators. A 2003 Austroads report, *A Review of Literature and Trials of Intelligent Speed Adaptation Devices for Light and Heavy Vehicles,* identified that the use of ISAdapt reduced fuel consumption too.[119] The prioritising of safe vehicles does not mean sacrificing other fleet requirements.

Further, the inclusion of additional economical benefits, external to safety would change cost-benefit analysis calculations so that fitment decisions are more likely.

Occupational Health and Safety

The responsibility of employers under Occupational Health and Safety (OHS) legislation was also flagged as a countermeasure for increasing vehicle fleet safety.[120]

The importance of OHS was promoted by Mr McArthur, Manager, Vehicle Safety, VicRoads at a Committee hearing, 6 August 2007. Mr McArthur stated that:

> … OHS requirements are a very strong driver for purchasing safe vehicles.[121]

Mr David Healy, Senior Manager Road Safety, TAC, stated at the Australasian Road Safety Research Policing and Education Conference in Melbourne, September 2007 that OHS is a motivator behind the selection of safer vehicles in fleet purchasing decisions.[122]

Mr Healy identified that the TAC had collaborated with WorkSafe Victoria and developed guidelines, and subsequent workplace inspector training, to encourage companies to upgrade their fleet for the purpose of improved OHS.[123]

At the public hearing, Mr Gwynne reinforced the role of OHS in prioritising vehicle safety when considering vehicle selection.[124]

The significance of vehicle travel as an OHS factor is evident when the number of work related vehicle trips is considered. Dr Narelle Haworth cited research in the following paper, *Updating MUARC's Car Policy – Research Meets Practice*. Dr Haworth identified that:

> Work-related travel comprises about a third of all travel, increasing to more than half if commuting to and from work is included.[125]

The Committee considers that the safety of employees is an important issue and that OHS is therefore a significant opportunity to add weight to arguments justifying the selection of safe vehicles and the fitment of safety technologies by vehicle fleet managers.

Recommendation

32. That from 2010, all new Government cars purchased or leased have a five star Australasian New Car Assessment Program crash rating. In the interim, all new vehicles purchased be fitted with all available safety options.

A Collaborative Approach

Governments, vehicle manufacturers and importers, road user groups and road safety lobbies share a common goal of improving vehicle safety. A shared goal requires a shared responsibility.

The Committee considers that a collaborative approach between the Government, manufacturers and road safety groups, to encourage the fitment of safety technologies will produce the greatest effect and increase in both fitment and vehicle safety.

The potential of collaborative initiatives by the Victorian Government, given the location of substantial sections of the vehicle industry in Victoria, was identified in the RACV submission.[126]

An example of the potential of improved vehicle safety through collaboration was illustrated at the 2007 conference on the Enhanced Safety of Vehicles. The paper, 'Intelligent Seatbelt Reminders: Do They Change Driver Seat Belt Use in Europe', co-presented by the Swedish Road Administration, the Folksam Research and Karolinske Institutet, provided the example of achieved fitment of advanced seatbelt reminders. The paper noted that:

> ... the Swedish Road Administration together with Swedish car manufacturers and research institutes started a co-operation around improved seat belt reminder systems in 1995. The joint effort resulted in a shared understanding that improved seat belt reminders could play an important role to increase seat belt use.[127]

The resultant fitment of this technology, following collaboration, reduced the number of occupants not wearing a seatbelt by 80 per cent.[128]

Increasing Fitment Rates Together

The Committee does not consider that the responsibility to ensure the fitment of safety technologies falls to any one party. An increase in the fitment will require an effort from everyone involved, Government, the vehicle industry, road safety bodies and consumers.

At a public hearing, 13 August 2007, Mr Gwynne, Director, Service Delivery, Government Services Group, Department of Treasury and Finance, indicated that VicFleet encourages local manufacturers to include safety technologies in base models.[129]

Memorandums of understanding and agreed timelines for the introduction and standard fitment of vehicle safety technologies are forums for government and manufacturers to work together.

The United States Department of Transportation National Highway Traffic Safety Administration (NHTSA) is of the view that industry agreed voluntary initiatives in the near term, combined with long-term regulatory standards are complementary approaches toward safer vehicle objectives.[130] The TAC submission encouraged the complimentary strategies of encouraging manufacturers to voluntarily fit safety technologies and regulations to ensure that where this fails, vehicle safety in Victoria continues to improve in line with, or exceeds, other developed economies.

A co-operative relationship between Government and Industry can produce greater safety outcomes than either a strong regulatory environment or through market forces alone.

An approach suited to encouraging commercial vehicle owners and operators has been demonstrated by the National Transport Commission as an example of a collaborative approach. A give and take model was pursued, whereby the fitment of front underrun protection was offset by no net decrease in load capacity due to increase to gross vehicle mass.[131]

The Committee recognises that the automotive industry is currently a significant component of the Victorian economy. It is therefore in the interest of both the Victorian Government and local automotive industry to support co-operative initiatives to increase the fitment of safety technologies to locally manufactured vehicles.

However, the automotive sector is also important to South Australia and more broadly, Australia. This is evident in the Federal Governments current Inquiry into the Automotive Industry. The responsibility of ensuring world class specification of safety technologies for Australian vehicles should not be unevenly carried by a Victorian Government that wishes to improve vehicle safety.

Therefore the Committee recommends that the Victorian Government continue its proactive approach to road safety and support of Victorian industry by initiating collaboration with the vehicle industry to achieve increased fitment of safety technologies.

Recommendation

33. That the Department of Transport, Department of Innovation, Industry and Regional Development and VicRoads engage the South Australian and Federal Governments in the formation of an inter-governmental vehicle safety taskforce charged with the task of encouraging local manufacturers to fit leading edge technologies.

Commercial vehicle operations also provide an opportunity for cooperative efforts. At a public hearing the Committee were informed by Mr Fox, 4 February 2008, that Linfox have arranged meetings with a European heavy vehicle manufacturer for four State transport ministers and nine representatives from the Federal Government to advocate for increased heavy vehicle safety.[132] Mr McInnes, Group Manager, Environment and Climate Change, Linfox, stated that Linfox:

> ... accept our responsibility, as a major land transport provider, to demonstrate and implement leadership.[133]

Efficiency advantages from active safety technologies such as ISAdapt and ACC for heavy vehicle operators have been identified by Austroads as adding incentive for the fitment of these technologies.[134] This is due both to the commercial context, comparatively large amount of time spent on the road and public concerns about the involvement of heavy vehicles in road crashes.[135]

Similarly taxis are another commercial transport avenue that could benefit from increased fitment of safety technologies. In addition to the immediate safety of drivers and customers already identified, taxis are regularly on sold into the low-end of the used car market. This presents a valuable opportunity to increase vehicle safety in a vehicle segment that will not benefit from vehicle safety strategies in the short and mid term.

The long hours spent driving provides a strong argument for the fitment of fatigue monitoring or surrogate fatigue technologies. The 24 hour service of some commercial vehicles adds justification to this argument and also ensures that a greater proportion of vehicles on the road are highly specified with safety technologies.

Therefore the Committee considers that it is imperative that commercial drivers benefit from safer vehicles and that commercial companies provide safety technologies in their fleet that enable drivers to drive more safely.

Recommendation

34. That VicRoads investigates, by 2010, the potential introduction of Lane Departure Warning and Forward Collision Warning technologies to all new commercial vehicles.

Achieving a high level of vehicle safety in Australia is a collective responsibility. Both manufacturers and the Government need to show leadership in ensuring the fitment of safety technologies. Consumers too need to demonstrate a commitment by buying safe vehicles. The Victorian Government can demonstrate leadership through fleet vehicles purchased and encourage the private sector to also choose the safest vehicles possible. Finally, the public need to be educated about leading edge technologies and encouraged to prioritise safety when buying a car or motorcycle.

Summary of Findings

- The responsibility of increasing the fitment of safety technologies lies with all parties, including the Government, the vehicle industry, road safety organisations and the public.
- The availability of a technology is a prerequisite to fitment, however de-specification is reducing the availability of technologies in Australia and in some instances bundling is adding extra cost to safety technologies.
- Manufacturers were circumspect in the evidence regarding the timing of the fitment of technologies they provided for the Committee, citing commercial-in-confidence.
- The Australasian New Car Assessment Program has been successful in increasing vehicle safety levels. However ANCAP has to maintain its relevance as a result of the shift in emphases from passive to active technologies. The Committee considers that funding of ANCAP needs to be increased to allow greater testing and wider publicity in Victoria.
- The public needs to be kept informed about the importance of vehicle safety and encouraged to prioritise safety when buying a vehicle. One way of keeping consumers informed is through a renewed TAC website www.howsafeisyourcar.com.au.
- The Committee considers that reduced third party insurance could provide an incentive to encourage the purchase of safe vehicles.

- Occupational Health and Safety makes the supply of safe vehicles a requirement of employers.

Recommendations

25. That VicRoads analyse crash data and the Used Car Safety Ratings data to determine a crash profile for the Melbourne metropolitan area, regional centres and country regions, and then determine the safety technologies most suited to addressing these crash profiles. This information should be shared with vehicle manufacturers to encourage fitment of technologies that would help reduce Victorian crashes.

26. That the Victorian Government develop and implement strategies to strongly discourage retailers from bundling safety technologies with non-safety features.

27. That VicRoads and the Transport Accident Commission provide sufficient funding, over the next five years, to implement the Australasian New Car Assessment Program Stars-On-Cars program in Victoria.

28. That the Transport Accident Commission review and expand the website, www.howsafeisyourcar.com.au, and promote the following technologies:

- **Pre-emptive Brake Assist**
- **Lane Departure Warning**
- **Adaptive Cruise Control**
- **Pedestrian Protection**
- **Active head restraints**
- **Repeatable Seatbelt Pre-tensioning.**

29. That the Transport Accident Commission undertake economic modelling to establish discounts for compulsory third party insurance premiums according to the safety features fitted to vehicles.

30. That the Victorian Government collaborate with private insurance companies to encourage insurance incentives for safer vehicles.

31. That once Intelligent Speed Adaptation technology becomes available, Victoria Police, the Department of Justice and VicRoads, develop and trial a program to target recidivist speed offenders and drivers/riders caught exceeding the speed limit by 30 km/h.

32. That from 2010, all new Government cars purchased or leased have a five star Australasian New Car Assessment Program crash rating. In the interim, all new vehicles purchased be fitted with all available safety options.

33. That the Department of Transport, Department of Innovation, Industry and Regional Development and VicRoads engage the South Australian and Federal Governments in the formation of an inter-governmental vehicle safety taskforce charged with the task of encouraging local manufacturers to fit leading edge technologies.

34. That VicRoads investigates, by 2010, the potential introduction of Lane Departure Warning and Forward Collision Warning technologies to all new commercial vehicles.

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Chapter

6

Intelligent Transport Systems

The development of Intelligent Transport Systems (ITS) is being facilitated by enhanced communication technologies that improve the security, management, efficiency, environmental effect and safety of sea, air and land transport. There is limitless scope within this range for improvements in road and vehicle safety.

In most cases the public is unaware that ITS is already playing a key role in the movement of traffic in metropolitan Melbourne, such as, travel time signs, variable speed limit signs that can change according to congestion and adverse weather, and digital signs indicating available parking spaces and public transport co-ordination.

At a public hearing in Melbourne, 4 February 2007, Mr Peter Robertson, General Manager of Vehicle Safety Standards, Federal Department of Infrastructure, Transport, Regional Development and Local Government defined vehicle safety aspects of ITS as:

> ... onboard systems that utilise information received from direct sensing or telecommunications via infrastructure or another road source.[1]

Communication from one vehicle to other vehicles, or a vehicle and roadside infrastructure is the focus of ITS enabled vehicle safety technologies. ITS can transform the leading edge technologies, identified in Chapter 3, from autonomous vehicle-based systems into a networked safe system that integrates vulnerable road users, such as pedestrians and bicyclists and post-crash emergency communication networks.

ITS is being actively promoted by the Governments of most developed economies through development programs and dedicated organisations, which include demonstrations of the potential for ITS to improve vehicle safety. However, the pace being set by different countries varies and Australia is lagging. Much of the technology and potential safety systems described in this chapter will not be available in Australia for some years, and longer if Australian ITS development is not significantly increased.

The Future of Vehicle Safety

Vehicle-to-Vehicle

Currently, leading edge safety technologies rely on in-vehicle sensors to determine the location of other vehicles and roadway infrastructure. Pre-emptive Brake Assist for example, needs to detect and monitor the vehicle ahead and differentiate between the moving vehicle and other vehicles. Blind spot monitoring systems use a separate array of sensors. Both systems need to have a direct line of vision to surrounding vehicles.

Further, each individual technology adds additional expense and complexity to the price and functioning of a vehicle and is limited to a maximum range of 100 metres.[2]

ITS enables the replacement of various in-vehicle sensors with a single radio receiver. An ITS enabled vehicle receives Global Positioning Satellite (GPS) information from a 300 metre radius.[3] The vehicle is able to regularly monitor and track the movements and speed of surrounding vehicles. Rather than using the sensors to detect and track other vehicles, the ITS capable vehicle is effectively being told by other vehicles of their presence.

Vehicle-to-vehicle (V2V) communication technology transmits three types of information between vehicles:

- vehicle positioning and travel movement;
- information about changes in road conditions; and
- road hazards detected by on-board systems.

Communication of another vehicle's location through GPS means that a driver can be made aware of unseen vehicles, significantly improving on the current requirement of the driver, or sensors, to have a direct line of sight.

The benefit to the driver is that they will be made aware of vehicles entering from a side street, travelling around a corner, or unseen traffic congestion further down the road.[4]

At the National Electronic Tolling Committee (NeTC) Industry Forum, held in Melbourne, 21-23 April 2008, Mr Donald Grimm, Senior Researcher, Wireless Systems & Technology Group, General Motors (US), stated that a vehicle could potentially record enactment of safety systems, for example, Electronic Stability Control (ESC) due to some sort of spill on the road surface. This information would be tagged with a GPS location and then relayed

to vehicles approaching that part of the road, effectively erecting a virtual warning sign for that section of road.[5]

Where infrastructure may not exist, such as outside capital cities, or communication black spots due to the geographic terrain, central traffic management would rely on information being passed on through transmissions between vehicles.[6]

Vehicle-to-Infrastructure

Vehicle-to-Infrastructure (V2I) presents the most accessible starting point for implementing an ITS system in Victoria.

V2I technologies allow the direct communication of information from a central traffic management centre to passing vehicles via roadside transmitter beacons and visual displays. The data flow can also be two-way with data collected by a vehicle being transmitted back to the traffic management centre.

Variable speed limit signs could transmit the current speed limit to a vehicle's Intelligent Speed Assistance (ISAssist) system.

During the overseas study tour the Committee saw a demonstration of the potential of advanced travel information technology by Siemens in Munich, 12 September 2007. V2I communication can transmit the latest travel time data to individual vehicles. A vehicle's on-board navigation system would than calculate various travel route options based on the pre-selected destination. The system can also deliver parking space information and utilise the satellite navigation system to direct a driver to an available parking space nearest the driver's destination.

V2I ITS systems are also providing an extension to emergency call numbers. Following a crash, when active and passive safety technologies have been deployed, a vehicle's occupants or riders may be trapped, isolated and seriously or fatally injured. Post-crash vehicle safety technology is developing as a tertiary system that transmits an emergency call through ITS infrastructure.[7]

According to the submission from the Monash University Accident Research Centre (MUARC) the human body has a greater chance of being able to survive injuries sustained in a crash if seen by emergency services within the first hour after a crash.[8] Therefore, the objective of emergency call technology is to shorten the time it takes emergency services to arrive at a crash scene. MUARC estimated that increasing the response rate of emergency services could potentially prevent up to 11 per cent of fatalities in Australia.[9]

Current systems such as General Motors OnStar program in the United States, a Puegeot/Citroën system operating in nine European countries and CarCom in Australia are subscriber

systems, offered either through vehicle dealerships or as an after-market service.

These systems provide connection to emergency services via a service provider's operator.

The Committee held discussions on General Motors OnStar service while in Detroit in August 2007. OnStar will automatically notify the OnStar operator in the event of a crash. If occupants can not respond to an OnStar operator's return call, emergency services are sent based on transmitted GPS data, and with a vehicle generated crash report indicating the severity of the crash.[10]

The Puegeot/Citroën system is similar to the OnStar system with either manual or automatic crash notification to a central operator, who contacts the vehicle and determines the requirement for emergency services attendance. In addition to the location and a crash report, the vehicle type and owner's name is transmitted.[11]

The Royal Autmobile Club of Victoria (RACV) Ltd CarCom version offers similar services within the mobile phone network but does not include automatic crash notification. An occupant needs to activate the system by pressing the SOS button. Upon doing so the vehicle's location is transmitted and the occupant is connected to a CarCom operator.[12] GM Holden is offering this service as Holden Assist, a local replication of the OnStar service offered by General Motors in the United States.

The Committee considers these advancements significant lifesaving measures and the establishment of ITS communication infrastructure is required if the 000 emergency system is to continue to provide leading edge emergency assistance to road crash victims.

ITS and Vulnerable Road Users

Passenger cars, heavy vehicles and motorcycles are not the only road users and a complete ITS framework needs to incorporate vulnerable road users (VRUs). The very vulnerability of these road users makes their incorporation into ITS an important safety feature.

Similarly, making pedestrians and cyclists aware of approaching vehicles contributes to their increased safety.

Developments in ITS based safety systems are creating greater channels of communication between vehicles and vulnerable road users.

Communication Protocols

ITS communication is divided into wide communication zones used in V2I and flexible communication networks within immediate locations, local to a vehicle, for V2V functions.

Wide area communication for transmitting data from a traffic control centre to roadside beacons for relay to vehicles uses a specific telecommunications protocol known as CALM (Communications Air-interface, Long and Medium range). The United States is the lead country of an international working group (WG.16) which is standardising the CALM protocol within the broader international standard ISO/TC204.[13]

V2V communication within an immediate area and temporary ad hoc networks use a Dedicated Short Range Communication (DSRC) protocol and operate within an internationally agreed frequency range of 5.850 GHz – 5.925 GHz.[14] Germany is the lead country of a second working group (WG.15) which is standardising the DSRC protocol within ISO/TC204.[15]

Australia is a participating member of both working groups.

The Australian Communications and Media Authority (ACMA) has identified that the 5.8GHz band is used for:

> ... speed/distance measurement, movement detectors, short-range links, traffic monitoring and e-tolling. The 5.8 GHz band is also a principal band for short-range technologies under development in the intelligent transport systems (ITS) sector.[16]

Due to the small market position of Australia, ACMA has stated that with respect to the use and development of short-range devices, attempts are made to:

> ... harmonise our national regulatory arrangements with other regions of the world as far as is practicable.[17]

Mr Dennis Walsh, Executive Director, Planning Design and Operations, Department of Main Roads, Queensland, made an Austroads presentation, in Melbourne, 30 April–2 May 2008, 'Future Bandwidth Requirements for Intelligent Transport Systems' at *RadComms08: ACMA's Second Annual Conference on Spectrum Management*. At his presentation Mr Walsh indicated that representations have been made to ACMA regarding the bandwidth requirements for an Australian intelligent transport system.[18] While

on the overseas study tour, the Committee met with the Department of Transportation, Federal Highway Administration (FHWA) in Washington, 4 September 2007. At that meeting, Dr Joseph Peters, Office Director, Office of Operations, Research and Development, FHWA, informed the Committee that in the United States there is a national DSRC frequency available for ITS communications.[19]

This was confirmed by Mr Grimm at the NETC forum, who stated that the 5.9 GHz band had been set aside for ITS, with a 75 MHz band width allocated that permits seven channels.[20]

Mr Grimm discussed trials in the United States that have revealed limitations in the transmission of data in high traffic volumes. This limitation was offset however, by a reduced requirement for information from vehicles further away.[21]

Europe has also identified the need for a dedicated frequency for V2V communication, choosing 5.8 GHz.[22] However only 30 MHz bandwidth has been allocated, restricting the number of channels to three.[23] This discrepancy in bandwidth should provide a guide to ACMA in decisions on the allocations of bandwidth for Australia.

In Japan the ITS frequency is 2.5 GHz for visual information and 5.8 GHz for visual and audio signals.[24]

Privacy

The functional process of vehicle communication, including the transmitting of location and vehicle data, and the collection of the same data from other road users, raises issues about privacy and information security.

The Committee raised these issues during the overseas study tour in August and September 2007 in meetings held in both the United States and Germany.

Dr Peters noted that privacy considerations needed to be addressed as part of the implementation of ITS technology.[25]

In Munich on 12 September 2007, Dr Jost Gail, Active Safety and Emissions, German Federal Highway Research Institute (BAST) also informed the Committee that V2V communication technology presented privacy and information security issues.[26]

System security was identified in a combined paper presented at the *20th International Technical Conference on the Enhanced Safety of Vehicles* in Lyon, June 2007, from General Motors Corporation and the Ford Motor Company United States. The paper stated that communication has to ensure that it:

> ... has been received unaltered and from a trusted source. In addition, the communication should be anonymous, at least to passive listeners.[27]

The IEEE, originally the Institute of Electrical and Electronics Engineers, has developed the communications protocol, known as IEEE 1609, that has been widely adopted for ITS use. Privacy issues are being addressed through a second communication standard IEEE 1609.2 which includes security protocols and defines the coding for secure message formats and the processing of these messages, including circumstances for use and the purposes of exchange.[28]

Privacy and security is being addressed in Europe by the Geographic Privacy-Aware Knowledge Discovery and Delivery (GeoPKDD) project. The goal of the project is to develop 'trustable technology' for tracking data for moving objects, such as vehicles, while preserving the privacy of the source.[29] This operational protocol will be central to ensuring the privacy and security of vehicles and their occupants.

Secure Vehicle Communication (SEVECOM) is another European project that is primarily concerned with the security of data communicated between vehicles. The project is looking at potential threats to security, requirements of a secure system and the operational structure.[30]

In the Austroads presentation at the RadComms conference, Mr Walsh, stated that the issue of privacy was a key issue identified for an initial ITS future work plan.[31] However, work has not progressed significantly past this initial identification, demonstrating the slow development of ITS in Australia.

ITS Research and Development

In addition to the efforts by developed economies to achieve standardisation of communication protocols and radio frequencies for ITS, they are also researching and developing ITS technology and infrastructure.

In Europe ITS projects are coordinated by ERTICO – ITS Europe which includes a dedicated vehicle safety initiative, eSafety. In the United States and Japan the lead ITS organisations play a different role, providing a network hub for connecting and promoting companies with ITS products. Research and development of ITS infrastructure is led by the respective Government departments, the Ministry of Land, Infrastructure and Transport (MLIT) in Japan and the National Highway Traffic Safety Administration (NHTSA) of the Department of Transportation, in the United States.

The Committee met with representatives from both MLIT and NHTSA during the overseas study tour during August and September 2007.

The lead organisation in Australia is ITS Australia, which follows a similar facilitating role to organisations in Japan and the United States. This was confirmed for the Committee, by Mr Terry Warin, Executive Director, ITS Australia at a hearing, 19 November 2007, who defined the role of ITS Australia as encouraging:

> ... networking between researchers, developers, regulators.[32]

Mr Warin informed the Committee that the Victorian government funded the establishment of ITS Australia's office and data centre at a cost of $1 million.[33] However, as a facilitator ITS Australia is dependent on private companies developing ITS projects and providing funding. Therefore, beyond commercial ventures, the responsibility of co-ordinating research and development leadership lies with Government Transport Departments.

The Committee considers that the government needs to support ITS Australia as the coordinator and leader in the development of ITS in Australia. To be successful, ITS Australia needs to hasten the development of an Australian Intelligent Transport System.

Research and Development in Europe

The European Commission's intelligent car initiative project is i2010. The focus of the initiative is to identify and address barriers to the implementation of ITS in Europe. Barriers identified include:

- consensus between stakeholders within Europe;
- legal and institutional barriers; and
- generating public demand for ITS capable vehicles.[34]

The European Commission has identified that a combination of research, policy and trials will be used to remove barriers to the implementation of ITS. More than €2 billion (approximately $3.3 billion) in funding is being made available in 2009-2010 for reseach aspects of i2010.[35] This is equivelant to one per cent of the €200 billion (approximately $329 billion) in costs incurred by the 40,000 fatalities and 1.3 million crashes in Europe each year.[36]

Many research projects have already been undertaken, or are continuing, into the functional components of ITS. The significant research and trialling of ITS in Europe is illustrated by the

proliferation of sub-projects that further expand on previous research projects.

The following table is a list of European projects researching and developing safety related aspects of ITS.

Table 6.1 Projects List for European Commission i2010: Intelligent Car

Term	Abbreviation
Adaptive Integrated Driver-vehicle Interface	AIDE
System for Effective Assessment of Driver Vigilance and Warning According to Traffic Risk Assessment	AWAKE
Safe and Comfortable Driving Based on Inter-vehicle Communication	CarTALK 2000
Cooperative Communication System To Realise Enhanced Safety and Efficiency In European Road Transport	COM2REACT
Communication Multimedia Unit Inside Car	COMUNICAR
Cooperative Vehicle-Infrastructure Systems	CVIS
CyberCars2	CyberCars2
Socio-economic Impact Assessment of stand-alone and co-operative intelligent vehicle safety systems (IVSS) in Europe	eIMPACT
European In-Vehicle Emergency Call	E-MERGE
Support for the eSafety Forum	eSafety Support
Global System for Telematics enabling On-line Safety Services	GST
Breakthrough Intelligent Maps and Geographic Tools for the Context Aware Delivery of eSafety and Value-Added Services	HIGHWAY
Preventative Safety (Active Safety integrated project in EUCAR Integrated Safety Programme)	PREeVENT
Co-operative Systems for Road Safety "Smart Vehicles on Smart Roads"	SAFESPOT
Exploratory Study on the Potential Socio-Economic Impact of the Introduction of Intelligent Safety Systems in Road Vehicles	SEISS
Secure Vehicle Communication	SEVECOM
Traffic Accident Causation in Europe	TRACE
Vehicle-vulnerable Road User Cooperative Communication and Sensing Technologies to Improve Transport Safety	WATCH-OVER

Source: European Commission, *i2010: Intelligent Car*, 2007, p. 16.

Below is a short summary of a number of projects being undertaken by the European Commission that indicates the level of development of ITS in Europe.

WILLWARN

The WILLWARN project, finalised in January 2007, produced a fully integrated application of V2V communication. Notably the project found that the accuracy of existing GPS technology was in most instances sufficient for the task. The report identified larger field

trials and a study of human behaviour associated with the use of the technology as the next step.[37]

SAFESPOT

The SAFESPOT ITS trial is exploring the usability of data from roadside sensors (V2I) and data from vehicles within the immediate vicinity (V2V) to increase the time available for a driver to respond to an emergency situation.

Running for four years from 2006 until 2010, the SAFESPOT trial is developing and testing technology with the objective of:

> ... improving the driver's access to vital safety-relevant information, and enhancing the precision, reliability and quality of this information.[38]

Technological prototypes are scheduled for development and testing in 2008 and further testing and evaluation in 2009.[39]

The SAFESPOT project involves eight separate sub-projects looking at different aspects of the system, including:

- vehicle and infrastructure technologies;
- cooperation between technologies;
- system architecture; and
- deployment.

The systems being trialled will be installed on existing infrastructure.[40] At a cost of €37.63 million (approximately $64 million), the trial has received €20.59 million (approximately $35 million), in funding from the European Commission Directorate General Information Society and Media.[41] The project is being coordinated by the Fiat Research Centre, demonstrating cooperation between Government and industry.

WATCH-OVER

The WATCH-OVER project is researching and developing technology that will detect vulnerable road users (VRU). Unique technology is required because sensors currently being used to detect other vehicles are not suited to the detection of humans.[42] Pedestrian movement is not as restricted as vehicle movements, for example stepping out from between parked cars, making the design of detection technology more difficult.[43]

The WATCH-OVER project was limited however, to one-way communication from a VRU to a vehicle. A pedestrian or cyclist would have similar locating transmitters as those fitted to vehicles that would allow a vehicle equipped with WATCH-OVER technology to identify VRUs.[44]

The WATCH-OVER project identified a system requirement for a vehicle or VRU unit to be capable of communicating with multiple users. In 2007 the system architecture design was being finalised, the communication protocol selected and a new generation camera developed.[45]

eCall

In Europe an emergency-call system, or eCall, is being developed as an extension of the European emergency number, 112. The European Commission i2010 project overview states that:

> When a car senses a major impact...its eCall device automatically calls the nearest emergency centre using 112.[46]

Emergency services are given route guidance via V2I systems and V2V technology delivers the emergency call to approaching vehicles to warn of the crash situation.[47]

However the 2007 project evaluation report, *Global Systems for Telematics*, submitted to the European Commission, from the project partners operating the London eCall test site, notes that while some technical aspects of the eCall system are nearly ready to implement, while: 'others are a few years away'.[48]

Mr Ian Knowles from the European Commission informed the Committee at a meeting in Brussels, 7 September 2007, that within Europe, eCall was predicted to prevent 1,400 fatalities and 27,000 severe injuries annually.

In 2006 the European Commission released the report, *Cost-Benefit Assessment and Prioritisation of Vehicle Safety Technologies*, calculated a cost-benefit analysis of eCall and found that it produced varying results depending on the cost scenarios and the severity of crashes considered.[49]

Despite this, eCall has been given high priority by the European Commission and completion of a European wide system roll-out is scheduled for 2009 that will see eCall devices fitted to all new cars sold in Europe.[50]

Socio-Economic aspects of ITS

In addition to a focus on the technical requirements of ITS and the establishment of infrastructure and vehicles, Europe has considered the socio-economics of ITS through two studies:

- Exploratory Study on the Potential Socio-Economic Impact of the Introduction of Intelligent Safety Systems in Road Vehicles (SEISS).
- Socio-economic Impact Assessment of stand-alone and co-operative intelligent vehicle safety systems in Europe (eIMPACT).

The focus of eIMPACT has been to identify the most promising ITS based vehicle safety technologies through cost-benefit analysis and traffic safety and efficiency scenarios to develop policies that will facilitate implementation.[51]

The findings of the eIMPACT project were presented at a conference in Paris on 26 June 2008. Key findings from the project included:

- the ease of deployment varies between technologies;
- the majority of technologies are 'distinctly profitable from a society point of view';
- a need for customer understanding of technologies; and
- introduction of technologies needs to be determined by competing stakeholder strategies.[52]

Research and Development in the United States

In the United States the Federal Intelligent Transportation Systems program invests in major initiatives and exploratory studies to support widespread deployment of ITS.[53] This support includes a $US100 (approximately $107) million research budget for NHTSA's ITS research division, along with greater flexibility in determining how the funding is used.[54]

The significance of this amount is low however compared with the funding being provided in Europe.

During the overseas study tour the Committee met with Mr Ray Resendes, Intelligent Technologies Research Division, at a meeting with NHTSA in Washington, 4 September 2007. Mr Resendes informed the Committee that NHTSA are researching prototype ITS vehicle safety technologies under real conditions for both cars and heavy vehicles.[55]

These technologies are being developed within the Vehicle Infrastructure Integration (VII) program. The responsibility for vehicle based technology is allocated to vehicle manufacturers and the infrastructure for all major roads is the responsibility of the Department of Transportation.[56]

The successful development and implementation of ITS is dependent upon the co-operation between Government and Industry.

An overview of ITS research and implementation in the United States is provided by the Department of Transportation, Research and Innovative Technology Administration (RITA) website.[57] Research listed includes a network trial of vehicles capable of 360 degrees awareness of hazards and appropriate communication with the driver utilising V2I and V2V systems and technology.[58]

A feasibility study into the widespread deployment of ITS and the establishment of an implementation strategy is underway.[59] Currently a testing facility for prototype technologies developed for the VII program is being established in Detroit, with the facility scheduled for completion towards the middle of 2008. The United States Department of Transportationation has sought expressions of interest for its operation and use.[60]

Vehicle Safety Communication

In the United States technology and systems are being developed in the Vehicle Safety Communication – Applications (VSC-A) project. VSC-A is a joint project comprising the United States Department of Transportationation and five vehicle manufacturers DCX, Ford, General Motors, Honda and Toyota.[61] The VSC-A project began in December 2006 and the objectives are:

- to assess and define the application, performance and requirements of Dedicated Short Range Communication (DSRC) and GPS technologies;
- develop common communication systems and protocols;
- develop an accurate and affordable vehicle positioning technology in conjunction with the capability of DSRC technology;
- develop an analysis of safety benefits compared with market penetration to design deployment models;
- develop a security solution for safety communications; and

- develop a verifiable set of objective tests for vehicle safety communication applications.[62]

Mr Grimm, Senior Researcher, Wireless Systems & Technology Group, General Motors US was a keynote speaker at the National Electronic Tolling Committee (NeTC) Industry Forum, 21-23 April 2008, in Melbourne. In his address he outlined the trial of six V2V test vehicles. Mr Grimm stated that the installed technologies comprised of three systems: safety, driver assistance, and transport efficiency. He noted that to be successful, these applications will require high market penetration and high speed communication capabilities.[63]

Co-operative Intersection Collision Avoidance Project

In a meeting with the FHWA in Washington, 4 September 2007, Mr Robert Ferils, Technical Director, Office of Operation, Research and Development, FHWA, outlined for the Committee the Co-operative Intersection Collision Avoidance (CICAS) project. In the United States, half of all road crashes and 21 per cent of fatalities occur at intersections. Therefore improving intersection safety has been made an ITS priority.[64]

The basis of the CICAS project is to alert vehicles approaching an intersection of other vehicles either entering or crossing the intersection. The system can utilise data both from other vehicles and intersection infrastructure.

A CICAS trial in Minnesota that ran from 2004 to 2007 used a portable surveillance system comprising cameras, sensors, radars and short-range communication technology. The portable system allowed multiple intersections to be studied in the trial.[65]

As a result of these trials the predicted benefits of the CICAS system have been assessed as a saving of:

> ... up to $45 billion in comprehensive costs and 4,600 fatalities.[66]

Next Generation 9-1-1

The United States is developing an infrastructure based post-crash emergency system. Similar to the eCall project in Europe, the new system is an extension of the existing 911 emergency number, called Next Generation 9-1-1.[67]

Next Generation 9-1-1 will be supported by Response Routing, a system that determines the quickest route for an emergency vehicle to take to a crash scene.[68]

Dr Joseph Kanianthra, the Associate Administrator of Vehicle Safety Research, NHTSA, informed the Committee at a meeting in Washington on 4 September 2007 that post-crash systems will be available by 2010.[69]

A prototype motorcycle specific post-crash system has been developed at the University of Massachusetts. When the helmet senses an impact, a beeping signal is activated. If after 60 seconds the rider does not respond to the alarm, an emergency call is sent.[70]

Research and Development in Japan

The MLIT is coordinating the development and implementation of ITS in Japan. Vehicle manufacturers have been enlisted by MLIT to develop V2V safety technologies and systems. Local prefectures (municipalities) have installed trial infrastructure in support of V2I safety applications, often in conjunction with a vehicle manufacturer.

In conversation with Mr Yoshihiko Teguri, Senior Manager, Information and Safety System, Research and Development Department, Driving Assist and Safety Product Division, Denso Corporation during the overseas study tour, Nagoya, 29 August 2007, the Committee heard that the potential of ITS has led safety technologies supplier Denso to shift the focus of product development toward ITS because that is the future for vehicle safety.[71]

Advanced Safety Vehicle

The Advanced Safety Vehicle (ASV) project has been the main program for vehicle based ITS technologies.[72] The involvement of Japanese vehicle manufacturers has meant that all vehicle types, cars, motorcycles and heavy vehicles, have been represented in ASV trials.[73]

The long-term commitment to ITS in Japan is evident by the systemic approach taken by MLIT, dating back to 1991. Below is a summary of the progressive developments from successive generations of the ASV project:

ASV1	1991-1995	Study of technical feasibility
ASV2	1996-2000	Research and development for practical application

ASV3	2001-2005	Study for diffusion and promotion, and the development of new technologies[74]
ASV4	2006-2010	Real world trials and introduction of technology to market[75]

A predictive simulation of real world deployment during the ASV3 trial phase, achieved a 28 per cent reduction in fatalities and 38 per cent reduction in serious injuries.[76]

ASV4 is scheduled for completion in 2010 and will involve on-road trials in collaboration with industry and government.[77] The stated aim of ASV4 is to achieve:

> Full-scale introduction of autonomous detection type driver assistance systems.[78]

In realising this aim Japan will have completed a significant achievement. While this progress highlights the lack of ITS development in Australia, it also provides a tested framework that Australia could import and adapt.

The advanced development of ITS in Japan has given rise to operational issues, some of which were a topic of discussion at a lecture at *Fiscal 2006 ITS Info-Communications Forum Symposium* in Tokyo on 6 June 2006 by Akira Iihoshi, Chief Researcher, automobile research and development at Honda. Mr Iihoshi commented that a staggered approach to implementing an ITS safety system would work best. He stated that:

> Since there will be few vehicles in which the system is installed when system operation begins, it is believed that the service itself should be limited, thereby urging drivers to maintain alertness at all times. As the share of vehicles using the system approaches 100%, it is expected that higher levels of functionality will be added; with system functions progressing from perceptual functions to providing information for safe driving support and bringing attention to dangers and braking assistance.[79]

SMARTWAY

The Committee was informed by Mr Tetsuo Hasegawa, General Manager, Global Government Affairs Department – Environmental & Safety Technologies, Technology Development Division, Nissan, in Tokyo, 28 August 2007 that in the short-term, V2I ITS can be implemented through existing telecommunication and vehicle navigation systems. By building on existing technology the

implementation of the first stage benefits from existing infrastructure. Mr Hasegawa stated that dedicated vehicle technologies including vehicle-to-mobile phone communication to warn pedestrians and drivers of their mutual presence, was being developed in support of mid-term ITS objectives.[80]

At March 2008 over 30.6 million navigation systems and more than 21.1 million on-board vehicle information and communication systems (VICS) had been sold in Japan.[81] Both technologies can be used to communicate information to a driver.

In 2007, as part of the ASV project, 60 trial vehicles tested traffic information, such as obstacles, road conditions and merging assistance systems. The particular trial project is known as SMARTWAY [82] When the Committee visited Japan in August 2007 the trial had begun. In 2008 the trial was to increase to large-scale testing with the project scheduled to be operational in 2010. The Committee was informed by Mr Takayoshi Kagei, Chief, ITS Policy and Program Office, Road Traffic Control Division, MLIT, at the meeting, that the end goal is a single platform for ITS technology by 2012.[83]

Recent findings in the 2007 report from the ITS Promotion Office, Road Administration, MILT, *ITS: A Collection of Effectiveness Case Studies: 2007-2008*, indicate that ITS vehicle safety technology has reduced:

- lane departure deviation across curves by half; and
- the number of crashes attributed to forward obstacles, including rear end crashes by 79 per cent.[84]

The MLIT website identifies that ITS:

> … requires a high-standard of upgrading of diversified information-related infrastructure for collection, provision, communication, and processing of information, and installation of necessary infrastructure. Since the infrastructure required for ITS is highly public, it is necessary to actively and systematically promote implementation of this infrastructure to realize the development and deployment targets …[85]

SKY Project

At the meeting with Nissan Motor Company Ltd, in Tokyo, Mr Hasegawa informed the Committee that Nissan was a participant in the SKY project. The safety of vulnerable road users is one aspect of the SKY project, utilisng mobile phone messaging to warn pedestrians of approaching vehicles and to notify the vehicle of the

presence of pedestrians.[86] The message over-rides any communication being conducted on a mobile phone at the time. A trial with 2000 vehicle is currently being undertaken with the goal of implementing the system in 2010.[87]

ITS in Australia

Australia is only at the starting line of ITS development. At a recent conference hosted by the Federal Government's Australian Communications and Media Authority (ACMA), *RadComms08: ACMA's Second Annual Conference on Spectrum Management,* Melbourne, 30 April-2 May 2008, Mr Walsh, Austroads Network Taskforce representative, stated that there has been an increased recognition of the importance of ITS amongst senior transport executives.

Austroads are completing a report outlining the importance of the frequency 5.9 GHz in support of ITS development in Australia.[88]

As part of this preliminary development an Australian wide embargo on new frequency assignments in the frequency range 5.85 – 5.925 GHz came into effect on 24 April 2008, reserving this spectrum for a potential future ITS application.[89]

While Australia is only at the preliminary stage of formulating an agenda of issues needing investigation for a future work plan, the lagging status of ITS development in Australia had already been recognised by Austroads. In the 2003 report, *A Review of Literature and Trials of Intelligent Speed Adaptation Devices for Light and Heavy Vehicles*, Austroads stated that:

> ... to date, Australia has lagged behind the rest of the world in relation to the design, development and deployment of in-vehicle ITS technologies.[90]

Australia is years behind in ITS development that other developed economies have undertaken, in some cases soon to implement.

One exception to the lack of ITS trials is a trial in Western Australia of ITS communication technology as part of an Intelligent Speed Assistance (ISAssist) trial. The trial is unique amongst previous Australian trials of ISAssist for its use of vehicle-to-infrastructure (V2I) communication. Three beacons have been installed in Perth to transmit speed zone data map updates to trial vehicles with wireless communication. The updated data will also utilise vehicle to vehicle (V2V) communication through transmissions from police cars.[91] Trials are presently underway with preliminary results not expected until the end of 2008.

In the absence of Government leadership, ITS research and development in being selectively pursued by private companies. These include:

- The collection and relay of VicRoads crash information to subscribers. The Committee understands that two local manufacturers are in discussion with a private company to provide this information into their vehicles.

- The RACV's CarCom product previously discussed in this chapter.

- Private road mapping by both satellite navigation companies and an after market ISAssist product.

The real potential of ITS will require Government support and commitment in co-operation with research institutes and manufacturers. This is evident in the important role collaboration has played in Japan, Europe and the United States.

The Committee is also conducting a concurrent Inquiry into Improving Safety at Level Crossings. At a public hearing for that inquiry, 14 April 2008, Mr Warin, Executive Director, ITS Australia, informed the Committee that ITS development in Australia is five years behind Japan and Europe.[92]

Mr Peter Bentley, President, ITS Australia stated at the *ITS for Railway Level Crossing Workshop*, in Melbourne, 29 February 2008, that achieving Vision Zero – zero road and rail fatalities – will only be achieved through the implementation of vehicle-to-vehicle and vehicle-to-infrastructure systems and associated fitment of requisite technologies in vehicles.[93]

The Committee considers that closing the gap on ITS development and implementation is an imperative requirement both for the advancement of vehicles safety and road safety generally. A failure to realise the potential safety benefits of ITS would result in Australia's vehicle and road safety standards falling further behind other developed economies.

The Committee calls on the Victorian Government to further demonstrate its leadership in vehicle and road safety by acting to close the ITS gap in Australia through a major funding commitment and departmental support for the rapid deployment of the requisite vehicle and roadside infrastructure.

What is Required

The Committee recognises that if Australia is to benefit from leading edge ITS technology, significant funding will be required. The

provision of this funding by the Victorian Government will ensure that Victoria remains a leader in road safety. Sufficient funding would contribute to a reduction in road trauma and the development of a new industry in Victoria.

The Committee considers that for Victoria to successfully deploy an Intelligent Transport System will require collaboration with ITS Australia. ITS Australia for its part will have to move from a facilitator to management role to ensure ITS projects are delivered.

At the NeTC Industry Forum, Mr Grimm identified that the key restriction to wide spread roll out of vehicle-to-vehicle (V2V) ITS safety systems is the number of vehicles transmitting positional information.[94] Vehicles fitted with V2V systems to detect information will only be viable, from both a safety and marketing perspective, if a great majority of vehicles are transmitting, at a minimum, positional information for V2V enabled vehicles.

The Committee considers that all vehicles need to be fitted with transmitting beacons. A retrofit program would be a necessary step toward a high functioning intelligent transport system for Australia.

ITS based safety technologies go beyond the traditional concept of stand alone vehicle based technologies. This shift means that safety technology is no longer the primary domain of vehicle manufacturers.

The Government has a central role and key responsibility in establishing infrastructure that will facilitate the integration of vehicle based ITS components.

As discussed earlier, this technology is close to operational development in Japan and Europe is not far behind. This gives Australia the opportunity to jump start ITS infrastructure through the importation of ITS technology and knowledge from these leading economies.

Austroads has identified the potential of adapting overseas developments as an option for an initial ITS future work plan.[95]

The Committee considers that prerequisite infrastructure must be established to stimulate the corresponding fitment of vehicle based technologies to realise the potential vehicle safety of ITS.

The fitment of vehicle based GPS beacons to locate vehicles within an ITS network would enable the establishment of an ITS based 000 post-crash function, like those set to be launched in Europe and the United States within the next two years.

The Committee considers that this is an achievable first stage ITS project and one that has the potential to deliver safety benefits for both new and existing vehicles.

Recommendations

35. That the Victorian Government coordinate, with ITS Australia, the financial and technical support required to develop, trial and adopt Intelligent Transport System infrastructure for Victoria as a matter of urgency.

36. That VicRoads fit transmitting beacons with a 000 emergency call function to all existing vehicles as a part of vehicle regulation from 2011.

37. That the Department of Transport and the Department of Justice extend the existing 000 emergency number to include distress calls generated by in-vehicle transmitting beacons.

Summary of Findings

- Communication systems linking vehicles to a central transport centre and networks between vehicles are set to potentially revolutionise road safety and the vehicles we drive.
- Significant development and trials have been undertaken overseas, with Japan on track to launch an active Intelligent Transport System in 2010.
- That State and Federal Governments need to take immediate action to ensure that Australia keeps pace with technologies in establishing ITS based road safety infrastructure.
- That ITS Australia must take a greater leadership role in the management of ITS research and development.

Recommendations

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36. That VicRoads fit transmitting beacons with a 000 emergency call function to all existing vehicles as a part of vehicle regulation from 2011.

37. That the Department of Transport and the Department of Justice extend the existing 000 emergency number to include distress calls generated by in-vehicle transmitting beacons.

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Appendix A

List of Submissions

Government

Australian Government, Department of Infrastructure, Transport, Regional Development and Local Government

Department of Treasury and Finance, VicFleet

Government of Western Australia, Department for Planning and Infrastructure

Government of Western Australia, Department of Premier and Cabinet – Office of Road Safety

Government of Western Australia, Main Roads

Transport Accident Commission

VicRoads

Victoria Police

Non Government

Australasian New Car Assessment Program

Australian Automobile Association

Australian Fleet Managers Association

Automotion Control System Pty Ltd

BMW Motorrad

Dashlite® Australia

Federal Chamber of Automotive Industries

Ford Motor Company of Australia Limited

Gleneagles Stud Pty Ltd

GM Holden Ltd

Hyundai Motor Company Australia Pty Ltd

Isuzu Australia Limited

Intelligent Transport Systems Australia

Linfox Australia Pty Ltd

Mazda Australia Pty Ltd

Mitsubishi Motors Australia

Monash University Accident Research Centre

Robert Bosch (Australia) Pty Ltd

Royal Australasian College of Surgeons, Victorian Road Trauma Committee

Royal Automobile Club of Victoria (RACV) Ltd

Streets Ahead Pty Ltd

The Royal Humane Society of Australasia Inc

Toyota Motor Corporation Australia Ltd

Truck Industry Council

Vehicle Design and Research Pty Ltd, in conjunction with Safety and Policy Analysis International

Victorian Transport Association Inc

Xenon Technologies Pty Ltd

Individuals

Name			Suburb
Mr	P	Dolheguy	Belmont
Professor	B	Fildes	Clayton
Mr	W	Haire	Wodonga

Confidential Submission

Appendix B

List of Witnesses

Public Hearings

Melbourne 6 August 2007

Professor Brian Fildes	Chair, Road Safety
Dr Stuart Newstead	Senior Research Fellow
Dr David Logan	Senior Research Fellow
	Monash University Accident Research Centre
Mr John Bolitho	Senior Manager, Legal Policy
Mr David Healy	Senior Manager, Road Safety
	Transport Accident Commission
Sergeant Peter Bellion	Collision Reconstruction Team Leader
	Victoria Police, Major Collision Investigation Unit
Mr Gary Liddle	Chief Executive
Mr George Mavroyeni	Executive Director, Road Safety and Nework Access
Mr Ross McArthur	Manager, Vehicle Safety
	VicRoads

Melbourne 13 August 2007

Mr Michael Case	Chief Engineer, Vehicles
	Royal Automobile Club Victoria (RACV) Ltd
Dr Jeffrey Potter	Senior Manager, Safety
	National Transport Commission
Mr Ken Thompson	Director, Research and Communications
	Australasian Fleet Managers Association
Mr Owen Gwynne	Director, Government Services Group
	Department of Treasury and Finance, VicFleet

Melbourne 8 October 2007

Ms Samantha Read	National Manager, Government Relations and Public Policy
Mr Ian Butler	Director, Integration and Safety Engineering
	GM Holden Ltd
Mr Russell Scoular	Government Affairs Manager
Mr Bruce Priddle	Vehicle Assurance and Homologation Manager
	Ford Motor Company of Australia Limited

Melbourne 29 October 2007

Mr Peter McGregor	Divisional Manager, Product Management Division
Mr Peter Griffin	Corporate Manager, External Affairs
Mr Doug Soden	Manager, Product Planning, Product Management Division
	Toyota Motor Corporation Australia Ltd
Mr Pierre Hultstrand	General Manager, Technical and Marketing
Mr Robert Judd	Manager, Technology Development
	Autoliv Australia Pty Ltd
Mr Ashley Sanders	Manager, Certification and Regulations, Compliance Department, R & D Australia
	Mitsubishi Motors Australia Ltd
Mr Mark Jackman	Team Leader, Project Management
	Robert Bosch (Australia) Pty Ltd

Melbourne 19 November 2008

Mr Terry Warin	Executive Director
	Intelligent Transport Systems Australia
Mr Lindsay Smalley	Senior Director
	Honda Australia Pty Ltd
Mr Wayne Watson	Manager, Engineering and Compliance
Ms Jasmine Stringer	National HR Manager, General Counsel and Company Secretary
	Mazda Australia Pty Ltd

Mr Ben Hershman	Product Planning Manager
Mr Hee Loong Wong	Senior Manager, Product Engineering
Mr Paul du Preez	General Counsel and Company Secretary
	Hyundai Motor Company Australia Pty Ltd
Mr Simon Humphries	Manager, Product Planning and Engineering Support
	Isuzu Australia Limited

Melbourne 4 February 2008

Mr Ross McArthur	Chairman, Technical Committee
	Australasian New Car Assessment Program
Mr James Hurnall	Director, Technical Services
	Australian Automobile Association
Mr Peter Robertson	General Manager Vehicle Safety Standards
	Australian Government, Department of Transport and Regional Services
Mr Andrew McKellar	Chief Executive
	Federal Chamber of Automotive Industries
Mr Lindsay Fox	Founder, Director
Mr David McInnes	Group Manager, Environment and Climate Change
	Linfox Australia Pty Ltd

Melbourne 3 March 2008

Mr Cameron Cuthill	General Manager
	BMW Motorrad

Melbourne 31 March 2008

Mr Ray Newland	Motorcycle Manager
Mr Stuart Strickland	Executive Committee Member
	Federal Chamber of Automotive Industries
Mr Stuart Strickland	Managing Director
Mr Greg Snart	National Motorcycle Service Manager

Honda Australia, Motorcycle and Power Equipment Pty Ltd

Appendix C

Overseas Briefings

Tokyo, Japan 27 August 2007

Mr Koichiro Kubo	Chief Official, Engineering Planning Division, Engineering and Safety Department
Mr Hiromi Kimura	International Affairs Office, Engineering and Safety Department
Mr Takayoshi Kagei	Chief, ITS Policy and Program Office, Road Traffic Control Division
Mr Touji	Promotion Officer, ITS Policy and Program Office, Road Traffic Control Division
	Ministry of Land, Infrastructure & Transport, Engineering and Safety Department, Road Transport Bureau
Mr Shigeru Sasaki	Director General, Technical Department
Mr Hirokazu Furukawa	Deputy Group Leader, Technical Department
Mr Tadashi Toya	Technical Department
Mr Yoshinori Hasegawa	Group Leader, Traffic Affairs Department
Mr Toshihiro Iwatake	Vice President, International Affairs
Mr Takashi Ueno	International Department
	Japan Automobile Manufacturers Association Inc

Tokyo, Japan Tuesday 28 August 2007

Mr A McLean	Ambassador
	Australian Embassy
Mr Kanazawa Satoru	Director
Mr Takahiro Ikari	Director, Planning Department
Mr Yasuo Shimura	Manager, Safety and Information Division, Planning Department
Mr Osamu Arai	Assistant Manager, Planning Department

Mr Hiroshi Kawahara	Assistant Manager, Planning Department
Mr Kenichi Funaki	Staff, Planning Department
Mr Yoshiyuki Mizuno	Technical Advisor
	National Agency for Automotive Safety and Victim's Aid
Mr Tetsuo Hasegawa	General Manager, Global Government Affairs Department – Environmental and Safety Technologies, Technology Development Division
Ms Noriko Kadota	Manager, Technical Affairs Group, Global Government Affairs Department – Environmental and Safety Technologies, Technology Development Division
	Nissan Motor Co. Ltd

Nagoya, Japan 29 August 2007

Mr Satoshi Mikutsu	Group Manager, Vehicle Safety, Vehicle Engineering Division, Vehicle Engineering Group
Mr Akio Masegi	Project Manager, Strategy Planning Department, IT & ITS Planning Division
Mr Hisanobu Nakagawa	Assistant Manager, Strategy Planning Department, IT & ITS Planning Division
Mr Masaki Hotta	Assistant Manager, Australia Group, Oceania Department, Oceania, Middle East & Southwest Asia Marketing Division
Mr Patrick Wilson	Australia Group, Oceania Department, Oceania, Middle East & Southwest Asia Marketing Division
	Toyota Motor Corporation
Mr Oyuki Ogawa	Executive Vice President
Mr Yoshihiko Teguri	Senior Manager, Information and Safety Systems, R & D Department, Driving Assist & Safety Product Division, R & D Center
Mr Satoshi Iwata	Managing Officer, Tokyo Office, ITS Product Division
Mr Shigeki Tomai	Assistant Manager, Asia & Oceania Team, International Business Planning Group, Sales Planning Department 1
	Denso Corporation

Detroit, United States of America 31 August 2007

Ms Susan Cischke	Senior Vice President, Sustainability, Environment & Safety Engineering
Mr Robert Brown	Director, Vehicle Environmental Engineering, Environmental & Safety Engineering
Mr James Vondale	Director, Automotive Safety Office, Environmental & Safety Engineering
Mr Todd Fronckowiak	Manager, Advanced Safety and Rulemaking, Automotive Safety Office, Environmental & Safety Engineering
Mr Thomas Artushin	Safety Strategy Manager, Automotive Safety Office, Environmental & Safety Engineering
Dr Mike Blommer	Supervisor, VIRTTEX Simulator, Research & Innovation Center
Dr Reates Curry	Analyst, VIRTTEX Simulator, Research & Innovation Center
Dr Stephen Rouhana	Senior Technical Leader, Biomechanics & Occupant Protection Group, Research & Innovation Center, Safety Technology Review
Mr Craig Pattinson	Engineer, Research & Innovation Center, Safety Technology Review
Mr Tony Rendi	Manager Advanced Engineering, Brake Controls, RSC/ESC Active Safety Technology, Dearborn Development Center
Mr Tom Salmon	Supervisor, Brake Controls,RSC/ESC Active Safety Technology, Dearborn Development Center
	Ford Motor Company
Mr Bob Lange	Executive Director, Vehicle Structure & Safety Integration
Ms Anne Ginn	Manager, Public Policy & Issues, Vehicle Structure & Safety Integration
	General Motors Corporaton
Mr Anupam Malhotra	Senior Manager, Global Strategy & Business Development
Mr Jeffrey Perry	Manager, Public Policy
	OnStar by General Motors

Washington, United States of America 4 September 2007

Dr Joseph Kanianthra	Associate Administrator, Vehicle Safety Research
Mr Tim Johnson	Division Chief, Crash Avoidance & Heavy Truck Research, Office of Applied Vehicle Safety Research
Ms Stephanie Binder	General Engineer (Human Factors), Vehicle Safety Research
Ms Marilena Amoni	Associate Administrator, Research and Program Development, Traffic Injury Control
Mr John Hinch	Director, Office of Human Vehicle Performance Research
Mr Ray Resendes	Intelligent Technologies Research Division
	United States Department of Transportationation, National Highway Traffic Safety Administration
Dr Adrian Lund	President
Mr Stephen Oesch	Senior Vice President, Insurer and Government Relations, Secretary and Treasurer
	Insurance Institute for Highway Safety
Mr Dennis Judycki	Associate Administrator, Research, Development and Technology, Turner-Fairbank Highway Research Center
Dr Joseph Peters	Office Director, Office of Operations, Research and Development, Turner-Fairbank Highway Research Center
Mr Robert Ferlis	Technical Director, Office of Operations, Research and Development, Turner-Fairbank Highway Research Center
Mr Michael Halladay	Office Director, Office of Program Integration and Delivery, Office of Safety
Mr Raymond Krammes	Technical Director, Office of Safety Research and Development
Dr Carol Tan	Highway Research Engineer, Office of Safety Research and Development
Mr Kenneth Opiela	Roadside Team Manager, Federal Highway Administration's National Crash Analysis Center

Ms Martha Soneira	Team Leader, Strategic Communications, 'Public Roads' Editor-In-Chief, Research and Technology Services
Dr Anthony Kane	Director of Engineering & Technical Services, American Association of State Highway and Transportation Officials
	United States Department of Transportationation, Federal Highway Administration
Dr Susan Ferguson	Director
	Ferguson International LLC, Consulting Services

Washington, United States of America 28 August 2007

Professor Timothy Tong	Dean, Professor of Mechanical Engineering, School of Engineering and Applied Science
Dr Cing-Dao Kan	Director, FHWA/NHTSA National Crash Analysis Center, School of Engineering and Applied Science
Professor Kennerly Digges	Research Director, Vehicle Safety & Biomechanics Research, FHWA/NHTSA, National Crash Analysis Center
Mr Rick Morgan	Senior Research Scientist, FHWA/NHTSA, National Crash Analysis Center, GW Transportation Research Institute
Ms Randa Radwan Samaha	Research Scientist, National Crash Analysis Center, School of Engineering and Applied Science
	The George Washington University
Governor Bill Graves	President and Chief Executive Officer
Mr Richard D Holcomb	General Counsel and Senior Vice President
Mr Dave Osiecki	Vice President
Mr Jim Tipka	Vice President
Mr Clayton Boyce	Vice President, Public Affairs, Press Secretary
Mr Brian Routhier	Automotive Engineer
Mr Robert Braswell	Technical Director, Technology & Maintenance Council
	American Trucking Associations, Inc

Brussels, Belgium 7 September 2007

Mr Jacques Compagne	Secretary General
Mr Edwin Bastiaensen	Safety Coordinator
Mr Antonio Perlot	Public Affairs Manager
	ACEM The Motorcycle Industry in Europe
Dr Reinhard Schulte-Braucks	Head of Unit Automotive Industry
Mr Ian Knowles	Detached National Expert
	European Commission, Enterprise and Industry Directorate-General

Brussels, Belgium 10 September 2007

Mr Dominique Cesari	Chairman
	European Enhanced Vehicle Safety Committee
Mr Adrian Hobbs	Secretary General
	European New Car Assessment Programme

Brussels, Belgium 11 September 2007

Dr Jörg Beckmann	Executive Director
Mr Timmo Janitzek	Project Officer
	European Transport Safety Council

Munich, Germany 12 September 2007

Dr Volkmar Pflug	Vice President, Region Asia/Australia
Mr Ludwig Ertl	Product Innovation Manager, Advanced Development, Safety & Chassis
Mr Hans-Georg Stoll	Director, Business Strategy
Mr Klaus Overkamp	Senior Project Manager, Interurban Systems
Mr Jörg Lützner	Senior Principle, Technology and Innovation
	Siemens AG
Dr Jost Gail	Active Safety and Emissions
	Federal Highway Research Institute (BASt)

Stuttgart, Germany 13 September 2007

Mr Christian Thess	Director, Automotive Electronics, Business Unit Occupant Safety, Product Planning and Marketing
Mr Stephan Zwerschke	Section Manager, Automotive Electronics, Business Unit Driver Assistance, Product Planning and Marketing
Ms Sandra Pastore	Director, Chassis Systems Control, Communication and Promotion
Dr Mario Kröninger	Automotive Electronics, Product Marketing Occupant Safety
	Robert Bosch GmbH

Stuttgart, Germany 14 September 2007

Mr Richard Krüger	Manager, Publications Safety, NVH Testing, Durability
Dr Rodolfo Schöneburg	Director, Passive Safety, Durability, Vehicle Functions
Professor Norbert Schaub	Senior Manager, Testing Passive Safety, Durability, NVH, Vehicle Functions
Mr Karl-Heinz Baumann	Senior Manager, Concepts Passive Safety, Mercedes Car Group/Development
	DaimlerChrysler AG

Appendix D

Vehicle Safety Technology - Active Head Restraints

	Australia	USA	Japan	UK
Toyota				
Aurion			Standard	
Corolla		Standard	Standard	
Prius			Standard/ Optional on some models	
Yaris			Standard / Optional on some models	
Kluger		Standard	Standard / Optional on some models	
Landcruiser 200 series		Standard	Optional	Standard
RAV4			Optional/ N/A on some models	
Hilux			Optional	
Holden				
Calais	Standard			
Statesman	Standard			
Caprice	Standard			
HSV	Standard			
Captiva				Standard
Ford				
Focus	Advanced Restraint Module			
Mondeo	Standard			
Falcon	Advanced Restraint Module			
Mazda				
Mazda2	Standard		Optional	
Mazda3	Standard	Standard	Optional	
Mazda3 MPS	Standard			
Mazda6	Standard	Standard	Standard/	

	Australia	USA	Japan	UK
			Optional on some models	
MX-5			Optional	
RX-8	Standard		Optional	
CX-7			Optional	
Honda				
Civic		Standard	Optional	Standard
Civic Hybrid		Standard	Optional	Standard
Accord	Standard	Standard	Optional	
Accord Euro				
Odyssey		Standard	Optional on some models	
Legend			Standard	Standard
CR-V	Standard	Standard	Standard/ Optional on some models	Standard
Civic Type R				
S2000	Standard			
Mitsubishi				
Colt			Standard, Optional and N/A	
Lancer		Standard		
Grandis			Optional	
Outlander		Standard	Optional	
Pajero			Standard / Optional on some models	
Nissan				
Tiida		Standard	Optional	
Maxima	Standard			
350Z	Standard	Standard	Optional	Standard
Z Roadster	Standard	Standard		Standard (N/A with leather)
X-Trail	Standard		Optional/ N/A on some models	Standard
Murano	Standard	Standard	Optional	Standard
Pathfinder	Standard	Standard		Standard
Navara Dual Cab		Standard		Standard
Micra	Standard		Optional/	Standard

	Australia	USA	Japan	UK
			N/A on some models	
Dualis	Standard			Standard
Hyundai				
Getz	Standard		Optional/ N/A on some models	
Accent				
Elantra	Standard	Standard	Optional	
i30	Standard			Standard
Sonata	Standard	Standard	Standard/ N/A on some models	Standard
Grandeur	Standard		Standard/ Optional on some models	Standard
Tiburon				
Tucson		Standard	Standard/ N/A on some models	
Santa Fe	Standard	Standard	Optional	Standard
Subaru				
Impreza	Standard on some models	Standard	Optional	
Liberty	Standard	Standard	Optional/ N/A on some models	Standard
Forester	Standard	Standard	Optional/ N/A on some models	Standard
Outback	Standard	Standard	Optional	Standard
Tribeca	Standard	Standard		Standard
Volkswagen				
Polo			Standard	Standard
Golf	Front safety Optimised head restraints	Rear-impact Optionalimized head restraints - Driver and Passenger standard seats	Standard	Standard
New Beetle	Front safety Optimised head restraints		Standard	Standard

	Australia	USA	Japan	UK
New Beetle Cabriolet	Front safety Optimised head restraints		Standard	Standard
Jetta	Front safety Optimised head restraints		Standard	Standard
Passat	Front safety Optimised head restraints	Front safety Optimised head restraints	Standard	
Eos	Front safety Optimised head restraints	Standard		
Toureg		Standard	Standard	
Kia				
Rio				Standard/ N/A on some models
Cerato	Optional			
Magentis	Standard	Standard		Standard
Sorento	Standard	Standard		Standard
Rondo	Standard	Standard		Standard
Grand Carnival		Standard		Standard/ N/A on some models
Mercedes-Benz				
A-Class	Standard		Standard	Standard
B-Class	Standard		Standard	Standard
C-Class	Standard (Neck-pro) on some models	Standard	Standard	Standard/ N/A on some models
E-Class	Standard	Standard	Standard	Standard
S-Class	Standard (Neck-pro)	Standard	Standard	Standard
CLK-Class	Standard	Standard	Standard	Standard
CLS-Class	Standard	Standard	Standard	Standard
CL-Class			Standard	
SLK-Class			Standard	
SL-Class			Standard	
M-Class	Standard	Standard	Standard	Standard
GL-Class	Standard	Standard	Standard	Standard

	Australia	USA	Japan	UK
R-Class	Standard	Standard	Standard	Standard
BMW				
BMW 1 series			Standard	
BMW 3 series			Standard	
BMW 5 series	Standard/ N/A on some models		Standard	Standard
BMW 6 series	Standard	Standard	Standard/ N/A in some models	Standard
BMW 7 series	Standard/ Optional on some models	Standard	Standard	
BMW X3	Standard	Standard	Standard	Standard
BMW X5		Standard	Standard	Standard
BMW M 5	Standard		Standard	Standard
BMW M 6	Standard		Standard/ N/A in some models	Standard
Suzuki				
Swift			Optional on some models	
SX4			Standard/ N/A on some models	
Peugeot				
207 CC				Standard
307			Standard	
307 Touring			Standard	Standard
307 CC			Standard	Standard
308				Standard
407	Standard		Standard	Standard
407 Touring	Standard		Standard	Standard
407 Coupe	Standard		Standard	Standard
607	Standard			
Lexus				
LS			Standard	
GS			Standard	
IS			Standard	
LX	Standard	Standard		
Volvo Car				
S40	Standard	Standard	Standard	Standard
S60	Standard	Standard	Standard	Standard
S80	Standard	Standard	Standard	Standard
V50	Standard	Standard	Standard	Standard

	Australia	USA	Japan	UK
V70	Standard	Standard	Standard	Standard
XC70	Standard	Standard	Standard	Standard
XC90	Standard	Standard	Standard	Standard
C70	Standard	Standard	Standard	Standard
C30	Standard	Standard		Standard

Source: Manufacturers' Websites, April 2008 and *Japanese New Car Assessment Program, New Car Assessment*, Table of Safety Performance Comparison by Model, 2007.

Listed in order of manufacturer by sales volume in Australia, and only detailing those models that offer Advanced Head Restraints in one or more countries.

Appendix E

VicRoads Submission Data

Comparison of safety specification differences of some models between Australia and the United Kingdom.

Vehicle Model	Vehicle Category	Vehicle Safety Technology Differences
Citroen C2	Small car	In UK curtain airbags optional on top models. Not available in Australia
Citroen C3	Small car	Curtain airbags and ESC on top model in UK. Note available in Australia
Citroen C4	Small car	ESC optional for all in the UK but only on top model in Australia
Ford Fiesta	Small car	Side airbags/curtain airbags optional for all in UK but only top model in Australia
Holden Barina	Small Car	Side airbags available in UK but not Australia. ABS standard in UK but optional in Australia
Holden Captiva	4wd – large	Curtain airbags standard in UK but optional in Australia. ESC standard in Australia but not on base model in UK
Honda Accord Euro	Large/medium car	Side curtain airbags standard in UK, not on base model in Australia. ESC optional on base model in UK standard in Australia
Honda Civic	Large/medium car	Curtain airbags standard in UK, not on base model in Australia. ESC standard in UK not available in Australia
Honda Cr-V	4wd	Curtain airbags standard in UK, not on base model in Australia
Hyundai Getz	Small car	ABS standard in UK, not on base model in Australia, ESC optional in Australia, not available in UK
Hyundai Sonata	Large/medium car	ESC standard in UK, optional in Australia
Kia Carnival	Passenger van	Curtain airbags standard in UK, not on base model in Australia. ESC optional in Australia, not available in UK
Kia Rio	Small car	Curtain airbags on some models in UK, none in Australia. ABS standard

Vehicle Model	Vehicle Category	Vehicle Safety Technology Differences
		in UK, optional in Australia
Mazda BT50/Courier 4x2	Utility	Side airbags available in UK but not Australia
Mazda BT50/Courier 4x4	Utility	Front airbags standard in UK, optional on base model in Australia. Side airbags available in UK but not Australia
Mazda 2	Small car	ABS standard in UK, optional in Australia
Mazda 3	Small car	Side airbags & curtain airbags optional in Australia. Side airbags standard in UK but curtain airbags not available on base model. ESC optional in Australia, standard on all but base model in UK
Mazda 6	Large/medium car	ESC standard on some models in UK but not available on some models in Australia
Mazda Mx5	Sports	ESC and side airbags standard in Australia but not on base model in UK
Mitsubishi Outlander	4wd	Side airbags not available on some models in UK – optional in Australia. ESC standard in UK but not on base model in Australia
Mitsubishi Pajero	4wd – large	The vehicle is called the Mitsubishi Shogun in the UK. Curtain airbags standard in the UK, optional on the base model in Australia
Nissan Pathfinder	4wd	Curtain airbags and ESC standard in UK. Not on base model in Australia
Nissan Patrol	4wd – large	ABS standard in UK, not on base model in Australia
Nissan X-trail	4wd	ESC standard on top model in UK. Not available in Australia
Peugeot 207	Small car	Side airbags (not curtain airbags) standard in UK. Not on base model in Australia
Renault Laguna	Large/medium car	ESC optional on base model in UK, standard in Australia
Renault Megane	Small car	ESC standard in Australia, not on base model in UK
Renault Scenic	Passenger van	ESC standard in Australia, not on base model in UK
Subaru Forester	4wd	ESC standard in top model in UK. Not available in Australia
Suzuki Grand Vitara	4wd	Curtain airbags standard in UK. Not

Vehicle Model	Vehicle Category	Vehicle Safety Technology Differences
		on base model in Australia
Suzuki Swift	Small car	Curtain airbags standard in UK but not base model in Australia
Toyota Camry Altise	Large/medium car	The vehicle is called the Avensis in UK. It has curtain airbags and knee bag standard. Curtain airbags optional on base model in Australia and knee airbag not available
Toyota Hiace	Van	Passenger airbag standard in Australia, optional in UK. ABS standard in UK, optional in Australia
Toyota Hilux 4x2	Utility	ABS standard in UK, optional in Australia
Toyota Hilux 4x4	Utility	ABS standard in UK, optional in Australia
Toyota Landcruiser	4wd – large	Curtain airbags standard in UK, not available in Australia
Toyota Prius	Large/medium car	Curtain airbags standard in UK but only on top model in Australia. ESC on top model in Australia but not available in UK
Toyota Rav4	4wd	Curtain airbag standard in UK but only top models in Australia
Toyota Yaris	Small car	Curtain airbags optional on base model in Australia, not available on base model in UK
Volvo S40	Large/medium car	ESC standard in UK, optional on most models in Australia
Volvo S60	Luxury	ESC standard in UK, optional in Australia
VW Golf	Small car	ESC standard in UK, optional in Australia
VW Polo	Small car	ABS standard in UK, optional on base models in Australia
VW Transporter	Van	ESC, side airbags and curtain airbags optional in UK. Not available in Australia

Source: Derived from VicRoads, Submission to the Inquiry, May 2007, Table 4, pp. 51-3.

VicRoads Notes: This table shows that in many cases vehicles in the UK are offered with higher leveles of safety equipment than those in Australia.

This table is based on brochures and internet pages. Actual specifications may vary.

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ROAD SAFETY COMMITTEE INQUIRY INTO VEHICLE SAFETY AUGUST 2008

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