Australian Government
Department of Infrastructure and Regional Development

Regulation Impact Statement for

the Control of Light Commercial Vehicle Stability

October 2013

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Department of Infrastructure and Regional Development

Canberra, Australia

Report Documentation Page

Report No.	Report Date	File No.	OBPR Reference No.
DoIT VSS 01/2012	October 2013	13/3429	14535

Title and Subtitle
Regulation Impact Statement for the Control of Light Commercial Vehicle Stability

Organisation Performing Analysis
Standards and International Vehicle Safety Standards Branch Department of Infrastructure and Regional Development

Regulatory Agency
Department of Infrastructure and Regional Development GPO Box 594 Canberra ACT 2601

Key Words	Distribution Statement
Stability, Electronic Stability Control, ESC	Document is available to public through the website: http://www.infrastructure.gov.au/roads/motor/design/adr_comment.aspx

Security Classification	No. Pages	Price
Unclassified	89	No charge

ABSTRACT

Electronic Stability Control (ESC) has significant potential to save lives by reducing the number and severity of single motor vehicle crashes.

In 2009 the Australian Government mandated ESC for new passenger cars, passenger vans and Sports Utility Vehicles through Australian Design Rules (ADRs) 31/02 Brake Systems for Passenger Cars and 35/03 Commercial Vehicle Brake Systems. These requirements have applied from November 2011 for newly approved models and will apply from November 2013 for all remaining models.

In terms of light commercial vehicles (LCVs), the Australian market is responding on a voluntary basis, with a rate for fitment of ESC of approximately 45 per cent in 2012.

This Regulation Impact Statement (RIS) examined the case for Australian Government intervention in order to increase the fitment rate for the new LCV fleet in Australia.

A total of six options, including both regulatory and non-regulatory options were explored. The results of a benefit-cost analysis showed that, even with the expected voluntary fitment rate, regulation under the *Motor Vehicle Standards Act 1989* (C'th) (MVSA) would generate the highest net benefits of the options examined. Compared with the business as usual case, this option would generate net benefits of $79m, a saving of 29 lives over a 15-year period of regulation and a benefit-cost ratio of 2.5. It is also the option that results in the highest ongoing fitment rate of ESC in new LCVs, thereby maximising the benefits that ESC has to offer. Regulation under the MVSA is therefore the recommended option.

Should this option be adopted, the fitment of ESC in LCVs would be mandated through ADRs 31 and 35. The ESC requirements would be aligned with those contained in United Nations Economic Commission for Europe (UNECE) Regulation 13-H Braking of Passenger Cars (R 13-H) and so also with the existing requirements in the Australian Design Rules for new passenger cars, passenger vans and Sports Utility Vehicles.

Where the stringency of a standard is increased or requirements are made applicable to additional vehicle categories, the usual lead time is around 2 years. In line with this, the proposed implementation timetable for ESC is 2015 for new models and 2016 for all models. However, the final timing may be subject to further negotiations with industry.

As part of this RIS process, the proposal was circulated for 60 days public comment. The Federal Minister for Infrastructure and Regional Development may then choose to determine an ADR under section 7 of the MVSA.

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EXECUTIVE SUMMARY

In Australia, between 2001 and 2008, crashes involving light commercial vehicles (LCVs) increased from around 13,000 to 19,000 per year. Over this period, on average, 39 LCV drivers were killed and 387 were seriously injured each year.

Electronic Stability Control (ESC) is a driver assistance technology that reduces the chance of a vehicle understeering (‘plowout’) or oversteering (‘spinout’), thereby reducing crashes.

ESC is regulated in various ways in Australia and internationally. In 2008, the United Nations Economic Commission for Europe—or UNECE—established Global Technical Regulation No. 8 Electronic Stability Control Systems (GTR 8) for passenger and goods vehicles with a gross vehicle mass (GVM) of 4,536kg or less. This was done under the Agreement Concerning the Establishing of Global Technical Regulations for Wheeled Vehicles Equipment and Parts (the 1998 Agreement) of June 1998.

In the same year the UNECE amended Regulation No. 13-H Braking of Passenger Cars (R 13-H) to incorporate the text of GTR 8. This was done under the Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts (the 1958 Agreement) of March 1958. Australia is a Contracting party to both the 1958 Agreement and 1998 Agreement for developing UN regulations.

The R 13-H amendments only applied technical requirements where ESC is fitted. However, the Transitional Provisions in R 13-H provided Contracting Parties with the mechanism to mandate the actual fitting of ESC within their own domestic or regional legislation, at their discretion. R 13-H included an implementation timing of 1 November 2011 for newly introduced vehicle models and 1 November 2013 for all models.

In 2009, following a public consultation process, the Australian Government mandated ESC in passenger cars, passenger vans and four-wheel drives/Sports Utility Vehicles (4WDs/SUVs) through Australian Design Rules (ADRs) 31/02 Brake Systems for Passenger Cars and 35/04 Commercial Vehicle Brake Systems, in line with the scope of R 13-H. The UN implementation timetable was also adopted.

At the time the Australian RIS was being developed for ESC, there were no direct estimates available for the effectiveness of the technology in LCVs. However, subsequent research by the Monash University Accident Research Centre (MUARC) commissioned by the Australian Government showed effectiveness for ESC in LCVs similar to that for passenger cars. Fitzharris et al (2010) estimated that ESC in LCVs is likely to be 32 per cent effective at reducing crashes across all severities (for crash types where ESC would be able to assist, i.e. single vehicle crashes).

In terms of ESC in LCVs, the Australian market is responding. In 2010 ESC was fitted to 8.3 per cent of LCVs (Fitzharris et al, 2010), increasing to 45 per cent in 2012. In 2012 the Australian industry advised, through the Federal Chamber of Automotive Industries (FCAI), that it expected this to increase to 90 per cent by 2018 and 99 per cent by 1 January 2020 (FCAI, 2012).

This RIS examined the case for Australian Government intervention in order to increase this fitment rate for the new LCV fleet in Australia. It did not consider retro-fitting to vehicles that are already in-service, which is not regulated by the Australian Government. The RIS has been written in accordance with Australian Government RIS requirements, which are set down in the Best Practice Regulation Handbook (Australian Government, 2010).

Any Australian Government intervention must be in accordance with its obligations under the World Trade Organisation (WTO) and the UNECE 1958 and 1998 Agreements for motor vehicle regulations. These generally require regulation to adopt internationally based standards where possible. With Australia producing just one per cent of the world's vehicles, these agreements make it possible for consumers to enjoy access to a large range of the safest vehicles while positioning the local industry well for the export market.

Six options, including both regulatory and non-regulatory, were considered: Option 1: no intervention; Option 2: user information campaigns; Option 3: fleet purchasing policies; Option 4: codes of practice; Option 5: mandatory standards under the *Competition and Consumer Act 2010* (C'th) (C&C Act); and Option 6: mandatory standards under the *Motor Vehicle Standards Act 1989* (C'th) (MVSA).

Options 1, 2 and 6 were considered feasible and were examined in more detail using cost-benefit analysis. A summary of the results of the benefit-cost analysis for the three feasible options is shown below in Table 1 and Table 2. However, a brief summary discussion is provided below for all options.

Option 1: no intervention. Based on the most recent industry estimates of voluntary fitment, this option is achieving the objective to deliver safer LCVs. However, industry wide installation may not be achieved in the short to medium term.

Option 2: user information campaigns—informing consumers about the benefits of ESC technology using education campaigns. This includes two sub-options—a targeted awareness campaign (Option 2a) costing $3 million per annum over 4 years, and an advertising campaign (Option 2b) costing $18 million per annum over 7 years. While Option 2b is expected to result in net costs to the community (-$66m), Option 2a is expected to have broadly the same costs as Option 6, but fewer benefits than Option 6, largely due to lower industry wide installation of ESC in LCVs. Overall, it is estimated to deliver net benefits of $48m with a BCR of 2.

Option 3: fleet purchasing policies. As of 1 July 2011, all new Australian Government fleet passenger vehicles must have a minimum five-star ANCAP rating, while, as of 1 July 2012, Australian Government fleet LCVs must have a minimum four-star rating, subject to operational requirements. Under the ANCAP Road Map, ESC has been required for vehicles to achieve a five-star rating from 2011 and a four-star rating from 2012. Therefore ESC is, in effect, already a requirement for Commonwealth fleet LCVs. This means that any further

Australian Government fleet purchasing policy relating to the purchase of LCVs fitted with ESC would be redundant, and therefore no different from the status quo.

Option 4: codes of practice. Given the already high voluntary ESC fitment rate, a voluntary code of practice is not seen as a practical way to influence the remaining manufacturers. Mandatory codes of practice are generally used as an alternative where government does not have the expertise and resources in a certain area—this is not the case for ESC.

Option 5: mandatory standards under the C&C Act. This is a less efficient and effective regulatory mechanism than utilising ADRs.

Option 6: mandatory standards under the MVSA generated the highest net benefits of the options examined at $79m. This estimated benefit includes monetised avoided serious injuries as well as lives saved, which is the predominant benefit expected. Option 6 includes 29 lives saved relative to the status quo option. This option is also expected to generate a benefit-cost ratio of 2.5. Option 6 is also the option that that results in the highest ongoing fitment rate thereby maximising the benefits that ESC has to offer. The calculations in the RIS were based on a proposed implementation timetable of 2015 for new models and 2016 for all models. This timing is consistent with the usual lead time of two years for an ADR change involving an increase in stringency. Option 6 delivers greater benefits than Option 2a and it is expected to result in a greater number of lives saved (29 compared with 17). As indicated in Figure 1, the costs under Option 6 largely occur in the short term, while the benefits are increasing and then decreasing over a longer period taking into account expected safety outcomes under a mandatory standard.

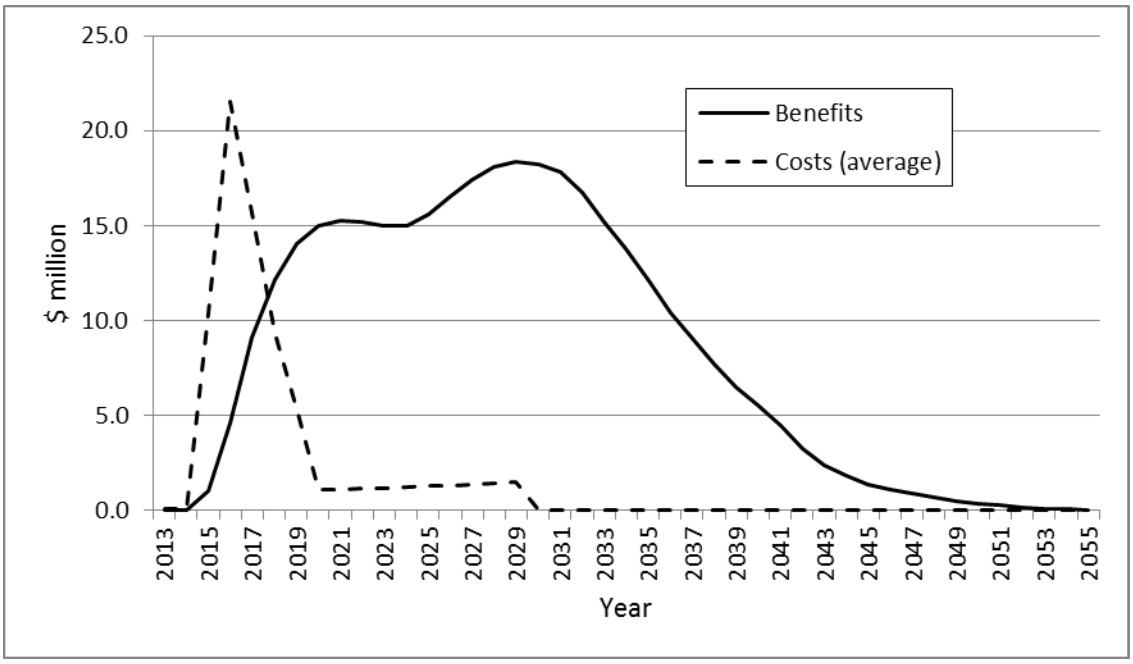
Table 1 Summary of net benefits and total benefits for Options 1, 2 and 6

	Net benefits ($m)	Total benefits ($m)	Costs ($m)
Option 1: no intervention	-	-	-
Option 2a: user information campaigns—targeted awareness	48	95	47
Option 2b: user information campaigns—advertising	-66	51	117
Option 6: regulation	79	130	51

Table 2 Summary of costs and benefit-cost ratios for each option

	BCR	Lives saved
Option 1: no intervention	-	
Option 2a: user information campaigns—targeted awareness	2.0	17
Option 2b: user information campaigns—advertising	0.4	10
Option 6: regulation	2.5	29

Figure 1 Option 6: mandatory standards under the MVSA—undiscounted benefits and costs over time



A sensitivity analysis was undertaken for Option 6 and was conducted on two variables: effectiveness of ESC in LCVs; and the discount rate. The net benefits from this option remained positive under all scenarios.

As part of the RIS process, the proposal was circulated for 60 days public comment. A summary of public comment input and departmental responses has been included at Appendix 13—Public Comment.

During the public comment period, industry proposed an extended implementation timetable of 2015 for new models and 2017 for all models. Industry also indicated current and expected future voluntary fitment rates that differed from its previous advice. The effects of an extended implementation timetable and revised rates were examined in an additional sensitivity analysis. Under both scenarios, Option 6 still resulted in higher net benefits and lives saved than the other feasible options considered, including Option 2a.

Therefore, Option 6 is the recommended option. If Option 6 was to be adopted the fitment of ESC in LCVs would be mandated through ADRs 31 and 35. This would be in line with the technical requirements of UN regulation R 13-H, where ESC is fitted.

The actual implementation timetable may be subject to final negotiations with industry based on the particular case in Australia. In this case, the dates proposed in the consultation RIS may be brought closer to those proposed by industry.

1 STATEMENT OF THE PROBLEM

1.1 Introduction

The impact of road crashes on society is significant. Individuals injured in crashes must deal with pain and suffering, medical costs, wage loss, higher insurance premium rates, and vehicle repair costs. For society as a whole, road crashes result in enormous costs in terms of lost productivity and property damage. The cost to the Australian economy has been estimated to be at least $27 billion per annum (Department of Infrastructure and Transport, 2012). This translates to an average of over $1100 for every person in Australia. The cost is borne widely by the general public, businesses, and government. It has a further impact on the wellbeing of families that is not possible to measure.

Electronic Stability Control is an advanced vehicle stability system that works by automatically braking individual wheels to help the driver steer in the intended direction during a skid. The technology is marketed under various proprietary names, but is most commonly known as Electronic Stability Control (ESC). It was introduced in its modern form by Robert Bosch GmbH and Mercedes-Benz in 1993.

When the benefits of ESC emerged in recent years, governments around the world moved first to promote and then mandate the technology in passenger and four-wheel drive (4WD) vehicles. In 2009 the Australian Government mandated ESC for new passenger cars, passenger vans and 4WD/Sports Utility Vehicles (SUVs) through Australian Design Rules (ADRs) 31 and 35. These requirements have applied from November 2011 for newly approved models and will apply from November 2013 for all remaining models.

This Regulation Impact Statement (RIS) follows on from the earlier ESC work for passenger cars, passenger vans and 4WDs/SUVs. It examined the case for Australian Government intervention to increase the fitment rate of ESC to the new light commercial vehicle (LCV) fleet in Australia. It did not consider retro-fitting to vehicles that are in-service (i.e. that have already been registered for use on the road).

LCVs are defined as goods vehicles with a Gross Vehicle Mass (GVM) not exceeding 3.5 tonnes. For the purposes of this RIS, the term Electronic Stability Control, or ESC, has been used exclusively throughout the document.

1.2 Background

ESC is a motor vehicle driver assistance technology that aims to reduce the chance of a vehicle understeering—‘plowout’—or oversteering—‘spinout’—thereby reducing crashes. It is linked to and complements Traction Control Systems (TCS) where fitted and Anti-lock Braking Systems (ABS).

ESC monitors the driver’s intended direction of the motor vehicle through the steering wheel and automatically acts on the engine and brake of one or more wheels if the vehicle begins to move off course. By applying uneven braking, directional forces can be generated on the vehicle to assist the steering system in bringing it back on course. The system responds to the difference between the intended (steering input) and actual path and rotational (yaw) rate of a vehicle, and acts to reduce the difference. A computer continuously evaluates the readings from side acceleration and yaw rate sensors and uses TCS and/or ABS to reduce power to or automatically brake individual wheels. ESC is discussed in more detail in Appendix 1—Overview of Electronic Stability Control Systems.

ESC is a tool to help the driver maintain control of the vehicle using available traction. While effective in many situations, it cannot override a vehicle's physical limits. If the driver pushes the vehicle beyond these limits, ESC will no longer be able to prevent a loss of control.

ESC is regulated in various ways in Australia and internationally. In 2008, the United Nations Economic Commission for Europe—or UNECE—established Global Technical Regulation No. 8 Electronic Stability Control Systems (GTR 8). The GTR applies to passenger and goods vehicles with a GVM of 4,536 kg or less, and is open for adoption by Contracting Parties under the international Agreement Concerning the Establishing of Global Technical Regulations for Wheeled Vehicles Equipment and Parts of June 1998 (1998 Agreement) (ECE, 2002).

GTR 8 was based on the United States Federal Motor Vehicle Safety Standard (FMVSS) 126. Its intention is to reduce the number of deaths and injuries that result from crashes in which the driver loses directional control of the vehicle. This includes those resulting in vehicle rollover. It does this by specifying performance and equipment requirements for ESC systems.

As a Contracting Party to the 1998 Agreement, Australia was obliged to subject GTR 8 to its domestic rulemaking process. In 2009, as part of this process, a RIS was developed proposing amending Australian Design Rules (ADRs) 31/02 Brake Systems for Passenger Cars and 35/03 Commercial Vehicle Brake Systems to mandate the fitting of ESC to ADR category MA, MB and MC vehicles. These are passenger cars, passenger vans and 4WDs/SUVs respectively. While Australia was not obliged to mandate ESC (even though it had voted for the GTR to be established), if a regulatory option was chosen it was obliged to adopt the accepted international standard, in this case GTR 8.

At the same time, the UNECE had recently amended Regulation No. 13-H ‘Braking of Passenger Cars’ (R 13-H) to incorporate the text of GTR 8. This was done under the Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts of March 1958 (the 1958 Agreement). Australia is a Contracting party to the 1958 Agreement for developing UN regulations, separately from the 1998 Agreement for developing the GTRs.

The R 13-H amendments only applied technical requirements where ESC is fitted. However, the Transitional Provisions provide Contracting Parties with the mechanism to mandate the actual fitting of ESC within their own domestic or regional legislation, at their discretion. R 13-H included an implementation timing of 1 November 2011 for newly introduced vehicle models and 1 November 2013 for all models.

Following the RIS process in 2009, ADRs 31 and 35 were amended in order to mandate ESC in MA, MB and MC (UNECE M1 vehicles) in line with the scope of R 13-H. The UN implementation timetable of 1 November 2011 – 1 November 2013 was also adopted.

UN Regulation No. 13 Braking on Vehicles of Categories M, N and O (R 13) also contains requirements for ESC, but these are different from the requirements in GTR 8. It is understood that GRRF (the UN Working Party on Braking and Running Gear) focussed on heavy vehicles when developing the ESC requirements for R 13 and that the test protocols for heavy vehicles naturally tend to be very different from those for light vehicles.

Under R 13, ESC is mandatory for the UN heavy vehicle categories, but is optional for LCVs, which fall under ADR category NA (UN category N1). For NA (N1) vehicles, R 13 contains technical requirements for ESC where fitted.

Contracting Parties that are signatories to both R 13 and R 13-H recognise approvals to either regulation as equally valid. However, the effect of this is that NA (N1) is the only powered category covered by these regulations for which ESC cannot be mandated, as NA vehicles can always be certified to R 13 instead of 13-H.

At the time the Australian RIS was being developed for ESC, the case for mandating ESC for light passenger vehicles was clear cut. However, there was no direct estimate available for the effectiveness of the technology in LCVs. The final RIS recommended mandating ESC only for MA, MB and MC vehicles, in line with R 13-H.

Australian research by the Monash University Accident Research Centre (MUARC) and commissioned by the Australian Government subsequently showed effectiveness for ESC for LCVs similar to that for passenger cars. This research is discussed further in Appendix 4—Effectiveness of Electronic Stability Control Systems.

As a net importer of vehicles, having harmonised vehicle standards and an international approach to mandating effective safety technologies is important to Australia. Therefore, at the September 2011 UNECE World Forum for Harmonisation of Vehicle Regulations (WP.29) GRRF meeting, the Government submitted a paper proposing mandating ESC in N1 category vehicles through Regulation 13, in line with actions already taken by the European Union and the United States.

At that time, the view put to Australia was that regulations R 13 and R 13-H already contained requirements suitable for ESC for LCVs where fitted, and so regulation would be a matter for Australia if its market warrants it. This RIS therefore examines the case for mandating ESC fitment in the LCV fleet in Australia through the ADRs, independently of any revisions being made to the UN regulations.

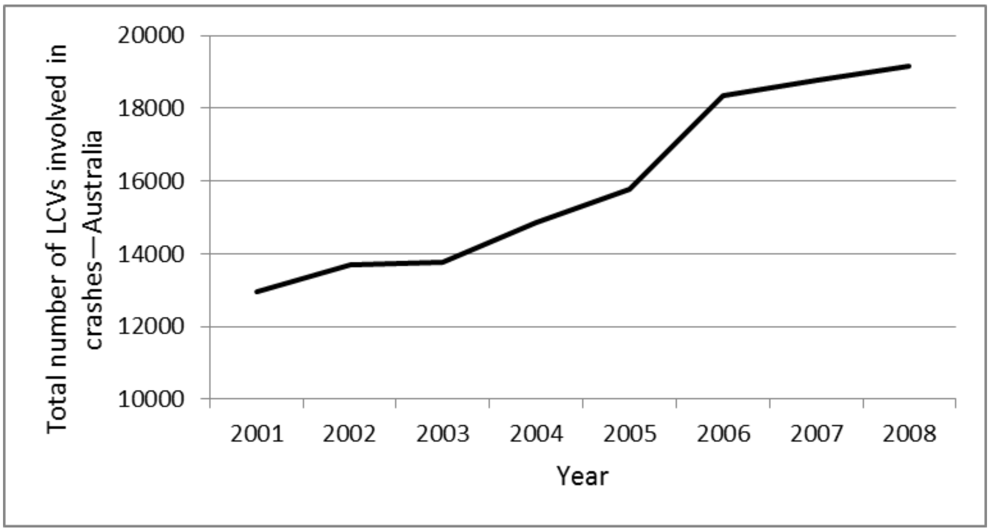
Additionally, the Australian Government has worked closely with the states and territories to develop the *National Road Safety Strategy 2011-2020* (NRSS), which was endorsed on 20 May 2011 by the Transport Ministers. Under action item 16b of the ‘actions for the first three years’ section of the strategy, the Government is committed to considering mandating ESC in LCVs, subject to the final outcomes of a RIS. (NRSS, 2011)

As with any vehicle safety initiative in Australia, there are a number of options that need to be examined. These include both non-regulatory and/or regulatory means such as the use of market forces, manufacturer commitments, codes of practice, public education campaigns, fleet purchasing policies, and regulation through the ADRs.

2 EXTENT OF THE PROBLEM

Research conducted by Fitzharris et al from MUARC in 2010 shows that the number of LCVs involved in crashes in Australia increased each year over the eight-year period from 2001 to 2008. See Figure 2 below. Over this period, on average, 39 LCV drivers were killed each year, and 387 were seriously injured (Fitzharris et al, 2010).

Figure 2 Total number of LCVs involved in crashes in Australia 2001-2008 (Fitzharris et al, 2010)



ESC is effective, or ‘relevant’, for particular crash types, such as loss of control, run-off road crashes and irrelevant for other crash types, specifically rear impact crashes (Fitzharris et al, 2010). The MUARC research estimates that ESC would be relevant in approximately 89 per cent of serious injury (including fatal) crashes and would be relevant in approximately 67 per cent of minor injury crashes.

3 WHY GOVERNMENT INTERVENTION MAY BE NEEDED

Government intervention may be needed when the market fails to provide the most efficient and effective solution to a problem. In the case of ESC technology, Stanford (2007) suggests that if a rapid take-up is desired in the short term, government intervention is likely to be necessary.

3.1 Market response

In Australia, the recent market response to ESC in LCVs has been significant. Therefore, there is the question of whether government intervention to extend the level of ESC penetration in the LCV fleet would be cost-beneficial.

In 2011, LCVs accounted for 20 per cent of Australian vehicle sales (VFACTS, 2011). In 2010 ESC was fitted to 8.3 per cent of LCVs (Fitzharris et al, 2010), increasing to 45 per cent in 2012 In 2012, industry advised that it expected the fitment rate to increase to 90 per cent by 2018 and 99 per cent by 2020 (FCAI, 2012).

There has been some intervention by Australian and state and territory governments, in partnership with vehicles manufacturers, in raising public awareness of the technology. It is likely that these measures have contributed to the current level of take-up of ESC technology.

However, even though penetration is increasing with time, there is no guarantee that these expected fitment rates will be reached. Additionally there is no guarantee, in the absence of an appropriate standard, that all ESC systems fitted to LCVs will achieve an acceptable minimum level of performance.

3.2 Objective of Government Intervention

A general objective of the Australian Government is to establish the most appropriate measure(s) for delivering safer vehicles to the Australian community. The specific objective of this RIS is to examine the case for government intervention to increase the current voluntary fitment rate of ESC to the new LCV fleet in Australia.

Where intervention involves the use of regulation where the decision maker is the Australian Government's Cabinet, the Prime Minister, minister, statutory authority, board or other regulator, Australian Government RIS requirements apply. This is the case for this RIS. The requirements are set out in the Best Practice Regulation Handbook (Australian Government, 2010).

The Agreement on Technical Barriers to Trade, to which Australia is a signatory, requires contracting parties to adopt international standards where they are available or imminent.

4 EXISTING REGULATIONS

The Australian Government provides protection for new vehicle consumers through the *Competition and Consumer Act 2010* (C'th) (C&C Act) and the *Motor Vehicle Standards Act 1989* (C'th) (MVSA).

The C&C Act provides consumer protection and quality of supply of product. The MVSA provides mandatory vehicle safety, emission and anti-theft standards with which suppliers of new vehicles are required to comply. These are national standards and are known as the Australian Design Rules (ADRs).

In 2009, the Australian Government mandated ESC for new passenger cars, passengers vans and 4WD/SUVs through ADRs 31 and 35 in line with the scope of UNECE R 13-H. These requirements have applied from November 2011 for newly approved models and will apply from November 2013 for all remaining models. The regulation of ESC in Australia and internationally was discussed in detail earlier in Section 1.2 Background.

5 OPTIONS

The available options are listed below.

5.1 Non-Regulatory Options

Option 1: no intervention
Allow market forces to provide a solution (no intervention).

Option 2: user information campaigns
Inform consumers about any benefits of ESC technology using education campaigns (suasion).

Option 3: fleet purchasing policies
Only allow vehicles fitted with ESC for government purchases (economic approach).

5.2 Regulatory Options

Option 4: codes of practice
Allow road vehicle supplier associations, with government assistance, to initiate and monitor a voluntary code of practice for ESC and its fitment. Alternatively, mandate a code of practice (regulatory—voluntary or mandatory).

Option 5: mandatory standards under the C&C Act
Mandate standards for ESC under the C&C Act (regulatory—mandatory).

Option 6: mandatory standards under the MVSA
Develop (where applicable) and mandate standards for ESC under the MVSA.

6 DISCUSSION OF THE OPTIONS

6.1 Option 1: No Intervention

The current level of penetration of ESC equipped LCVs in Australia has been achieved without regulation. Industry has recognised the benefits of ESC and is responding accordingly. There have been a number of actions that have likely contributed to this current position, including, importantly, the regulation of ESC in MA, MB and MC vehicles in 2009.

In 2010, the proportion of new vehicles fitted with ESC as standard equipment in Australia was approximately 8.3 per cent (Fitzharris et al, 2010). The current (2012) voluntary fitment of ESC in LCVs is 45 per cent (FCAI, 2012). The change in fitment rates between 2010 and 2012 may be indicative of future trends.

To determine the proportion of the Australian LCV fleet expected to be fitted with ESC into the future, Australian manufacturers and importers were requested in mid-2012 through the Federal Chamber of Automotive Industries (FCAI) to indicate expected fitment rates.

FCAI have stated that, without any form of intervention, the planned timing to have close to 100 per cent (i.e. 99 per cent) of LCVs fitted with ESC is:

a) > 90 per cent during 2018;

b) 99 per cent by 1 January 2020.

During the public comment period, the FCAI indicated current and expected future voluntary fitment rates which differ from those advised earlier. The effect of this examined in an additional sensitivity analysis in Section 7.4 and discussed in more detail in Section 10.2.

6.2 Option 2: User Information Campaigns

User information campaigns can be used to promote the benefits of a new technology and so encourage consumer demand. Campaigns may be carried out by the private sector and/or the public sector. They can be effective where the information being provided is simple to understand and unambiguous. They can be targeted towards the single consumer or to those who make significant purchase decisions, such as private or government fleet owners.

Appendix 5—Awareness and Advertising Campaigns details two real life examples of awareness campaigns, a broad high cost approach and a targeted low cost approach. The broad high cost approach cost $6m and provided a benefit-cost ratio of 5. The targeted low cost approach cost $1m and generated an awareness of 77 per cent. It was run over a period of four months. However, these figures are indicative only as the campaigns do not relate to ESC or even automotive related topics generally. It is likely that an awareness campaign would need to be run on a continuous basis to maintain its effectiveness.

Advertising campaigns were also considered as a means of increasing the uptake of ESC. A typical cost for a three month campaign consisting of television, newspaper and magazine advertisements is $5m (~$1.5m per month) (Average Advertising Costs, n.d.). Some research into advertising showed that for general goods, advertising campaigns can lead to an increase of around 8 per cent in sales (Radio Ad Lab, 2005). This is consistent with the result achieved by a Mitsubishi campaign promoting Active Stability Control, which is also detailed in Appendix 5—Awareness and Advertising Campaigns. This campaign was relevant as it focussed solely on ESC.

It is likely that an advertising campaign would also need to run on a continuous basis to maintain its effectiveness. However, it may be optimistic to assume that the campaign could continue to generate the same level of effectiveness (8 per cent) each year. It was therefore assumed that the effectiveness would start at 8 per cent and then decrease in each subsequent year by 10 per cent of the previous year's value. In addition, given the high voluntary fitment rates predicted under the BAU case, it would be unlikely that an advertising campaign could influence the final 1 per cent of consumers and improve on the BAU rate once it reaches its final level of 99 per cent. While it is possible that a campaign could maintain a higher effectiveness for longer, in making the above assumptions a conservative approach has been taken. Table 3 provides a summary of the cost and effectiveness of the various campaigns discussed.

Table 3 Estimated cost and effectiveness of various campaign types

Campaigns	Estimated cost (AUD)	Expected effectiveness
Awareness—broad	6m	$5 benefit/$1 spent
Awareness—targeted*	1m per four month campaign, or 3 per year	Total of 77 per cent awareness and therefore sales (but no greater than existing sales if already more than 77 per cent)
Advertising*	1.5 per month campaign, or 18 per year	8 per cent increase in existing sales in the first year (decreasing by 10 per cent each year thereafter)

*subsequently used towards benefit-cost analysis

6.3 Option 3: Fleet Purchasing Policies

The government could intervene through fleet purchasing by favouring vehicle models fitted with a specific safety technology, in this case ESC, and by persuading manufacturers to fit the technology to vehicles currently not fitted with it.

Advantages of targeting fleet purchasing are:

- there is substantial evidence that fleet drivers have an increased crash risk compared with privately registered vehicle drivers (Bibbings, 1997);
- ex-fleet vehicles are often sold after 2 to 3 years, giving the public the opportunity to buy a near new vehicle at a large discount (Nesbit & Sperling, 2001; Symmons & Haworth, 2005); and
- fleet vehicles are on average driven twice as far annually than household vehicles, thus maximising the use of any technology benefits (Nesbit & Sperling, 2001).

In 2011, the Australian Government introduced requirements for Australasian New Car Assessment Program (ANCAP) star ratings into its fleet purchasing guidelines.

ANCAP publishes vehicle crash test results and awards star ratings indicating a vehicle's level of safety in an accident. The highest safety rating is five stars.

As of 1 July 2011, all new Australian Government fleet passenger vehicles must have a minimum five-star ANCAP rating, while, as of 1 July 2012, Australian Government fleet LCVs must have a minimum four-star rating, subject to operational requirements (Department of Finance and Deregulation, 2011). It is understood that some state and territory government agencies have already adopted similar fleet purchasing policies, while other agencies are considering this as an option.

The ANCAP Rating Road Map outlines the safety technologies required in vehicles in order to achieve different star ratings over the period 2011 to 2017. Under the Road Map, ESC has been required for vehicles to achieve a five-star rating from 2011 and a four-star rating from 2012 (ANCAP, 2012).

Therefore ESC is, in effect, already a requirement for Commonwealth fleet LCVs. This means that any further Australian Government fleet purchasing policy relating to the purchase of LCVs fitted with ESC would be redundant. This option was not considered further.

6.4 Option 4: Codes of Practice

A code of practice can be either voluntary or mandatory. There are remedies for those who suffer loss or damage due to a supplier contravening the code, including injunctions, damages, orders for corrective advertising and refusing enforcement of contractual terms.

Voluntary Code of Practice

Compared with legislated standards, voluntary codes of practice offer the opportunity for a high degree of industry involvement, as well as a greater responsiveness to change when needed. For them to succeed, the relationship between business, government and consumer representatives should be collaborative so that all parties have ownership of, and commitment to, the arrangements (Grey Letter Law, 1997). The Australian new vehicle industry is well placed to provide a collaborative voice in the case of ESC. Of the manufacturers and importers involved with new passenger cars, the Federation of Automotive Product Manufacturers (FAPM) and FCAI represent 40 per cent and 99 per cent [1] respectively of the total.

In the case of ESC, the technology is well established and so on first inspection it would appear that a voluntary code of practice would be feasible and need not be too detailed. It could be reduced to an agreement by industry to fit ESC to all nominated vehicle types by a certain date or to publish and promote information on ESC.

However, any breaches would be difficult to control by the manufacturers' associations or by the Australian Government. Given the sophistication of ESC systems, detecting a breach would also be difficult in a case of reduced performance rather than it simply not being fitted. Such breaches would usually only be revealed through failures in the field or by expert third party reporting. Therefore any reduction in implementation costs over mandated intervention would need to be balanced against the consequences of these failures.

In addition, as the BAU case being considered already represents a high expected voluntary rate—99 per cent by 2020—it would be less likely that additional benefits through voluntary means such as codes could be realised. Once a high level is reached, the code would impact only those manufacturers finding it more difficult to comply in the first place. It would also have no effect on any manufacturer that is not a member of an association subject to the code. Given that the FCAI covers most but not all (i.e. 99 per cent) of vehicles manufacturers and importers involved with new passenger cars it would be very difficult for any voluntary code to reach that final 1 per cent.

[1] Membership base of the FCAI includes vehicle manufacturers and the FAPM. It does not include sectors such as tyre manufacturing, vehicle distribution, transport logistics and after market supplies.

The lack of control over breaches and the fact that the code would be operating in the upper margins of fleet numbers, would make it difficult for this option to improve on the no-intervention option. Therefore, it was not considered further.

Mandatory Code of Practice

Mandatory codes of practice can be an effective means of regulation in areas where government agencies do not have the expertise or resources to monitor compliance. However, in considering the options for regulating the design and construction of motor vehicles, the responsible government agency (Department of Infrastructure and Regional Development) has existing legislation, expertise, resources and well-established systems to administer a compliance regime that would be more effective than a mandatory code of practice. This option was therefore not considered further.

6.5 Option 5: Mandatory Standards under the C&C Act

As with codes of practice, standards can either be voluntary or mandatory as provided for under the C&C Act.

However, in the same way as a mandatory code of practice was considered in the more general case of regulating the design and construction of motor vehicles, the responsible government agency (Department of Infrastructure and Regional Development) has existing legislation, expertise and resources to administer a compliance regime that would be more effective than a mandatory standard administered through the C&C Act. This option was therefore not considered any further.

6.6 Option 6: Mandatory Standards under the MVSA

Under Option 6, the Australian Government would mandate ESC fitment in the LCV fleet through the ADRs, adopting the performance requirements of relevant UN regulations.

<u>Background</u>

As discussed earlier, in June 2008 the UNECE adopted GTR 8 under the 1998 Agreement. UN R 13-H (braking) was amended in November 2008 to incorporate the text of the GTR. The timing of the amendments was November 2011 for new models and November 2013 for all models.

As a contracting member to the 1998 Agreement, in 2009 Australia subjected GTR 8 to its domestic rule-making process and subsequently adopted the requirements into ADRs 31/02 and 35/03 for MA, MB and MC category vehicles. The UN implementation timetable of 2011–13 was also adopted.

ADRs 31 and 35 together specify the braking performance of passenger and commercial vehicles, including cars, vans, buses, utes, and both light and heavy trucks. The ESC requirements were implemented as annexes to these ADRs. This is similar to the UN arrangements where requirements for ESC comprise annexes to its braking regulations.

Therefore, the requirements of ESC were taken from the international standard R 13–H as well as GTR 8, both of which are accepted as an alternative means of compliance.

UN R 13 also contains requirements for ESC, but these are different from the requirements of GTR 8. Under R 13, ESC is mandatory for certain categories of medium and heavy vehicles, but is optional for LCVs (UN category N1). For N1 vehicles, R 13 contains technical requirements for ESC where fitted.

Contracting Parties that are signatories to both Regulations 13 and 13-H recognise approvals to either regulation as equally valid. The effect of this, however, is that N_1 is the only powered category covered by these regulations for which ESC cannot be mandated as it can be certified to Regulation 13 instead of 13-H.

N_1 category vehicles were not considered during the development of the ESC requirements for R 13. It is possible that it was recognised at the time that ESC was more problematic for LCVs than for passenger cars, due to the complexity of cab-chassis configurations and mass distribution effects. However Australian research by MUARC subsequently showed effectiveness for ESC in LCVs similar to that for passenger cars (see Appendix 4—Effectiveness of Electronic Stability Control Systems).

As discussed in Section 1.2 Background, at the September 2011 UNECE WP.29 GRRF meeting, the Australian Government submitted a paper proposing mandating ESC in N1 category vehicles through R 13. At that time, the view put to Australia was that regulations R13 and R13-H already contained requirements suitable for ESC for LCVs where fitted, and so regulation would be a matter for Australia if its market warrants it. Therefore, under Option 6, the Australian Government would mandate ESC fitment in the LCV fleet through the ADRs and independently of any revisions being made to the UN regulations.

Performance Requirements

The UN regulations (R 13 and R 13-H) and the ADRs (31/02 and 35/03) contain both prescriptive and performance requirements for ESC. Although the preference was to have only performance requirements, the UN working party identified that it was not possible to devise a reliable single test that could cover all scenarios of instability in a vehicle. To keep the testing burden as low as possible, a single test was formulated, and then supplemented with prescriptive requirements.

The performance requirements have their origins in the US New Car Assessment Program "fishhook test"; a test that has been used in the past to evaluate resistance to rollover. It consists of a lane changing manoeuvre at 50 mph (80 kph). The lane change contains a precisely specified steering wheel movement (in the shape of a half sine wave performed by a machine) from the straight ahead position first in one direction, then in the other, then a pause, and finally a return to the straight ahead position. Within around two seconds of achieving the final position, the rate of rotation, or yaw, of the vehicle must be sufficiently diminished. There is a minimum sideways movement that must be achieved in the first second or so of the manoeuvre, the purpose of which is to defeat the use of steering systems that respond slowly to steering input.

The prescriptive requirements are slightly modified from, but otherwise consistent with, the definition of ESC as contained in a voluntary consensus standard, the Society of Automotive Engineers (SAE) Surface Vehicle Information Report J2564 (rev. June 2004), which require an ESC system to have:

- individual braking to correct yaw;
- computer closed loop control;
- detection of yaw rate and sideslip;
- monitoring of steering input; and
- operation on full range of vehicle use except slow speed.

7 ECONOMIC ASPECTS—BENEFIT-COST ANALYSIS

General

Benefit-cost analysis is a useful tool for evaluating the feasibility of implementing new technology, but it does not replace the decision process itself. The model used in this analysis is the Net Present Value (NPV) model. Using this model, the flow of benefits and costs are reduced to one specific moment in time. The time period that the benefits are assumed to be generated over is the life of the vehicle(s). Benefit-cost ratios (BCRs) show whether the returns (benefits) on a project outweigh the resources outlaid (costs) and indicates what this difference is.

In the case of adding particular safety features to vehicles, there will be an upfront cost (by the vehicle manufacturers) at the start, followed by a series of benefits spread throughout the life of the vehicles. This is then repeated in subsequent years as additional new vehicles are registered. There may also be other ongoing business and government costs through the years, depending on the option being considered.

The only ongoing costs directly associated with the technology of ESC would be part of the overall maintenance of the vehicles. As this would be minimal, it is not necessary to include it in the model. Calculations were started at the current estimated voluntary fitment rate of 45 per cent, as initially advised by industry. The results of each option were compared with what would happen if there was no government intervention, that is, Option 1: business as usual (BAU). Under the BAU case, industry expected the voluntary fitment rate to reach 90 per cent during 2018 and 99 per cent by 2020.

The analysis model that was used had the capacity to calculate over a 42 year period of analysis. All options were given a starting point of 2013, but for Option 6: regulation, the starting point was set as 2015 (for new models) to 2016 (for all models). The analysis model was run such that the regulation option remained in force for 15 years, i.e. 15 years from 2015—the phase-in date for new models. This took the analysis to 2029, after which the regulation would be withdrawn or replaced. All options were then set to have this same end date of implementation. A 25 year period followed for the full set of benefits from each option to be realised over the life of a fleet of vehicles. As the options other than the regulation option were able to be implemented straightaway from 2013, their period of effectiveness added to a total of 17 years. It was necessary to run the analysis over such a long period. Generally, the road safety benefits resulting from improving the performance of vehicles are gradually realised as the fleet is first replaced and then the vehicles age and crash over a period of about 26 years for each vehicle.

The calculations used a method that accounted for variations in both crash likelihood and vehicle registrations over a possible 25 year vehicle crash life, as originally developed by Fildes (2002). Thus the benefits were controlled for the risk that a crash would occur during a particular year of a vehicle's life. The crash likelihoods represented historical crash rates and as such were a good approximation of the crash profile of an average vehicle. The average crash age of a vehicle under this model was around 10-15 years. It should be made clear that the average crash age of a vehicle is not the same as the average age of a vehicle. By way of example, a cohort of vehicles in the fleet crashes very little in the first few years of its life and, due to scrappage and/or reduced use, decreasingly in the last fifteen years of its life. Under this model, it was not necessary to determine the average age of a vehicle. The benefits were calculated using established monetary values representing fatalities, serious injuries and minor injuries.

A detailed explanation of the method can be found at Appendix 7—Benefit-Cost Analysis—Methodology.

Vehicle fleet

The ADR vehicle category relevant to LCVs is category NA—light goods vehicle—'a goods vehicle with a GVM not exceeding 3.5 tonnes'. Annual NA vehicle sales are detailed below in Table 4.

Table 4 Details of the new LCV fleet (FCAI, 2011)

ADR category	Description	Makes	Models	Vehicles
NA	Light goods vehicle	20	51	176,940

Costs

For the non-regulatory options, the costs were discussed earlier in the RIS and the results summarised in Table 3. These costs represented the non-regulatory intervention methods (awareness campaigns and advertising campaigns). The actual fitment, development and (as relevant) regulatory costs are discussed in the following sections.

Source of the costs

In March 2012, the FCAI were contacted for information on costs specific to implementing ESC in LCVs. The FCAI provided an aggregate per vehicle cost that covered the costs of implementing ESC, including development, testing and installation costs.

Magnitude of the costs

For the purposes of the benefit-cost analysis, a figure of $400 was advised by the FCAI for the cost of implementing (i.e. developing, testing, and installing) ESC in an LCV for the Australian market.

There is also an assumed yearly cost of $50,000 to governments to create, implement and maintain the regulation, as well as for state and territory jurisdictions to develop processes for its in-service use, such as vehicle modification requirements. This includes the initial development cost, as well as ongoing maintenance and interpretation advice. The assumed value was based on Department of Infrastructure and Regional Development experience.

The cost of increased fuel consumption was not calculated as part of the benefit-cost analysis. Individual components of an ESC system would add around 4 kg to the mass of a vehicle. According to Transport Canada (2007), this would result in increased fuel consumption of 0.1 per cent or 1 additional litre every 10,000 km (assuming an average fuel consumption of 10L/100 km). As a result, this impact would be minimal and so did not need to be factored in to the analysis.

Table 5 provides a summary of the costs for various aspects of fitting ESC to an LCV. It includes the non-regulatory options from Table 3.

Table 5 Estimation of costs of ESC

Type of cost	Estimated cost (AUD)	Notes
Implement ESC system	400	Per vehicle
Information campaigns	3m-18m	Per year
Implement and maintain regulation	50,000	Per year

Particular costs

Option 1: no intervention was the BAU case and therefore there were no associated costs.

For the remaining options, there was a basic implementation cost associated with the number of vehicles that would be fitted with ESC due to the particular intervention method (option) used, above and beyond those already fitted voluntarily. For example, say that 60 per cent of newly registered vehicles already have ESC fitted voluntarily, and an intervention method (option) was expected to raise this to 80 per cent. Then there would be a basic implementation cost associated with 80-60 = 20 per cent of these newly registered vehicles.

This basic implementation cost was added to any other costs related to the intervention (for example, the cost of awareness campaigns).

For Option 2: user information campaigns, there was a basic implementation cost of $400 per vehicle as well as a minimum cost of $3m per year ongoing for an awareness campaign (Option 2(a)) or a maximum cost of $18m per year ongoing for an advertising campaign (Option 2(b)). These were discussed earlier in the RIS.

For Option 6: mandatory standards under the MVSA there was an implementation cost of $400 per vehicle and an estimated cost of $50,000 per year to governments to create, implement and maintain the regulation.

By their nature, regulations would be applied to all of the relevant models in the new passenger fleet (regardless of whether they already had ESC when any regulation was first applied) and so regulation costs would be independent of the voluntary take-up of ESC. These costs represent designing, testing and proving compliance of an ESC system against regulated requirements. These costs would apply to every vehicle model under the scope of the regulation.

Appendix 8—Benefit-Cost Analysis—Details of Results shows the costs for each option.

7.1 Benefits and Costs of the Remaining Options

Three scenarios were prepared for estimating the benefits from ESC in LCVs. These represented the three remaining options, Options 1, 2 and 6. The three scenarios were based on the difference between the current voluntary fitment rate of ESC, and the final estimated fitment rate under each particular option. The current (2012) voluntary fitment rate for LCVs is 45 per cent.

For Option 1: no intervention, there were no benefits associated with this as it was the BAU case.

For Option 2: user information campaigns, there was an estimated increase from the Option 1 current fitment rate of 45 per cent to a total of 77 per cent fitment rate for an ongoing targeted awareness campaign (Option 2(a)). Alternatively, there was an eight per cent increase on Option 1 through advertising campaigns (Option 2(b)). For Option 2(a), the campaign stopped once the voluntary fitment rate would have otherwise, through the BAU case, reached 77 per cent. For Option 2(b), the advertising campaigns added eight per cent onto the fitment rate at the time, which was capped at 99 per cent total.

For Option 6: mandatory standards under the MVSA, there was an increase from the current fitment rate to a total of 100 per cent, with a pro-rata transition within the 2015-16 period of implementing the regulation.

Effectiveness of ESC

The effectiveness of ESC in reducing single vehicle crash trauma was estimated at 28 per cent for LCVs, based on Australian research by Fitzharris et al (2010). Refer to Appendix 4—Effectiveness of Electronic Stability Control Systems for further details.

7.2 Results

Appendix 8—Benefit-Cost Analysis—Details of Results shows the calculations for the benefit-cost analysis.

A 7 per cent discount rate was used for all options. The assumed final rate of the BAU case was 99 per cent from 2020 onwards.

An overview of the total net benefits, the total costs and the average BCRs and the total number of lives saved over the period of analysis for each option is given in Table 6 to Table 8. The distribution of the (undiscounted) benefits and costs, and the BCR, is shown over time in Figure 3 to Figure 5. A comparison of the expected fitment rate of Option 1 (no intervention) with Options 2a, 2b and 6 (intervention) over time is shown in Figure 6 to Figure 8.

Table 6 Summary of net benefits and total benefits for each option

	Net benefits ($m)	Total benefits ($m)
Option 1: no intervention	-	-
Option 2a: user information campaigns—targeted awareness	48	95
Option 2b: user information campaigns—advertising	-66	51
Option 6: regulation	79	130

Table 7 Summary of costs and BCRs for each option

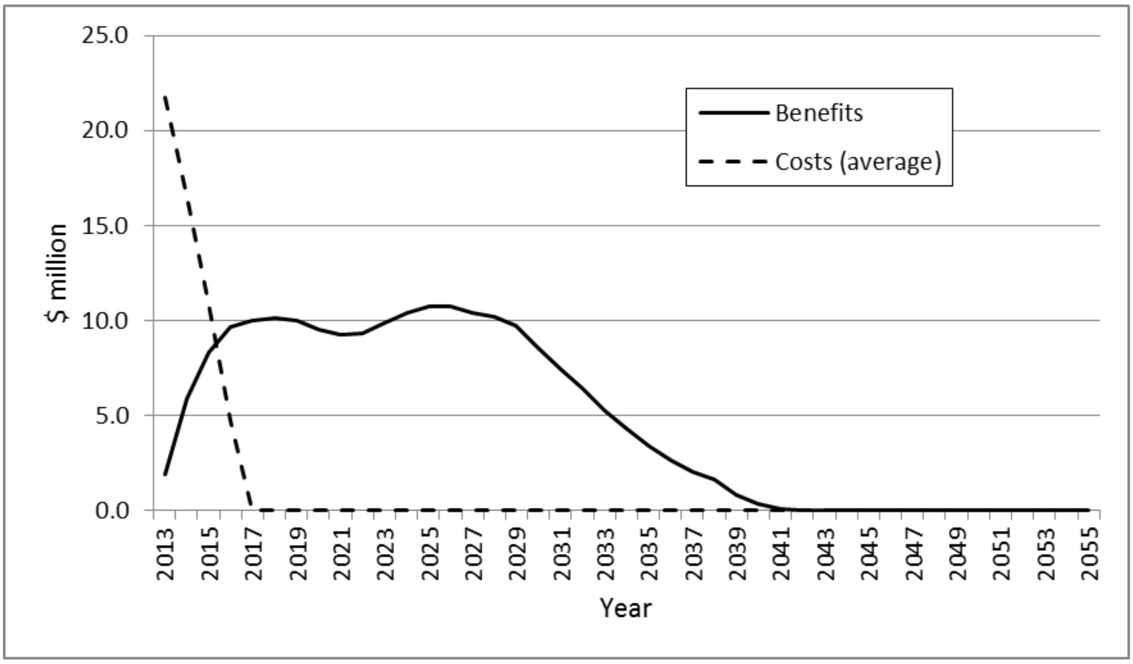
	Costs ($m)	BCR
Option 1: no intervention	-	-
Option 2a: user information campaigns—targeted awareness	47	2.0
Option 2b: user information campaigns—advertising	117	0.4
Option 6: regulation	51	2.5

Table 8 Summary of the number of lives saved for each option

	Lives saved
Option 1: no intervention	-
Option 2a: user information campaigns—targeted awareness	17
Option 2b: user information campaigns—advertising	10
Option 6: regulation	29

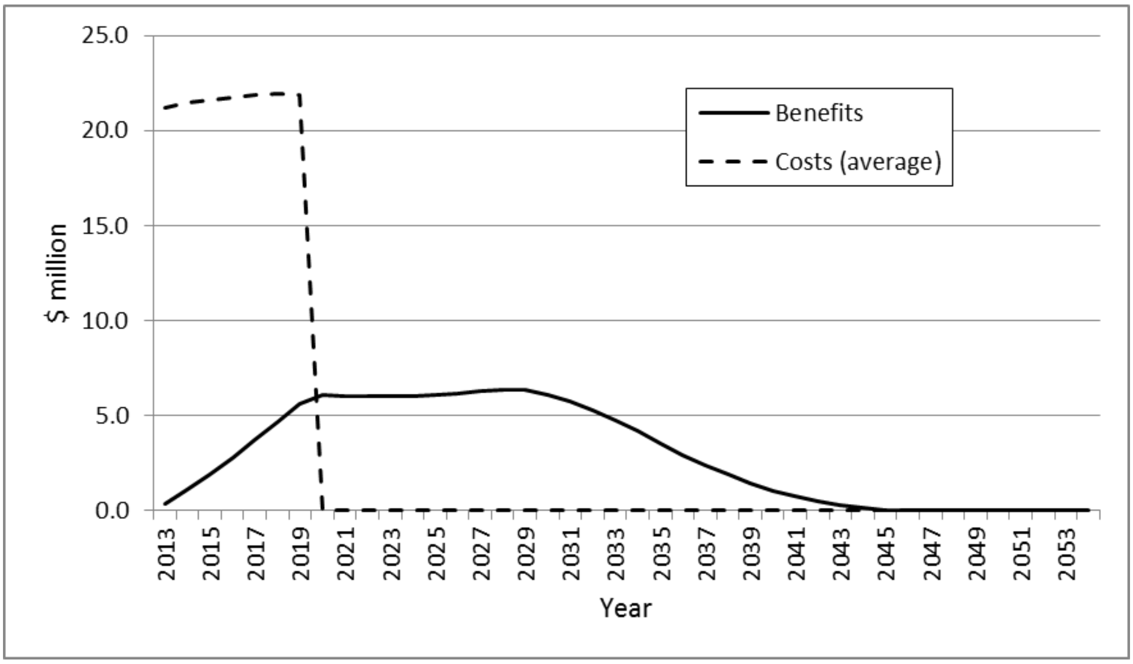
Note:
Seven per cent discount rate

Figure 3 Option 2a: user information campaigns—awareness



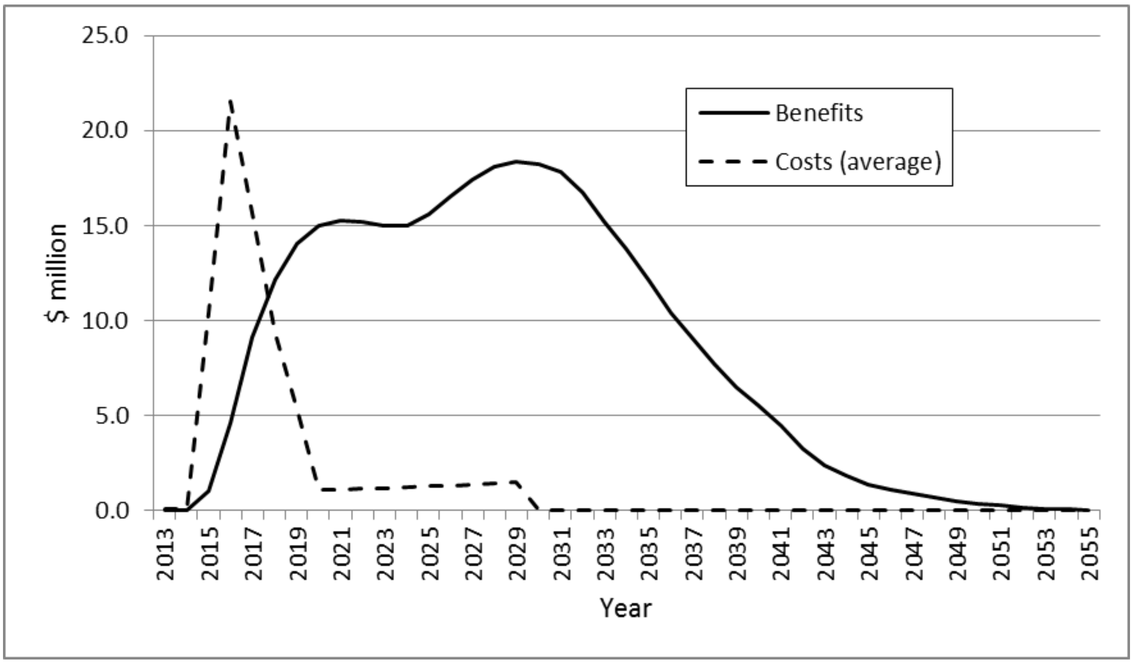
$400 installation cost, $0.5m-$1m per model development cost, $3m per year campaign cost

Figure 4 Option 2b: user information campaigns—advertising



$400 installation cost, $0.5m-$1m per model development cost, $18m per year campaign cost

Figure 5 Option 6: mandatory standards under the MVSA



$400 installation cost, $50,000 per year regulation maintenance cost

Figure 6 Option 2a: user information campaigns—awareness, compared with Option 1: no intervention

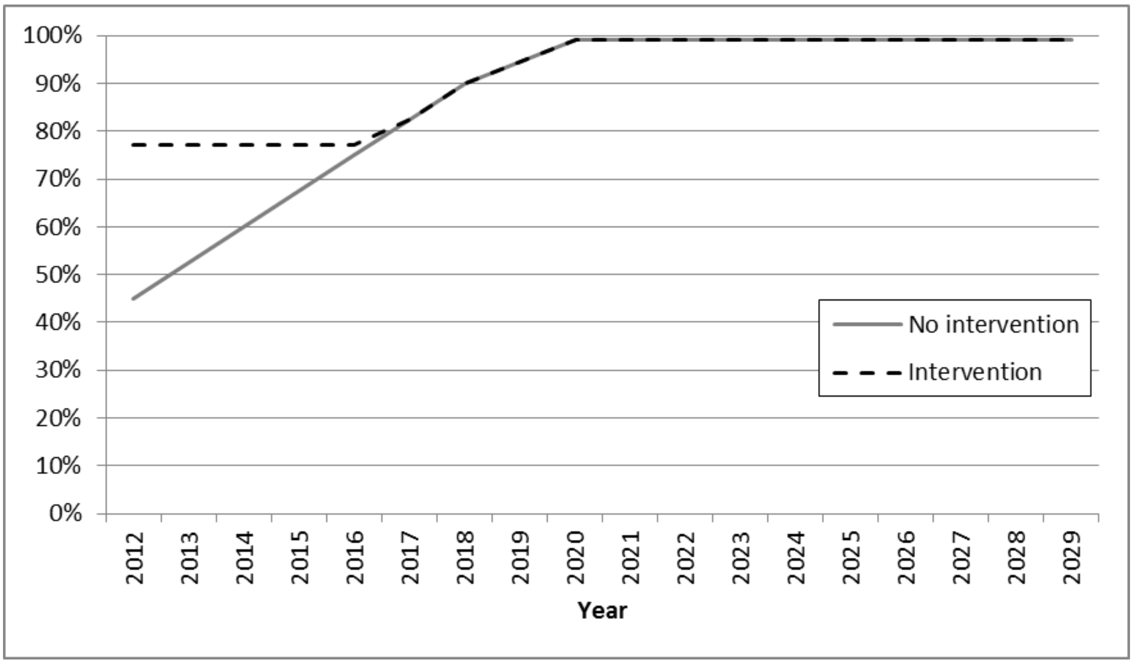


Figure 7 Option 2b: user information campaigns—advertising, compared with Option 1: no intervention

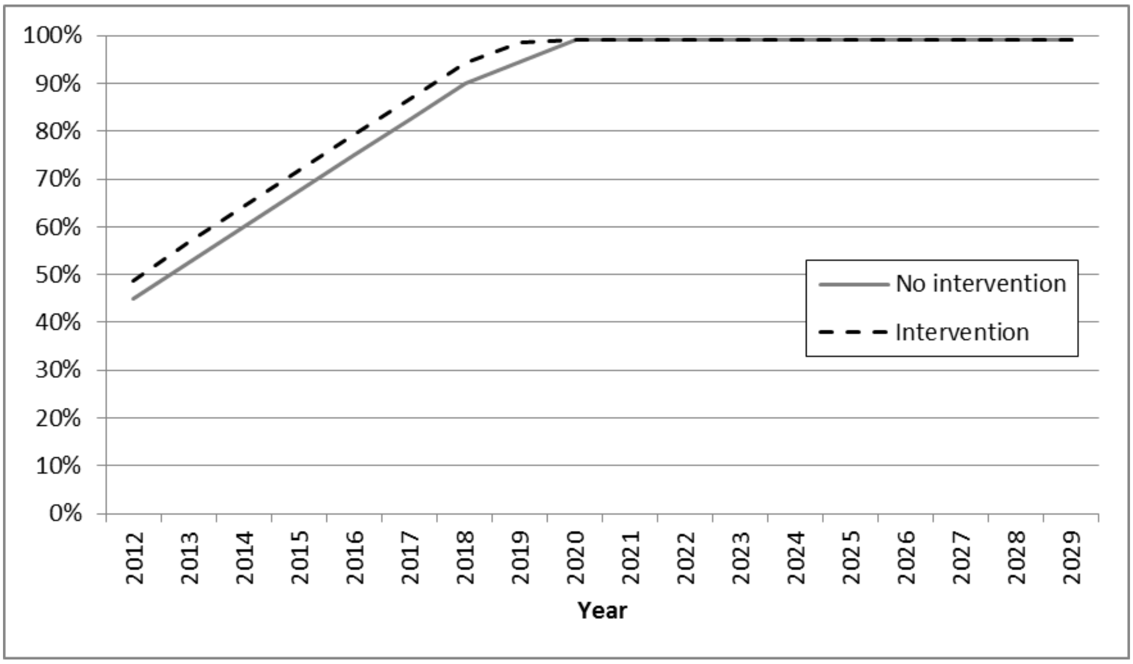
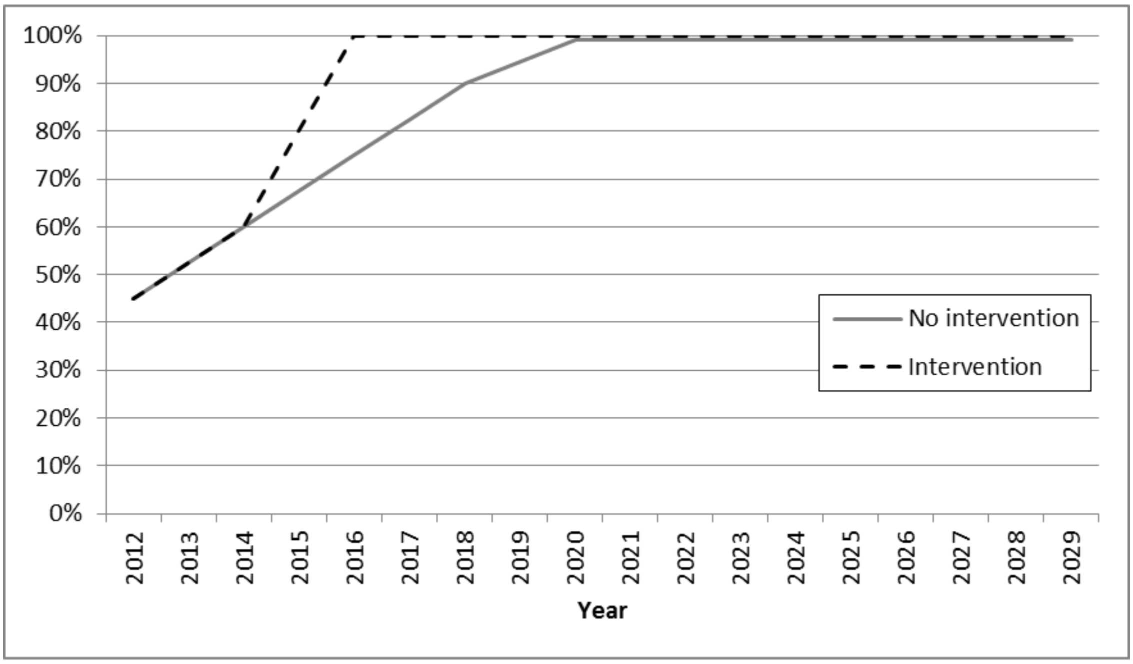


Figure 8 Option 6: mandatory standards under the MVSA, compared with Option 1: no intervention



7.3 Summary of the Results

Option 2a: user information campaigns—awareness and Option 6: mandatory standards under the MVSA gave positive net benefits. Of the two, Option 6 gave the highest net benefits.

The BCRs were above one for Option 2a and Option 6, ranging from 2.1 (Option 2a) to 2.5 (Option 6). This means that these options will provide more benefits through reduced road trauma than it costs to implement them. This was not the case for Option 2b which had a BCR of 0.4.

In terms of costs over the assumed 15 year life of regulation, Option 2b was the most expensive to implement—$117m (including costs to business and government). Option 6, the regulation option, was second at $51m and Option 2a was the cheapest at $47m.

In terms of lives saved, Option 6 was the highest by a healthy margin, at 29 lives saved over the assumed 15 year life of regulation. Option 2a and Option 2b saved 17 and 10 lives respectively.

Each option affected Option 1, the BAU case, differently. This is discussed below.

Option 1: no intervention was the base case and so had no allocated benefits or costs associated with it. It was assumed that the voluntary fitment rate would follow that advised by industry, reaching 90 per cent during 2018 and 99% by 2020. After that it was assumed that the rate would stay at 99 per cent for the foreseeable future. This trend can be seen in the no intervention series within Figure 6 to Figure 8.

Option 2: user information campaigns used two approaches. In the first—Option 2a: awareness— it was assumed that an ongoing awareness campaign, costing $3m per year, would bring the fitment rate up to 77 per cent, but could do no more than maintain this level in the long term. Figure 6 shows that for five years, the fitment rate is raised to 77 per cent. After five years, the BAU rate has exceeded this level and so the campaign stops.

Figure 3 shows the costs (to business and government) peaking in the first year, then reducing to zero when the BAU case reaches 77 per cent and the campaign therefore finishes. The benefits then flow on from that batch of ESC fitted vehicles moving through their life cycle.

In the second approach—Option 2b: advertising—it was assumed that an advertising campaign, costing $18m per year, would increase the fitment rate by eight per cent during its first year. The effectiveness of the campaign would then decrease by 10 per cent each year thereafter. Figure 7 shows that for the first seven years of the campaign, the BAU fitment rate increases by a smaller and smaller percentage until it reaches 99 per cent in 2019. By 2020, the BAU level reaches 99 per cent and so the campaign ends.

Figure 4 shows a very gradual rise in costs over the first seven years in line with the increasing fleet size. In 2020, when the campaign ends, the costs decline to zero. The benefits flow on from that batch of ESC fitted vehicles moving through their life cycle.

In Option 6: mandatory standards under the MVSA, there is a pro-rata transition phase from the BAU fitment rate to 100 per cent between 2015 and 2016. As the final BAU fitment rate was assumed to be 99 per cent, the regulation is ongoing and forces compliance to 100 per cent. This can be seen in Figure 8. It can also be seen in Figure 5 that the costs begin with the introduction of the regulation for new models in 2015 and peak in 2016 with the introduction of the regulation for all models. There is a significant dip in costs at 2020 when the BAU rate goes to 99 per cent. The costs remain steady at this level for the remainder of the regulation period, with only a gradual rise in line with the increasing fleet size. As with Option 2b, the benefits will continue to accrue as long as the BAU level would have otherwise remained at 99 per cent.

7.4 Sensitivity Analysis

A sensitivity analysis was carried out to determine the effect on the outcome of some of the less certain inputs to the benefit-cost analysis. Only Option 6 was tested as this was the option that gave the highest net benefits.

The cost of ESC implementation and regulation were considered to be reasonably accurate, being provided through the relevant industry and government sources. The life of a vehicle was set at 25 years in accordance with Australian crash likelihood data.

The main uncertainty that could adversely affect the options was the assumed 7 per cent discount rate of the benefits and costs. For Option 6, the benefit-cost analysis was therefore run with a discount rate of 10 per cent and then with a discount rate of 3 per cent. Table 9 shows that the net benefits are positive under all three discount rates.

Table 9 Impacts of changes to the discount rate

	Net benefits ($m)	BCR
Low discount rate (3%)	159	3.5
Base case discount rate (7%)	79	2.5
High discount rate (10%)	47	2.1

The effectiveness of ESC technology was also considered to be accurate—the research provided by Fitzharris et al (2010) being thorough and relevant to Australia. However, to account for any uncertainty, the effectiveness of 28 per cent was varied by ±20 per cent. As seen in Table 10, the net benefits are positive even when the effectiveness is reduced by 20 per cent.

Table 10 Impacts of changes to the effectiveness of ESC

	Net benefits ($m)	BCR
Low effectiveness (22.4%)	53	2.0
Base case effectiveness (28%)	79	2.5
High discount rate (33.6%)	105	3.1

Post-consultation sensitivity analysis

During the public consultation period, industry proposed, through the FCAI, an extended implementation timetable of 2015 for new models and 2017 for all models. Industry also indicated current and expected future voluntary fitment rates higher than those advised previously. Following consultation, additional sensitivity tests were undertaken to evaluate the effects of an extended implementation timetable and higher voluntary fitment rates on the net benefits of Option 6 (see Table 11 and Table 12 respectively). Increasing the baseline voluntary fitment rate will reduce or leave unchanged the expected net benefit of all options, as any intervention will impact on a smaller cohort of vehicles. The delayed implementation date only applies to Option 6 and will reduce the expected net benefit. Under this scenario, the net benefits are still positive and greater than the net benefits of the other options considered earlier in the RIS. As shown, the net benefits remain positive under both scenarios.

Table 11 Impacts of changes to the implementation timetable

	Net benefits ($m)	BCR
Base case implementation dates (2015 new models, 2016 all models)	79	2.5
Alternative implementation dates (2015 new models, 2017 all models)	69	2.5

Table 12 Impacts of changes to expected BAU fitment rate

	Net benefits ($m)	BCR
Base case BAU fitment rate (90 per cent 2018, 99 per cent 2020)	79	2.5
Alternative BAU fitment rate (70 per cent current, 90 per cent end of 2013*, 100 per cent 2018**)	21	2.5

* modelled as beginning of 2014

** i.e. 99 per cent, given that FCAI represents most but not all (99 per cent) of vehicle manufacturers and importers

The net benefits for Option 6 under higher voluntary fitment rates (Table 12 above) are approximately $21 million. As this is lower than the net benefits expected for Option 2a under the base case fitment rate, a sensitivity test was also conducted on Option 2a to determine the effect of higher rates (Table 13).

Table 13 Impacts of changes to expected BAU fitment rate on Option 2a

	Net benefits ($m)	BCR
Base case BAU fitment rates (90 per cent 2018, 99 per cent 2020)	48	2.0
Alternative BAU fitment rates (70 per cent current, 90 per cent end of 2013, 100 per cent 2018)	5	1.6

As Table 13 shows, the net benefits of Option 2a under the higher fitment rate are much lower than the net benefits of Option 6 under the same rate.

More detailed results of the sensitivity analysis are available at Appendix 9—Benefit-Cost Analysis—Sensitivities.

7.5 Assumptions

A number of assumptions were made in the benefit-cost analysis. Details can be found at Appendix 10—Benefit-Cost Analysis—Assumptions.

8 ECONOMIC ASPECTS—IMPACT ANALYSIS

Impact analysis considers the magnitude and distribution of the benefits and costs that have been calculated. It also looks at the impact of each option on the affected parties.

8.1 Identification of Affected Parties

In the case of ESC, the parties affected by the options are:

Business/consumers

- vehicle manufacturers or importers;
- vehicle owners;
- vehicle operators; and

Governments

- Australian/state and territory governments and their represented communities.

The business/consumer parties are represented by several interest groups. Those relevant to ESC include:

- FCAI, that represents the automotive sector and includes vehicle manufacturers, vehicle importers and component manufacturers/importers;
- FAPM that represents the automotive component manufacturers/importers; and
- Australian Automobile Association (AAA) that represents vehicle owners and operators (passenger cars and derivatives) through the various automobile clubs around Australia (RAC, RACV, NRMA etc).

8.2 Impact of the Remaining Options

Three options were considered feasible: no intervention, user information campaigns, and mandatory standards under the MVSA. This section looks at the impact of each option in terms of quantifying expected benefits and costs, and identifies how these would be distributed within the community. This is discussed below and then summarised in Table 14.

Option 1: no intervention

This option allows market forces to provide a solution.

As this option is BAU case, there are no benefits or costs allocated. All other options are calculated relative to this base case option.

Option 2: user information campaigns

This option educates consumers about the benefits of ESC technology through information campaigns.

As this option involves intervention only to influence consumer desire in the market place, the benefits and costs are those that are expected to occur on a voluntary basis, over and above those in the BAU case. The fitment of ESC would remain a commercial decision within this changed environment.

Benefits

Business

There would be no direct benefit to business (over and above that of Option 1) as a result of a reduction in road trauma caused by vehicles that are sold with ESC due to the user information campaigns.

Consumers

There would be a direct benefit to consumers and the wider community (over and above that of Option 1) as a result of a reduction in road trauma for those who drive a vehicle fitted with ESC due to the information campaigns, and who avoid (or minimise the effects of) a crash due to the action of ESC.

Governments

There would be an indirect benefit to governments (over and above that of Option 1) as a result of a reduction in road trauma for those who drive a vehicle fitted with ESC due to the information campaigns, and who avoid (or minimise the effects of) a crash due to the action of ESC.

This option would add between $51m and $95m over and above Option 1 (both types of user information campaigns—awareness and advertising—were used for the calculation). These benefits would be shared among governments and so the community.

Costs

Business/consumers

There would be a direct cost to business and consumers (over and above that of Option 1) as a result of additional implementation costs for vehicles that are sold fitted with ESC due to the user information campaign. This would add between $20m and $37m over and above Option 1 (both types of user information campaigns—awareness and advertising—were used for the calculation).

Governments

There would be a cost to governments for funding and/or running user information campaigns that inform the consumer of the benefits of ESC. This is estimated at between $10m and $97m.

Option 6: mandatory standards under the MVSA

This option mandates standards for ESC under the MVSA based on international standards from the UNECE (regulatory—mandatory).

As this option involves direct intervention to change the specification of the product supplied to the marketplace, the benefits and costs are those that would occur on a mandatory basis, over and above those determined in Option 1. The fitment of ESC would no longer be a commercial decision within this changed environment.

Benefits

Business

There would be no direct benefit to business (over and above that of Option 1) as a result of a reduction in road trauma caused by vehicles that are sold fitted with ESC due to the Australian Government mandating standards.

Consumers

There would be a direct benefit to vehicle owners and the wider community (over and above that of Option 1) as a result of a reduction in road trauma for those who drive a vehicle fitted with ESC due to the Australian Government mandating standards, and who avoid (or minimise the effects of) a crash due to the action of ESC.

Governments

There would be an indirect benefit to governments (over and above Option 1) as a result of a reduction in road trauma for those who drive a vehicle fitted with ESC due to the Australian Government mandating standards, and who avoid (or minimise the effects of) a crash due to the action of ESC.

This would add $130m over and above Option 1. This benefit would be shared with governments and so the community.

Costs

Business/consumers

There would be a direct cost to business/fleet owners (over and above Option 1) as a result of additional design, fitment and testing costs for vehicles that are sold fitted with ESC due to the Australian Government mandating standards. This would add $51m over and above Option 1. This cost would be passed onto the consumer.

Governments

There would be a cost to governments for development, implementing and administering regulations (standards) that require the fitment of ESC. This is estimated at $0.5m.

Table 14 Summary of the benefits and costs of ESC over a 42-year period of analysis

<table>
<tr><th rowspan="2">Affected parties</th><th colspan="2">Option 1:no intervention</th><th colspan="2">Option 2:user information campaigns</th><th colspan="2">Option 6: mandatory standards under the MVSA</th></tr>
<tr><th>Benefits</th><th>Costs</th><th>Benefits</th><th>Costs</th><th>Benefits</th><th>Costs</th></tr>
<tr><td>Business</td><td>n/a</td><td rowspan="2">n/a</td><td>None</td><td rowspan="2">Increased costs of vehicles—$20m-$37m</td><td>None</td><td rowspan="2">Increased costs of vehicles—$51</td></tr>
<tr><td>Consumers</td><td rowspan="2">n/a</td><td rowspan="2">Reduced road trauma—$51m-$95m</td><td rowspan="2">Reduced road trauma—$131m</td></tr>
<tr><td>Government</td><td>n/a</td><td>Cost of funding and running campaigns—$10m-$97m</td><td>Cost of implementing and administering regulations—$0.5m</td></tr>
<tr><td>Lives saved</td><td colspan="2">n/a</td><td colspan="2">10-17</td><td colspan="2">29</td></tr>
<tr><td>BCR</td><td colspan="2">n/a</td><td colspan="2">0.4-2.0</td><td colspan="2">2.5</td></tr>
</table>

9 DISCUSSION

The three scenarios that were prepared for estimating the benefits and costs from ESC represented the three options that were considered feasible:

- Option 1: no intervention;
- Option 2: user information campaigns; and
- Option 6: mandatory standards under the MVSA (regulation).

9.1 Net Benefits

Option 6: mandatory standards under the MVSA had the highest net benefits at $79m, resulting from the assumed 15 year life of regulation. These benefits would be spread over a period that goes beyond the 15 years that the intervention was in place. Option 2a: user information campaigns—awareness also had positive net benefits of $48m. Option 2b resulted in negative net benefits of -$66m. As noted in Section 6.2, the quantification of Option 2b was based on the assumption of a decreasing effectiveness of advertising. Even if this was not the case, the net benefits of this option would still be substantially negative.

9.2 Benefit-Cost Ratios

Option 6: mandatory standards under the MVSA had the highest BCR at 2.5, followed by Option 2a at 2.0. Option 2b had a BCR of 0.4.

9.3 Lives Saved

Option 6: mandatory standards under the MVSA had the highest number of lives saved at 29 over the assumed 15 year life of regulation. This was more than 1.5 times the number of lives saved under Option 2a: user information campaigns—awareness (17 lives). Option 2b: user information campaigns—advertising saved 10 lives.

9.4 The Case for Intervention

Examining a case for government intervention to increase the fitment of ESC in LCVs may seem counter intuitive, given the increasing voluntary fitment of the technology and industry plans to reach at least 90 per cent during 2018 and 99 per cent by 1 January 2020.

Generally, high voluntary fitment rates reduce the need to intervene in the market, particularly through regulation. On the other hand, there may be advantages to intervening through regulation—even at high voluntary rates—such as when a technology offers significant benefits that have been proven in real-world conditions. ESC is such a technology. Option 6 (regulation) still has the potential to offer positive net benefits of up to $79m and a saving of an additional 29 lives over a 15-year regulation period even if the final voluntary fitment rate were to reach a high of 99 per cent. This shows that ESC has the potential to make a difference even over a short period of increased fitment rates.

It is possible that measures such as those proposed in Option 2 have already contributed to the current level of take-up of ESC technology. There has been some intervention by federal and state governments and other road safety groups, in partnership with vehicle manufacturers, in raising public awareness of the technology. It may be possible for these measures to continue in one form or another regardless of the recommendation of this RIS.

It is important to note that the benefits of Option 2 are less assured than the benefits of Option 6 and would lie somewhere between the BAU case and their calculated value. This would be similar for the costs. This reflects the fact that the response to these options relies on two factors; firstly that consumers will receive the message favourably and secondly that manufacturers will perceive any increased demand and act accordingly.

From an international perspective and as a contracting party to the UN 1998 agreement (see Section 6.6), Australia was obliged to subject GTR 8 to its domestic rulemaking process. In 2009, as part of that process, a RIS was developed, which proposed amending ADRs 31 and 35 to mandate the fitting of ESC to new passenger cars, passenger vans and 4WDs/SUVs (ADR categories MA, MB and MC), in line with the following amendments to the UN braking regulations:

- Supplement 7 to UNECE Regulation No. 13-H – UNIFORM PROVISIONS CONCERNING THE APPROVAL OF PASSENGER CARS WITH REGARD TO BRAKING; and

- 11 series of amendments to UNECE Regulation No. 13 – UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES OF CATEGORIES M, N AND O WITH REGARD TO BRAKING.

The ESC requirements in ADRs 31 and 35 and in UN R 13-H were based on the requirements of GTR 8. GTR 8 in turn was based on US standard FMVSS 126. The ADRs came into force from November 2011 for new models and November 2013 for all models.

At the time the RIS was being developed for amendments to ADRs 31 and 35, there were difficulties with the case for ESC in LCVs due to there being less certainty, when compared with passenger vehicles, of configuration and changes in centre of gravity during operation. In addition, there were no direct estimates available for the effectiveness of ESC for this type of vehicle. Therefore, the final RIS recommended mandating ESC only for MA, MB and MC (UN M1 category) vehicles in line with scope of the UN regulations.

Following the mandating of ESC for MA, MB and MC vehicles, the Australian Government committed to further work to consider the case and timing for mandating ESC in LCVs. The government commissioned MUARC to undertake a follow-on study into whether potential benefits of ESC for LCVs could be identified. For the most part using statistical analysis, the study concluded that an estimate of 32 per cent for the effectiveness of ESC for LCVs was realistic, and this was consistent with values previously determined for passenger cars.

Additionally, as discussed in Section 1.2, under action item 16b of the 'actions for the first three years' section of the NRSS, the Government has elected to consider mandating ESC in LCVs, subject to the final outcomes of a RIS (NRSS, 2011).

Overall, Option 6 represents an effective and robust option. It is the option that results in the highest ongoing fitment rate of ESC in new vehicles. The other options may not deliver such an enduring result. Changing economic pressures, or the entry of new players into the market, could see a shift away from the current move to provide ESC equipped LCVs.

9.5 Recommendation

Option 6: mandatory standards under the MVSA is the recommended option. Given the proven benefits of ESC and the potential for Option 6 to save an additional 29 lives over a 15-year regulation period, it represents an effective and robust option. Overall, Option 6 is the option that results in the highest ongoing fitment rate of ESC in new vehicles thereby maximising the benefits that ESC has to offer.

9.6 Impacts

Business/consumers

The three options considered would have varying degrees of impact on consumers, business and the government. The costs to business would be passed on to the consumers, as the vehicle industry is driven by margins. The benefits would flow to the community (due to the negative externalities of road vehicle crashes) and the consumers. Governments would absorb much of the cost of the intervention (such as information programs, regulation etc.). Option 6 involves regulation-based development and testing with forced compliance of all applicable models. Local manufacturers, or those importing from Europe or the US are most likely to be already compliant or able to comply easily. Manufacturers importing from Asian markets are less likely to be compliant, as their program of ESC fitment is less advanced than that of other regions. Goods vehicles imported from Asia represent some 56 per cent of the total imports of goods vehicles (Department of Foreign Affairs and Trade, 2011).

Governments

The Australian Government operates and maintains the vehicle certification system, which is used to ensure that vehicles first supplied to the market comply with the ADRs. There are costs incurred in operating this service. A cost recovery model is used and so these costs are recovered from business.

9.7 Timing of the Preferred Option

If Option 6 was to be adopted, the fitment of ESC in LCVs would be mandated through ADRs 31 and 35 and independently of any revisions being made to the UN regulations. The ESC requirements would mirror those currently contained in UN R 13-H.

Where the stringency of a standard is increased or requirements are made applicable to additional vehicle categories, the usual lead time is around 2 years.

The proposed implementation timetable for ESC is 2015 for new models and 2016 for all models, which would meet this typical lead time. This timing was considered appropriate as ESC technology is well-established and, as noted, there is an international regulation for ESC that sets out technical specifications where fitted. However, industry has noted that, while the technology is well-established, it may need some redesigning to meet the regulation, and there is also a long design cycle for LCVs.

During public consultation, the FCAI proposed an extended implementation timetable of 2015 for new models and 2017 for all models. The effect of this is examined in an additional sensitivity analysis in Section 7.4, and discussed in more detail in Section 10.2.

9.8 Scope of the Preferred Option

As discussed in Section 1.2, in 2009 the Australian Government mandated ESC for MA, MB and MC (UN category M1) vehicles through ADRs 31 and 35, in line with UN R 13-H.

UN R 13-H applies to the braking of vehicles of categories M1 and N1 (LCVs). It incorporates the text of GTR 8. The regulation contains technical requirements where ESC is fitted. For LCVs, R 13 also contains technical requirements for ESC where fitted, which are different from the requirements in R 13-H.

It is recommended that the ESC requirements contained in UN R 13-H be adopted for the scope of any Australian regulation.

9.9 Other Issues

When ESC was being considered for MA, MB and MC vehicles, it was argued that the use of the technology could potentially have a negative effect on driving behaviour. If drivers believe that the system can prevent all loss of control then it may encourage drivers to drive irresponsibly. Similarly, drivers may not understand that the benefits of ESC may be negated with worn tyres or brakes (Erke, 2008).

Fitzharris et al (2010) also discuss this potential risk, noting that, as more cars are fitted with ESC, public knowledge of the safety benefits of the technology increases. This may lead to drivers driving more aggressively if they are aware that their car is fitted with ESC. Fitzharris et al reference two 2009 studies from Canada and Sweden, by Rudin-Brown et al, and Vadeby et al respectively. Both studies surveyed drivers regarding their knowledge of ESC. If their vehicles were fitted with ESC, drivers were asked how they thought ESC affected their driving. The studies found that drivers could be more likely to take risks if they know their cars are fitted with ESC. This risk taking behaviour was more common in males and young drivers. The possible scenario is common to all safety devices, such as seatbelts or airbag systems and is something that can only be monitored into the future.

10 CONSULTATION

10.1 General

Development of the ADRs under the MVSA is the responsibility of the Vehicle Safety Standards Branch of the Department of Infrastructure and Regional Development. It is carried out in consultation with representatives of the Australian Government, state and territory governments, manufacturing and operating industries, road user groups and experts in the field of road safety.

The Department undertakes public consultation on significant proposals. Under Part 2, section 8 of the MVSA the Minister may consult with state and territory agencies responsible for road safety, organisations and persons involved in the road vehicle industry and organisations representing road vehicle users before determining a design rule.

Depending on the nature of the proposed changes, consultation could involve the Technical Liaison Group (TLG), Strategic Vehicle Safety and Environment Group (SVSEG), Transport and Infrastructure Senior Officials' Committee (TISOC) and the Standing Council on Transport and Infrastructure (SCOTI).

- TLG consists of technical representatives of government (Australian and state/territory), the manufacturing and operational arms of the industry (including organisations such as the Federal Chamber of Automotive Industries and the Australian Trucking Association) and of representative organisations of consumers and road users (particularly through the Australian Automobile Association).

- SVSEG consists of senior representatives of government (Australian and state/territory), the manufacturing and operational arms of the industry and of representative organisations of consumers and road users (at a higher level within each organisation as represented in TLG).

- TISOC consists of state and territory transport and/or infrastructure Chief Executive Officers (CEO) (or equivalents), the CEO of the National Transport Commission, New Zealand and the Australian Local Government Association.

- SCOTI consists of the Australian, state/territory and New Zealand Ministers with responsibility for transport and infrastructure issues.

Up until 2010, the TLG was the principal consultative forum for advising on ADR proposals. The TLG has since been reconstituted under the higher level SVSEG forum, although its role in ADR development continues in a similar way to before. Membership of the TLG is shown at Appendix 11—Technical Liaison Group (TLG).

As noted earlier in the RIS, the consideration of mandating ESC in LCVs is an initiative of the NRSS. A draft strategy was developed by the federal and state and territory road authorities and released for public comment from 1 December 2010 to 18 February 2011, providing stakeholders and the community with an opportunity to comment on all initiatives of the NRSS, including ESC. The proposal has also subsequently been discussed at a number of SVSEG and TLG meetings. No substantive issues were raised and there was broad support given by the majority of the members of the consultative groups.

10.2 Public Comment

The publication of an exposure draft of the proposal for public comment is an integral part of the consultation process. This provides an opportunity for businesses and road user communities, as well as all other interested parties, to respond to the proposal by writing or otherwise submitting their comments to the department. Providing proposals with a RIS assists all stakeholders to identify the impacts of the proposals more precisely and enables more informed debate on the issues.

A draft RIS was released for public comment on 26 April 2013. The two-month public comment period closed on 26 June 2013. A summary of the public comment received is included at Appendix 13—Public Comment along with departmental responses.

Discussion of responses

The proposal to mandate ESC for LCVs was discussed a number of times at SVSEG and TLG meetings where it was broadly supported. During the public comment period, formal feedback was received from the AAA, ANCAP, the FCAI and the Victorian Government (VicRoads).

The AAA, ANCAP and VicRoads strongly supported the introduction of mandatory standards under the MVSA to require ESC on LCVs (Option 6), with the AAA noting its support for the proposed timing of 2015 for new models and 2016 for all models. ANCAP also indicated its support for the ongoing use of consumer information campaigns until ESC in mandated, to encourage quicker uptake of the technology.

The FCAI presented the view that regulation is not needed as the voluntary fitment rate will be high. However, the results of the benefit-cost analysis show that, even in the presence of high predicted fitment rates, there is a case for mandating ESC for LCVs. Compared with the BAU case, this option would provide a reduction in road trauma estimated at 29 lives over a 15-year regulation period, with net benefits of around $79m.

The FCAI requested that, should the Government decide to take regulatory action, the standard be harmonised with the international UN regulations and sufficient lead times be provided. In this respect, the FCAI proposed an extended implementation timetable of 2015 for new models and 2017 for all models. The timing proposed in the consultation RIS is consistent with the usual lead time of around two years for an ADR change involving an increase in stringency. The timing proposed by the FCAI would result in a lead time of four years for all models which is longer than the usual lead time for bringing in an ADR, particularly where the technology is well-established, like ESC. Notwithstanding this, the actual implementation timetable may be subject to final negotiations with industry based on the particular case in Australia. In this case, the dates proposed in the consultation RIS may be brought closer to those proposed by industry.

With regard to harmonisation with international standards, it is recommended that the requirements for ESC be taken from the international standard UN R 13-H, with the detailed structure of the proposed ADRs being developed in conjunction with industry.

The FCAI also indicated current and expected future voluntary fitment rates of ESC to LCVs which differ from its previous advice. The benefit-cost analysis was based on current and expected future fitment rates as advised by the FCAI at the time the consultation RIS was being developed (in 2012). More recent FCAI estimates are that the fitment rate is currently around 70 per cent, and is expected to reach 90 per cent by the end of this year and 100 per cent (i.e. 99 per cent, given that the FCAI covers most but not all vehicle manufacturers and importers) between 2016 and 2018. As noted earlier, there can be no guarantee that the predicted voluntary fitment rates will be achieved, with factors such as changing economic pressures or the entry of new players into the market having the potential to cause a shift away from the current move to provide ESC equipped vehicles. In the past it has been the case where the predicted rate has not been reached and the Government has moved to regulate.

The effects of an extended implementation timetable and alternative voluntary fitment rates on the net benefits of Option 6 have been evaluated in additional sensitivity tests (see Section 7.4). Under both scenarios, the net benefits remained positive and higher than the net benefits of the other options considered feasible. Option 6 therefore remains the recommended option.

11 CONCLUSION AND RECOMMENDED OPTION

Studies have shown that ESC has the potential to save lives by reducing the number and severity of single vehicle crashes. In Australia ESC is already mandatory in new models of

MA, MB and MC vehicles and will be mandatory in all models of these categories from November 2013.

This RIS examines the case for mandating ESC in LCVs—category NA vehicles—through the ADRs. In Australia, between 2001 and 2008, on average, 39 LCV drivers were killed and 387 were seriously injured each year.

The Australian market is responding well, having come from only around eight per cent fitment of ESC in LCVs in 2010 to 45 per cent in 2012. In 2012, the Australian industry advised that it expected this to increase to 90 per cent by 2018 and 99 per cent by 1 January 2020.

A benefit-cost analysis found that there was a case for the provision of ESC for LCVs through government intervention. A targeted information campaign (Option 2a) has the potential to increase the fitment rate to 77 per cent with net benefits of $48m and a saving of 10 lives over a 15 year period. A more extensive advertising campaign (Option 2b) has the potential to increase the BAU fitment rate to 99 per cent and a saving of 17 lives, however the net benefits of this option is -$66m. Option 6: mandatory standards under the MVSA has the potential to offer positive net benefits of $79m and a saving of 29 lives over a 15-year regulation period. These savings would be higher than any of the other options that were considered feasible.

Option 6 involves regulation-based development and testing with forced compliance of all applicable models. Local manufacturers, or those importing from Europe or the US are most likely to be already compliant or able to comply easily. Manufacturers importing from Asian markets are less likely to be compliant, as their program of ESC fitment is less advanced than that of other regions. Goods vehicles imported from Asia represent some 56 per cent of the total imports of goods vehicles (Department of Foreign Affairs and Trade, 2011).

An advantage of Option 6 is that it provides the highest level of compliance. Due to the mature nature of the technology, there is effectively a small positive net benefit to the community for each vehicle fitted with ESC even as the voluntary rate approaches 100%.

Therefore, the adoption of mandatory standards under the MVSA is the recommended option. If this option is adopted, the fitment of ESC would be mandated for ADR category NA vehicles through the ADRs, adopting the performance requirements of relevant UN regulations.

ADRs 31 and 35 together specify the braking performance of passenger and commercial vehicles, including cars, vans, buses, utes and both light and heavy trucks. The ESC requirements would be implemented as annexes to these ADRs. It is recommended that the requirements for ESC be taken from the ESC requirements contained in UN R 13-H.

12 IMPLEMENTATION AND REVIEW

New ADRs or amendments to the ADRs are determined by the Minister for Infrastructure and Regional Development under section 7 of the MVSA. At the time that the amendment is signed by the Minister, registered subscribers to the ADRs are e-mailed directly notifying them of the new ADR or the amendment to the ADR. Registered subscribers to the ADRs include but are not limited to; various industry groups such as vehicle manufacturers, designers and test facilities, and vehicle user organisations.

As Australian Government regulations, ADRs are subject to review every ten years as resources permit. This ensures that they remain relevant, cost effective and do not become a barrier to the importation of safer vehicles and vehicle components. ADRs 31 and 35 will be scheduled for a full review on an ongoing basis and in accordance with the Australian Government's Business Review Agenda. The timing for review is to be determined.

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APPENDIX 1—OVERVIEW OF ELECTRONIC STABILITY CONTROL SYSTEMS

ESC is a technology that assists drivers to avoid a loss of control in critical driving conditions, such as at speed or on slippery surfaces. At its most basic, ESC automatically brakes individual wheels on a vehicle to compensate for understeer or oversteer events. It does this by measuring the vehicle's velocity, acceleration, direction of travel and steering wheel angle. When the vehicle begins to deviate from the path the driver has intended (determined by speed and steering wheel angle) the brakes are applied automatically to individual wheels to provide a turning moment that corrects the vehicle's heading.

There are several key components present in all ESC systems. A four-channel Anti-lock Braking System (ABS) is required to brake the wheels independently along with sensors to measure vehicle yaw (rotation around the vertical axis; i.e. spinning left or right) and steering wheel angle and some form of computer (with software) to control the system. ESC may also incorporate traction control. This senses slip of the driving wheels under acceleration and individually reduces excess engine power until control is regained. More advanced systems are able to detect the point of rollover and/or to alter the vehicle's suspension characteristics as well.

In terms of tuning the system to individual vehicle models, the software calibration is affected by a range of variables including tyre type and size, and power train and suspension tuning. Different calibrations are necessary for each variant within the model range.

There are basic prescriptive requirements of any ESC system:

- having the ability to augment vehicle directional stability by applying and adjusting the brake torques individually to induce a correcting yaw moment;
- being computer-controlled, with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;
- having a means to determine vehicle yaw rate and to estimate its sideslip or the time derivative of sideslip;
- having a means to monitor driver steering input;
- having an algorithm to determine the need, and means to modify engine torque, as necessary, to assist the driver; and
- being operational over all speed ranges other than slow speeds.

Figure 9 How ESC works (Toyota)

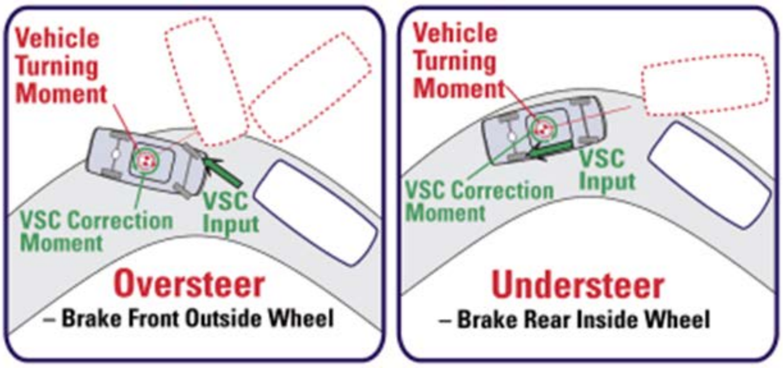


Figure 9 shows how ESC is designed to detect the intended vehicle response, and intervene in the case that the actual vehicle response does not match with this. For example, in cases of oversteer, the ESC system may brake the outboard front wheel to correct the vehicle's tendency to spin out. Alternatively, in cases of understeer, the ESC system can correct the lack of vehicle rotation by braking the inboard rear wheel.

APPENDIX 2—VEHICLE CATEGORIES

A two-character vehicle category code is shown for each vehicle category. This code is used to designate the relevant vehicles in the national standards, as represented by the ADRs, and in related documentation.

PASSENGER VEHICLES (OTHER THAN OMNIBUSES)

PASSENGER CAR (MA)

A passenger vehicle, not being an off-road passenger vehicle or a forward-control passenger vehicle, having up to 9 seating positions, including that of the driver.

FORWARD-CONTROL PASSENGER VEHICLE (MB)

A passenger vehicle, not being an off-road passenger vehicle, having up to 9 seating positions, including that of the driver, and in which the centre of the steering wheel is in the forward quarter of the vehicle's *'Total Length'*.

OFF-ROAD PASSENGER VEHICLE (MC)

A passenger vehicle having up to 9 seating positions, including that of the driver and being designed with special features for off-road operation. A vehicle with special features for off-road operation is a vehicle that:
(a) Unless otherwise '*Approved*' has 4-wheel drive; and
(b) has at least 4 of the following 5 characteristics calculated when the vehicle is at its '*Unladen Mass*' on a level surface, with the front wheels parallel to the vehicle's longitudinal centreline, and the tyres inflated to the '*Manufacturer's*' recommended pressure:
(i) '*Approach Angle*' of not less than 28 degrees;
(ii) '*Breakover Angle*' of not less than 14 degrees;
(iii) '*Departure Angle*' of not less than 20 degrees;
(iv) '*Running Clearance*' of not less than 200 mm;
(v) '*Front Axle Clearance*', '*Rear Axle Clearance*' or '*Suspension Clearance*' of not less than 175 mm each.

OMNIBUSES

A passenger vehicle having more than 9 seating positions, including that of the driver.
An omnibus comprising 2 or more non-separable but articulated units shall be considered as a single vehicle.

LIGHT OMNIBUS (MD)

An omnibus with a '*Gross Vehicle Mass*' not exceeding 5.0 tonnes.

HEAVY OMNIBUS (ME)

An omnibus with a '*Gross Vehicle Mass*' exceeding 5.0 tonnes.

GOODS VEHICLES

A motor vehicle constructed primarily for the carriage of goods and having at least 4 wheels; or 3 wheels and a ‘*Gross Vehicle Mass*’ exceeding 1.0 tonne.
A vehicle constructed for both the carriage of persons and the carriage of good shall be considered to be primarily for the carriage of goods if the number of seating positions times 68 kg is less than 50 per cent of the difference between the ‘*Gross Vehicle Mass*‘ and the ‘*Unladen Mass*‘. The equipment and installations carried on certain special-purpose vehicles not designed for the carriage of passengers (crane vehicles, workshop vehicles, publicity vehicles, etc.) are regarded as being equivalent to goods for the purposes of this definition. A goods vehicle comprising 2 or more non-separable but articulated units shall be considered as a single vehicle.

LIGHT GOODS VEHICLE (NA)

A goods vehicle with a ‘*Gross Vehicle Mass*’ not exceeding 3.5 tonnes.

MEDIUM GOODS VEHICLE (NB)

A goods vehicle with a ‘*Gross Vehicle Mass*’ exceeding 3.5 tonnes but not exceeding 12.0 tonnes.

Subcategories

Light Omnibus (MD)

Sub-category

MD1—up to 3.5 tonnes ‘*GVM*’, up to 12 ‘*Seats*‘
MD2—up to 3.5 tonnes ‘*GVM*’, over 12 ‘*Seats*‘
MD3—over 3.5 tonnes, up to 4.5 tonnes ‘*GVM*’
MD4—over 4.5 tonnes, up to 5 tonnes ‘*GVM*’
MD5—up to 2.7 tonnes ‘*GVM*’
MD6—over 2.7 tonnes ‘*GVM*’

Light Goods Vehicle (NA)

Sub-category

NA1—up to 2.7 tonnes ‘*GVM*’
NA2—over 2.7 tonnes ‘*GVM*’

Medium Goods Vehicle (NB)

Sub-category
NB1 over 3.5 tonnes, up to 4.5 tonnes ‘*GVM*’
NB2 over 4.5 tonnes, up to 12 tonnes ‘*GVM*’

APPENDIX 3—RATIO OF INJURIES

Ratios of injuries

Table 15 Number of Class NA vehicles involved in crashes, by driver injury severity, by year (Fitzharris et al, 2010)

Year	Fatal	Serious	Minor
2004	37	363	1,146
2005	38	380	1,274
2006	61	605	1,543
2007	49	487	1,585
2008	42	421	1,547
Total	**227**	**2,256**	**7,095**

Table 16 Ratios of injury types

	Ratios
Serious/Fatal	9.9
Minor/Serious	3.1
Minor/Fatal	31.2

The ratios of injury types outlined in Table 4 above were used to determine an overall effectiveness value for ESC in LCVs, as outlined in Appendix 4—Effectiveness of Electronic Stability Control Systems.

APPENDIX 4—EFFECTIVENESS OF ELECTRONIC STABILITY CONTROL SYSTEMS

There is a considerable number of studies around the world that demonstrate the effectiveness of ESC in reducing vehicle crashes. However, most studies have focussed on the effectiveness of ESC in passenger cars and SUV/4WDs rather than in LCVs. This is generally because the uptake of ESC in commercial vehicles has been slower than for passenger vehicles (Fitzharris et al, 2010).

One of the most relevant studies in terms of this RIS is a 2010 study by Fitzharris et al of the Monash University Accident Research Centre (MUARC). The study was prepared to provide guidance to the Department of Infrastructure, Transport, Regional Development and Local Government—now the Department of Infrastructure and Regional Development—in assessing whether to mandate ESC in NA category vehicles.

The study reviewed selected evaluations of ESC effectiveness research. Table 17 summarises the outcomes of this. It shows a range of effectiveness values across a range of crash types, vehicles types, and environments.

Table 17 Summary of selected published research of ESC effectiveness (Fitzharris et al, 2010 and various studies)

Jurisdiction, Author, Year	Target Crash Type	Estimated Reduction (per cent)
Europe, Sferco et al, 2001	All injury crashes	18
	All fatal crashes	34
	Loss of control injury crashes	42
	Loss of control fatal crashes	67
Germany, Langwider et al, 2003	Single vehicle skidding crashes	42-60
	All crashes	20-25
Germany, Kriess et al, 2005	All ESC sensitive crashes	33
	Fatal ESC sensitive crashes	56
Germany, Becker et al, 2003	All crashes	45
Japan, Aga & Okada, 2003	Single car crashes	35
	Severe single car crashes	50
	Head-on crashes	30
	Severe head-on crashes	40
USA, Dang, 2004	Single vehicle car crashes	35
	Single vehicle SUV crashes	67
	Fatal single vehicle – car	30
	Fatal single vehicle – SUV	63
France, Page & Cuny, 2006	All crashes	44 (not sig)
USA, Bahouth, 2005	Multi vehicle frontal crashes	11
	Single vehicle crashes	53
USA, Green & Woodrooffe, 2006	Single car crashes (dry road)	31

Jurisdiction, Author, Year	Target Crash Type	Estimated Reduction (per cent)
	Single SUV crashes (dry road)	50
	Rollover car crashes (dry road)	40
	Rollover SUV crashes (dry road)	73
	Run off road car	55
	Run off road SUV	70
Sweden, Lie et al, 2004	All crashes	22
	All crashes – wet road	32
	All crashes – snow and ice on road	38
Sweden, Lie et al, 2006	All injury crashes (not rear end)	17
	All serious and fatal crashes	22
	Fatal + serious loss of control (wet road)	56
	Fatal + serious loss of control (ice/snow)	49
USA, Farmer, 2004	All single vehicle crashes	41
	Single vehicle fatal crashes	56
USA Farmer, 2006	All single vehicle – SUV	49
	All single vehicle – cars	33
	Fatal single vehicles – SUV	59
	Fatal single vehicle – car	53
	Multiple vehicle – SUV	32-37
	Multiple vehicle – car	25
GBR, Frampton & Thomas, 2007	All crashes	7
	Fatality crashes	25
	Single vehicle crashes	27
	Rollover crashes	36
	Crashes involving skidding	23
Australia, Scully & Newstead, 2007	Single vehicle car crashes	24
	Single vehicle car crashes – driver injured	27
	Single vehicle SUV crashes	55
	Single vehicle SUV crashes – driver injured	68
USA, NHTSA, 2004	Single vehicle car crashes	35
	Single vehicle SUV crashes	67
	Single vehicle fatal car crashes	30
	Single vehicle fatal SUV crashes	63
USA, NHTSA, 2007	Single vehicle car crashes	34
	Single vehicle SUV crashes	59
	Single vehicle fatal car crashes	35
	Single vehicle fatal SUV crashes	67
	Single vehicle fatal car rollover crashes	69
	Single vehicle fatal SUV rollover crashes	88

Fitzharris et al (2010) also referenced a 2010 study by Scully and Newstead, which evaluated the benefit of ESC in commercial vehicles, passenger cars and 4WD vehicles in Australia. The study used the Used Car Safety Ratings (UCSR) database to estimate the effectiveness of ESC in reducing the risk of all types of crashes (excluding rear impacts). However, as there were only 442 commercial vehicles in the crash database fitted with ESC, the estimates of effectiveness for commercial vehicles were not statistically significant. Notwithstanding this, there was an indicative reduction in driver injury by 29.3 per cent associated with ESC in commercial vehicles, with 95 per cent confidence bands suggesting a range from a reduction of 62 per cent to an increase of 33 per cent.

For 4WDs, the study estimated that ESC was associated with a 34 per cent reduction in driver injury crashes, which was statistically significant.

Summary

On the basis of the literature review and the information available in Australia specific to LCVs, Fitzharris et al conclude that a benefit reduction value of 32 per cent across all crash severities where ESC is likely to be relevant as well as realistic.

Fitzharris et al (2010) note that the 32 per cent benefit reduction value is comparable to:

- 29.3 per cent—the 'best' estimate currently available for driver injury crash reduction benefit for commercial vehicles in Australia (Scully and Newstead, 2010);
- 34 per cent—the observed reduction benefit in serious injury for 4WD vehicles in Australia (Scully and Newstead, 2010);
- 34 per cent—the reported benefit for all fatal crashes in a European study (Sferco et al, 2001)
- 32 per cent—the reported benefit for ESC sensitive crashes in a German study (Kreiss et al, 2005);
- 31.5 per cent—the reported benefit for all crashes on a wet road in a Swedish study (Lie et al, 2004); and
- 32 per cent—the lower bound of the reported benefit for multiple vehicle crashes in the US (Farmer et al, 2006).

The estimated benefit reduction value is more conservative than the mean reduction value for the studies reviewed in Table 17.

Fitzharris et al note that the 32 per cent is derived from effectiveness values relating to passenger cars and 4WDs, as well as LCVs. In light of this, the study also analysed crash profile by location and speed zone for comparability of the crash distribution across vehicle types. It was found that the general distribution of crashes across vehicles types is relatively similar.

Relevancy

As Table 17 indicates, ESC is relevant for particular crash types, for example, loss of control, run off road and rollover crashes, but is irrelevant for other crash types, specifically rear impact crashes. Additionally, the types of crashes where ESC is relevant differ in proportions based on crash severity.

Using the Used Car Safety Ratings (UCSR) database, Fitzharris et al estimate that ESC would be relevant in the following proportions:

- 88.8 per cent of vehicles involved in serious injury crashes (including fatal);
- 66.8 per cent of vehicles involved in minor injury crashes; and
- 62.9 per cent of vehicles involved in property damage only crashes.

Overall Effectiveness

For the benefit-cost analysis component of this RIS, an overall ESC effectiveness value was calculated using:

- the 32 per cent effectiveness across all crash severities where ESC is likely to be relevant (Fitzharris et al, 2010);
- the relevancy factors for fatal and serious injury crashes—88.8 per cent—and minor injury crashes—66.8 per cent (Fitzharris et al 2010);
- the ratio of fatal to serious to minor injuries (for LCV crashes in Australia involving an injury)—1:9.9:31.2 (Fitzharris et al, 2010);
- the current (2012) unit cost of a fatal injury, serious injury and minor injury crash—A$5,415,702 for a fatal crash; A$624,851 for a serious injury crash; and A$21,098 for a minor injury crash (Abelson, 2007 & BTRE, 2000).

Table 18 Calculation of overall effectiveness of ESC

Type of injury	Ratio between all injuries	Proportion of all injuries **(A)**	Value of single event **(B)**	Value of an average casualty crash **(C)**	Saving for an average casualty crash **(D)**	Overall effectiveness
Fatality	1	0.024	A$5,415,702	A$128,639	A$36,554	
Serious injury	9.9	0.235	A$624,851	A$146,937	A$41,753	
Minor injury	31.2	0.741	A$21,098	A$15,636	A$3,342	
TOTAL	**42.1**	**1.000**		**A$291,211**	**A$81,650**	**28.0%**

Table 18 summarises the calculations involved in determining the overall ESC effectiveness.

By way of further explanation:

- Column A—proportion of all injuries—was determined using the ratio between all injuries; for example, serious injuries as a proportion of all injuries was calculated as 9.9/42.1 = 0.235.

- Column C—value of an average casualty crash—was calculated by multiplying column A by column B—the value of a single event as established by Abelson (2007) and BTRE (2000). The column was summed to arrive at the overall value of an average casualty crash.

- Column D—saving for an average casualty crash—was calculated by multiplying column C by 0.32 (the established ESC effectiveness) and by the relevancy factor. For example, the saving for an average fatal crash was calculated as $128,639*0.32*0.888 = $36,554. Column D was summed to arrive at the overall saving for an average casualty crash.

- The overall effectiveness was then calculated as the total of column D divided by the total of column C. This came to 28 per cent, which is the value used in the benefit-cost analysis.

APPENDIX 5—AWARENESS AND ADVERTISING CAMPAIGNS

Awareness campaigns

Providing accurate costing of awareness campaigns is a difficult task. Each public awareness campaign consists of different target markets, different objectives and different reaches to name a few common differences. Two cases are examined below; the Department of Health & Ageing's Skin Cancer Awareness Campaign, and the Office of Transport Security's Liquids, Aerosols and Gels (LAGs) Awareness Campaign.

Broad High Cost Campaign

The "Protect yourself from skin cancer in five ways" campaign was developed in an effort to raise awareness of skin cancer among young people who often underestimate the dangers of skin cancer.

Research prior to the campaign found that young people were the most desirable target market as they had the highest incidence of burning and had an orientation toward tanning. This group is also highly influential in setting societal norms for outdoor behaviour. A mass marketed approach was deemed appropriate.

The Cancer Council support investment in raising awareness of skin cancer prevention as research shows that government investment in skin cancer prevention leads to a $5 benefit for every $1 spent.

While it is not a direct measure of effectiveness, the National Sun Protection Survey 2006/07 would provide an indication as to the changed behaviours that may have arisen as a result of the advertising campaign. The research showed that there had been a 31 per cent fall in the number of adults reporting that they were sunburnt since the previous survey in 2004 suggesting that the campaign was to some extent effective (Cancer Council SA, 2008).

The costs of this campaign were from three sources:

Creative Advertising Services (e.g. advertisement development)	$378,671
Media Buy (e.g. placement of advertisements)	$5,508,437
Evaluation Research (measuring the effectiveness of the campaign)	$211,424
Total	$6,098,532

Using a mass marketing approach can be regarded as an effective approach because it has the ability to reach a large number of people. However, this may not be the most efficient approach as the advertisements will be exposed to people that are not members of the target market. It should also be noted that political sensitivities can arise from large scale marketing campaigns and that there is likely to be a thorough analysis of the spending. As a result, it is imperative to demonstrate that the campaign is likely to be effective prior to launch and that there is a measure that can demonstrate this.

Targeted Low Cost Campaign

In August 2006, United Kingdom security services interrupted a terrorist operation that involved a plan to take concealed matter on board an international flight to subsequently build an explosive device. The operation led to the identification of vulnerability with respect to the detection of liquid explosives.

As a result, the International Civil Aviation Organisation released security guidelines for screening Liquids, Aerosols & Gels (LAGS). As a result new measures were launched in Australia. To raise awareness of the changes the following awareness campaign was run over a period of four months:

- 14 million brochures were published in English, Japanese, Chinese, Korean & Malay and were distributed to airports, airlines, duty free outlets and travel agents;
- 1200 posters, 1700 counter top signs, 57000 pocket cards, 36 banners and 5000 information kits were prepared;
- radio and television interviews were conducted;
- items were placed in news bulletins;
- advertising in major metropolitan and regional newspapers;
- a website, hotline number and email address were established to provide travellers with a ready source of information;
- 5 million resealable plastic bags were distributed to international airports; and
- training for 1900 airport security screeners and customer service staff was funded and facilitated by the department.

The campaign won the Public Relations Institute of Australia (ACT) 2007 Award for Excellence for a Government Sponsored Campaign having demonstrated a rapid rise in awareness. Seventy-seven per cent of travellers surveyed said they had heard of the new measures in general terms and 74 per cent of respondents claimed to be aware of the measures when prompted.

The costs of this campaign were from three sources:

Developmental Research (e.g. Understanding Public Awareness prior to the campaign)	$50,000
Media Buy (e.g. Placement of advertisements)	$1,002,619
Evaluation Research (Measuring the effectiveness of the campaign)	$40,000
Total	$1,092,619

This campaign had a very narrow target market; international travellers. As a result the placement of the message for the most part was able to be specifically targeted to that market with minimum wastage through targeting airports and travel agents.

Should an ESC campaign be run, there would be a similar narrow target market; new car buyers. As a result, placement of similar marketing tools could be positioned in places where consumers search for information. Particular focus may be on new car yards.

Advertising Campaigns

A study conducted for the Radio Ad Lab (Radio Ad Lab, 2005) investigated the potential of advertising campaigns in increasing sales. The findings of the report indicated that, for general goods, advertising campaigns can lead to an around 8 per cent increase in sales.

An example of a real-world advertising campaign that featured ESC as a selling point is the Mitsubishi Outlander advertising campaign that was launched in February 2008. It focused solely on the fact that the car has “Active Stability Control as standard”. This means that any change in sales is most easily attributable directly to the campaign to promote Active Stability Control. There was an immediate effect with sales of the Mitsubishi Outlander increasing by 9.1 per cent for the month of February.

APPENDIX 6—OVERVIEW OF GLOBAL TECHNICAL REGULATION NO. 8

The following is an overview of the requirements of Global Technical Regulation No. 8 Electronic Stability Control Systems. For the full requirements refer to the UNECE website at www.unece.org/trans/main/welcwp29.htm.

The Global Technical Regulation (GTR) for ESC is intended to reduce the number of deaths and injuries that result from crashes in which the driver loses directional control of the vehicle. This includes those resulting in vehicle rollover. It does this by specifying performance and equipment requirements for ESC systems.

The test procedure was designed to induce excessive yaw in order to test for oversteer mitigation (ESC is also considered to be able to mitigate excessive understeer, however this is difficult to test for and so this was dealt with through the equipment requirement instead).

To determine a "pass/fail" result, there is an assessment of oversteer or "spinout". This is achieved by assessing the yaw rate at a point in time after completion of the steering inputs of the test manoeuvre. This is then compared to the peak yaw rate observed during the manoeuvre.

The GTR applies to all vehicles of Category 1-1, 1-2 and 2, with a GVM of 4,536 kg or less.

An ESC system must have all of the following attributes:

a) improves vehicle directional stability by at least having the ability to automatically control individually the braking torques of the left and right wheels on each axle or an axle of each axle group to induce a correcting yaw moment based on the evaluation of actual vehicle behaviour in comparison with a determination of vehicle behaviour demanded by the driver;

b) is computer-controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer based on the evaluation of actual vehicle behaviour in comparison with a determination of vehicle behaviour demanded by the driver;

c) a means to determine directly the value of vehicle's yaw rate and to estimate its side slip or side slip derivative with respect to time;

d) a means to monitor driver steering inputs; and

e) an algorithm to determine the need, and a means to modify propulsion.

Functional requirements

An ESC system shall be one that:

a) is capable of applying braking torques individually to all four wheels and has a control algorithm that utilizes this capability;

b) is operational over the full speed range of the vehicle, during all phases of driving including acceleration, coasting, and deceleration (including braking), except:

i. when the driver has disabled ESC;

ii. when the vehicle speed is below 20 km/h;

iii. while the initial start-up self test and plausibility checks are completed;

iv. when the vehicle is being driven in reverse; and

c) remains capable of activation even if the antilock brake system or traction control system is also activated.

Performance Requirements

During each test performed, the vehicle with the ESC system engaged shall satisfy the following directional stability criteria and responsiveness criterion at the maximum required steering angle;

The yaw rate measured one second after completion of a Sine with Dwell steering input shall not exceed 35 per cent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks) during the same test run; and the yaw rate measured 1.75 seconds after completion of the Sine with Dwell steering input shall not exceed 20 per cent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks) during the same test run.

The lateral displacement of the vehicle centre of gravity with respect to its initial straight path shall be at least 1.83 m for vehicles with a GVM of 3,500 kg or less, and 1.52 m for vehicles with a GVM greater than 3,500 kg.

Malfunction Detection

The vehicle shall be equipped with a tell-tale that provides a warning to the driver of the occurrence of any malfunction that affects the generation or transmission of control or response signals in the vehicle's ESC system. This shall illuminate for as long as the malfunction exists, whenever the ignition locking system is in the "On" ("Run") position. It shall also be activated as a check of lamp function.

ESC Off and Other Controls

The manufacturer may include an "ESC Off" control which shall be illuminated when the vehicle's headlamps are activated and places the ESC system in a mode in which it may no longer satisfy the required performance requirements. The Manufacturer may also provide controls for other systems that have an ancillary effect upon ESC operation.

The vehicle's ESC system shall always return to the manufacturer's original default mode at the initiation of each new ignition cycle unless:

a) the vehicle is in a four-wheel drive configuration which has the effect of locking the drive gears at the front and rear axles together and providing an additional gear reduction; or

b) the vehicle is in a four-wheel drive configuration selected by the driver that is designed for operation at higher speeds on snow-, sand-, or dirt-packed roads and that has the effect of locking the drive gears at the front and rear axles together.

A control whose only purpose is to place the ESC system in a mode in which it will no longer satisfy the performance requirements shall be identified by a symbol for "ESC Off" or "Off" if it is part of a control whose purpose is to place the ESC system in different modes, at least one of which may no longer satisfy the performance requirements.

Where the ESC system mode is controlled by a multifunctional control, the driver display shall identify clearly to the driver the control position for this mode using the symbol "ESC Off" or "Off".

A control for another system that has the ancillary effect of placing the ESC system in a mode in which it no longer satisfies the performance requirements need not be identified by the "ESC Off" identifiers.

If the manufacturer elects to install a control to turn off or reduce the required performance of the ESC system, an "ESC Off" tell-tale must alert the driver to the lessened state of ESC system functionality.

Test Conditions

The ambient temperature must be between 0° C and 45° C with a maximum wind speed no greater than 5-10 m/s depending on the vehicle type. The test surface must be a dry, uniform, solid-paved surface with a nominal peak braking coefficient (PBC) of 0.9, unless otherwise specified, when measured using either the American Society for Testing and Materials (ASTM) E1136 standard reference test tyre, in accordance with ASTM Method E1337-90 without water delivery, at a speed of 40 mph; or the method specified in Annex 6, Appendix 2 of UNECE Regulation No. 13-H. The test surface has a consistent slope between level and 1 per cent.

The vehicle must be loaded with the fuel tank filled to at least 90 per cent of capacity, and total interior load of 168 kg comprised of the test driver, approximately 59 kg of test equipment (automated steering machine, data acquisition system and the power supply for the steering machine), and ballast as required.

The tyres must be inflated to the recommended cold tyre inflation pressure(s).

Outriggers may be used for testing if deemed necessary for test drivers' safety, however conditions apply.

A steering machine programmed to execute the required steering pattern shall be used and shall be capable of supplying steering torques between 40 to 60 Nm.

Test Procedure

Conditioning

The brakes must be conditioned with ten stops from 56 km/h, with an average deceleration of approximately 0.5g, then three stops from 72 km/h.

The tyres must be conditioned by driving around a circle 30 metres in diameter at a speed that produces a lateral acceleration of approximately 0.5g to 0.6g for three clockwise laps followed by three counter clockwise laps.

Using a sinusoidal steering pattern at a frequency of 1 Hz, a peak steering wheel angle amplitude corresponding to a peak lateral acceleration of 0.5g to 0.6g, and a vehicle speed of 56 km/h, drive the vehicle through four passes, performing 10 cycles of sinusoidal steering during each pass. The steering wheel angle amplitude of the final cycle of the final pass must be twice that of the other cycles. The maximum time permitted between all laps and passes is five minutes.

Testing

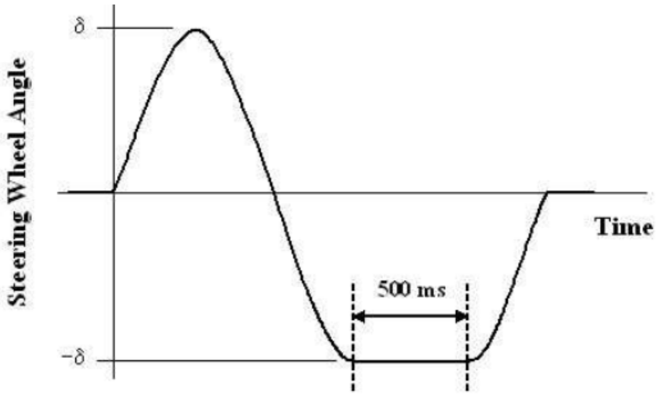
Carry out two series of runs of a Slowly Increasing Steer Test using a constant vehicle speed of 80 + 2 km/h and a steering pattern that increases by 13.5 degrees per second until a lateral acceleration of approximately 0.5g is obtained. Three repetitions are performed for each test series. One series uses counter clockwise steering, and the other series uses clockwise steering. The maximum time permitted between each test run is five minutes.

From the Slowly Increasing Steer tests, the quantity "A" is determined. "A" is the steering wheel angle in degrees that produces a steady state lateral acceleration of 0.3g. Utilizing linear regression, "A" is calculated, to the nearest 0.1 degrees, from each of the six Slowly Increasing Steer tests. The absolute value of the six A's calculated is averaged and rounded to the nearest 0.1 degrees to produce the final quantity, A, used below.

After the quantity "A" has been determined and without replacing the tyres, the tyre conditioning procedure described previously is performed immediately prior to conducting a Sine with Dwell Test. Initiation of the first Sine with Dwell test series shall begin within two hours after completion of the Slowly Increasing Steer tests of paragraph.

Check that the ESC system is enabled. Subject the vehicle to two series of test runs using a steering pattern of a sine wave at 0.7 Hz frequency with a 500 ms delay beginning at the second peak amplitude as shown below.

Figure 10 Test run steering pattern



One series uses counter clockwise steering for the first half cycle, and the other series uses clockwise steering for the first half cycle. The vehicle is allowed to cool-down between each test run of 90 seconds to five minutes, with the vehicle stationary.

The steering motion is initiated with the vehicle coasting in high gear at 80 ± 2 km/h. The steering amplitude for the initial run of each series is 1.5A, where "A" is the steering wheel angle determined previously.

In each series of test runs, the steering amplitude is increased from run to run, by 0.5A, provided that no such run will result in a steering amplitude greater than that of the final run.

The steering amplitude of the final run in each series is the greater of 6.5A or 270 degrees, provided the calculated magnitude of 6.5A is less than or equal to 300 degrees. If any 0.5A increment, up to 6.5A, is greater than 300 degrees, the steering amplitude of the final run shall be 300 degrees.

ESC Malfunction Detection

Simulate one or more ESC malfunction(s) by disconnecting the power source to any ESC component or disconnecting any electrical connection between ESC components (with the vehicle power off).

Drive the vehicle forward to obtain a vehicle speed of 48 ± 8 km/h at the latest 30 seconds after the engine has been started and within the next two minutes at this speed, conduct at least one left and one right smooth turning manoeuvre without losing directional stability and one brake application. Verify that the ESC malfunction indicator illuminates as required and remains illuminated as long as the engine is running or until the fault is corrected.

APPENDIX 7—BENEFIT-COST ANALYSIS—METHODOLOGY

The model used in this analysis was the Net Present Value (NPV) model. The costs and expected benefits associated with a number of options for government intervention were summed over time. The further the cost or benefit occurred from the nominal starting date, the more they were discounted. This allowed all costs and benefits to be compared equally among the options, no matter when they occurred. The analysis was broken up into the following steps.

1. The trend in new vehicle sales data for LCVs was established for the years 1999 to 2011. Sales data for this period showed a rise in vehicle sales of around 4.2 per cent per year. This trend was then extrapolated to 2042 by assuming an annual growth rate in new vehicle sales of 4 per cent.

2. The voluntary fitment rate of ESC in LCVs for the BAU case was established, starting at the current (2012) rate of 45 per cent, reaching 90 per cent by 2018 and 99 per cent by 2020. The fitment rates were then established for each of the options. These were higher than the BAU rate, the actual rate depending on the characteristics of the proposed intervention.

3. The likelihood of a registered LCV having a crash where a driver is injured (including fatally) was established for each year of a car's life using the method described in Fildes (2002). The method includes historical data of crash rates over 25 years.

4. The differences between the BAU and each option were calculated, resulting in the net number of vehicles fitted with ESC that was attributable to each option in a particular year.

5. For each year, the net number of vehicles fitted with ESC for each option was multiplied by the likelihood of a crash per registration in that first year. This was added to the likelihoods of older cars crashing during that year.

6. The net number of vehicles from Part 4 was multiplied by the number of expected crashes for that year, as determined in Part 5. The result was then multiplied by the overall effectiveness of ESC in LCVs (28 per cent, as reported in Appendix 4—Effectiveness of Electronic Stability Control Systems); the outcome being the number of injury-based crashes that could be saved by ESC due to the intervention option.

7. The crashes in Part 6 were multiplied by the value of an average casualty crash. This gave the savings associated with the reduction in crashes. In turn, this became the benefits for each option. Research undertaken by the Bureau of Transport Economics (2000) in Australia found the cost in 1996 dollars of a road crash was $1.65 million for a fatal crash, $407,990 for a serious injury crash, and $13,776 for a minor injury crash. The costs for a serious injury crash and a minor injury crash were updated to 2012 dollars, using an inflation rate of 2.6 per cent (Reserve Bank of Australia, 2012), to $615,187 and $20,772 respectively. The cost of a fatal crash was

modified to reflect willingness to pay terms. This was done using a base cost of a fatality of $3.587m (Abelson 2007), multiplied by 1.1 to convert it to a cost per crash rather than per fatality, with added costs from the Bureau of Transport Economics (2000) to a value of $922,551, to reach a final value for a fatal crash of $4.868 million (in 2008 dollars). This value was updated to 2012 dollars, using an inflation rate of 2.6 per cent (Reserve Bank of Australia, 2012), to $5.395 million. The values for fatality, serious injury and minor injury crashes were proportioned using data provided by Fitzharris et al (2010) to arrive at the cost of an average casualty crash of $288,197.

8. The implementation costs and government costs (as relevant) of each option were then calculated, using the values from Section 7 Economic Aspects—Benefit-Cost Analysis. The implementation costs were based on the net number of vehicles in Part 4.

9. All calculated values were discounted and summed, allowing calculations of Net benefits, Total Costs, Benefit-Cost Ratios and lives saved. A discount rate of seven per cent was assumed, this being in line with similar studies. However, discount rates of 10 per cent as well as 3 per cent were used as part of a sensitivity check.

APPENDIX 8—BENEFIT-COST ANALYSIS—DETAILS OF RESULTS

1. Establish the trend in new vehicle sales data for LCVs for the years 1999 to 2011. Extrapolate to 2029 by assuming an annual growth rate in new vehicle sales of 4 per cent.

Table 19 New vehicle sales 1998-99 to 2037-38 (ABS, 2009 & FCAI, 2010-11)

New Vehicle Sales	
Year	**Total LCVs**
1998-99	107,703
1999-00	113,779
2000-01	103,113
2001-02	115,744
2002-03	131,253
2003-04	155,098
2004-05	164,348
2005-06	166,748
2006-07	167,388
2007-08	186,868
2008-09	174,501
2009-10	186234
2010-11	176630
2011-12	183695
2012-13	191043
2013-14	198685
2014-15	206632
2015-16	214897
2016-17	223493
2017-18	232433
2018-19	241730
2019-20	251400
2020-21	261456
2021-22	271914
2022-23	282790
2023-24	294102
2024-25	305866
2025-26	318101
2026-27	330825
2027-28	344058
2028-29	357820
2029-30	372133

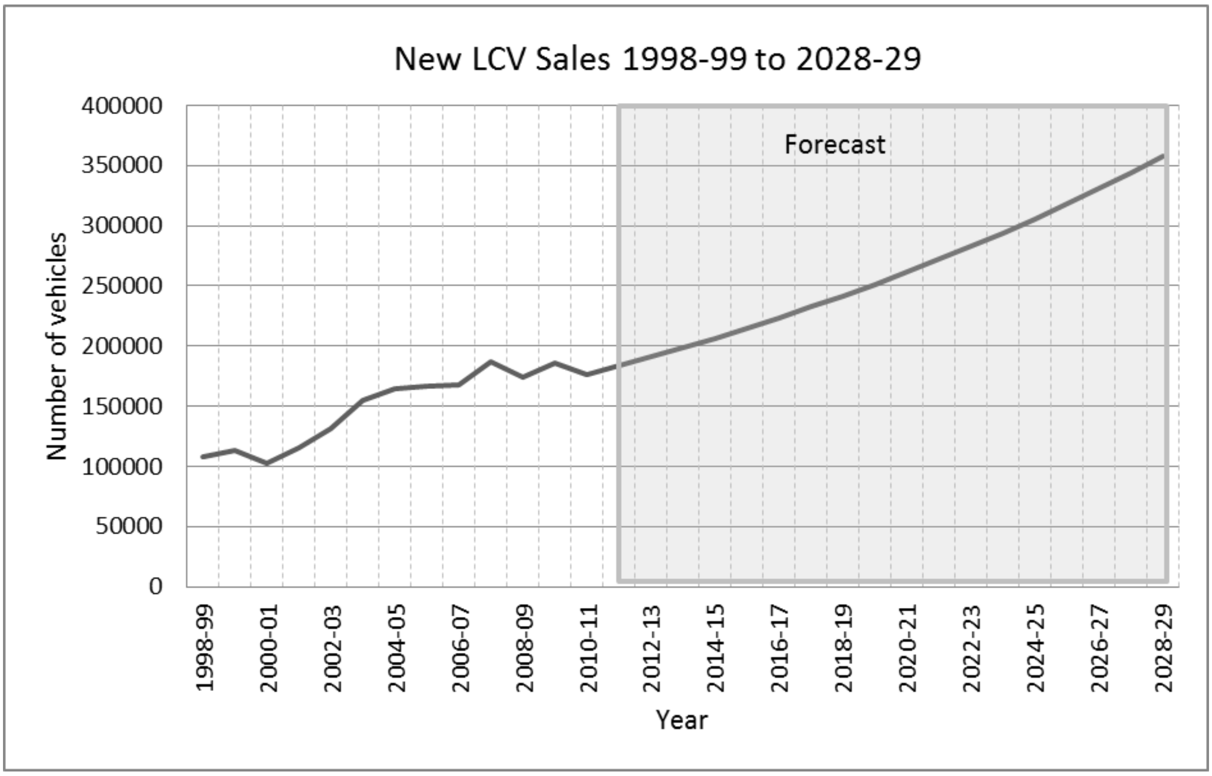


Figure 11 New LCV sales from 1998-99 to 2028-29 (data from Table 6)

2. Establish the fitment rate of ESC for the BAU case. Establish the fitment rate for each option.

Table 20 Effectiveness of each option

Benefit related to:	Expected effectiveness	Notes
Option 2(a): user information campaigns—targeted awareness	77%	Total awareness per new fleet per year
Option 2(b): user information campaigns—advertising	8%	Increase in existing sales in the first year (decreasing by 10 per cent each year thereafter)
Option 6: mandatory standards under the MVSA	100%	Total per new fleet per year

Table 21 Option 2(a)

Fitment Rate		
Year	**BAU**	**Option**
2012	0.450	0.770
2013	0.525	0.770
2014	0.600	0.770
2015	0.675	0.770
2016	0.750	0.770
2017	0.825	0.825
2018	0.900	0.900
2019	0.945	0.945
2020	0.990	0.990
2021	0.990	0.990
2022	0.990	0.990
2023	0.990	0.990
2024	0.990	0.990
2025	0.990	0.990
2026	0.990	0.990
2027	0.990	0.990
2028	0.990	0.990
2029	0.990	0.990
2030	0.990	0.990
2031	0.990	0.990
2032	0.990	0.990
2033	0.990	0.990
2034	0.990	0.990
2035	0.990	0.990
2036	0.990	0.990
2037	0.990	0.990
2038	0.990	0.990
2039	0.990	0.990
2040	0.990	0.990
2041	0.990	0.990
2042	0.990	0.990

Table 22 Option 2(b)

Fitment Rate		
Year	**BAU**	**Option**
2012	0.450	0.486
2013	0.525	0.567
2014	0.600	0.643
2015	0.675	0.719
2016	0.750	0.794
2017	0.825	0.868
2018	0.900	0.943
2019	0.945	0.985
2020	0.990	0.990
2021	0.990	0.990
2022	0.990	0.990
2023	0.990	0.990
2024	0.990	0.990
2025	0.990	0.990
2026	0.990	0.990
2027	0.990	0.990
2028	0.990	0.990
2029	0.990	0.990
2030	0.990	0.990
2031	0.990	0.990
2032	0.990	0.990
2033	0.990	0.990
2034	0.990	0.990
2035	0.990	0.990
2036	0.990	0.990
2037	0.990	0.990
2038	0.990	0.990
2039	0.990	0.990
2040	0.990	0.990
2041	0.990	0.990
2042	0.990	0.990

Table 23 Option 6

Fitment Rate		
Year	**BAU**	**Option**
2012	0.450	0.450
2013	0.525	0.525
2014	0.600	0.600
2015	0.675	0.800
2016	0.750	1.000
2017	0.825	1.000
2018	0.900	1.000
2019	0.945	1.000
2020	0.990	1.000
2021	0.990	1.000
2022	0.990	1.000
2023	0.990	1.000
2024	0.990	1.000
2025	0.990	1.000
2026	0.990	1.000
2027	0.990	1.000
2028	0.990	1.000
2029	0.990	1.000
2030	0.990	1.000
2031	0.990	1.000
2032	0.990	1.000
2033	0.990	1.000
2034	0.990	1.000
2035	0.990	1.000
2036	0.990	1.000
2037	0.990	1.000
2038	0.990	1.000
2039	0.990	1.000
2040	0.990	1.000
2041	0.990	1.000
2042	0.990	1.000

3. Establish the likelihood of a registered car having a crash where a driver is injured (including fatally) for each year of a car's life, using the method described in Fildes (2002).

Table 24 Crash likelihood

Age of vehicle	Crashes	Annual registrations	Likelihood of casualty crash
1	1,087	760,523	0.0005
2	2,556	740,998	0.0012
3	2,572	778,997	0.0011
4	2,412	698,916	0.0012
5	2,194	630,869	0.0012
6	2,142	613,261	0.0012
7	1,990	588,550	0.0012
8	1,637	530,947	0.0011
9	1,635	526,303	0.0011
10	1,591	482,099	0.0011
11	2,038	567,202	0.0012
12	2,008	544,296	0.0013
13	1,790	477,461	0.0013
14	1,510	414,467	0.0013
15	1,636	478,197	0.0012
16	2,176	625,061	0.0012
17	1,827	579,925	0.0011
18	1,297	524,515	0.0009
19	1,330	580,654	0.0008
20	1,082	555,753	0.0007
21	804	565,653	0.0005
22	667	532,710	0.0004
23	489	532,473	0.0003
24	360	517,449	0.0002
25	314	556,300	0.0002
26	263	551,011	0.0002

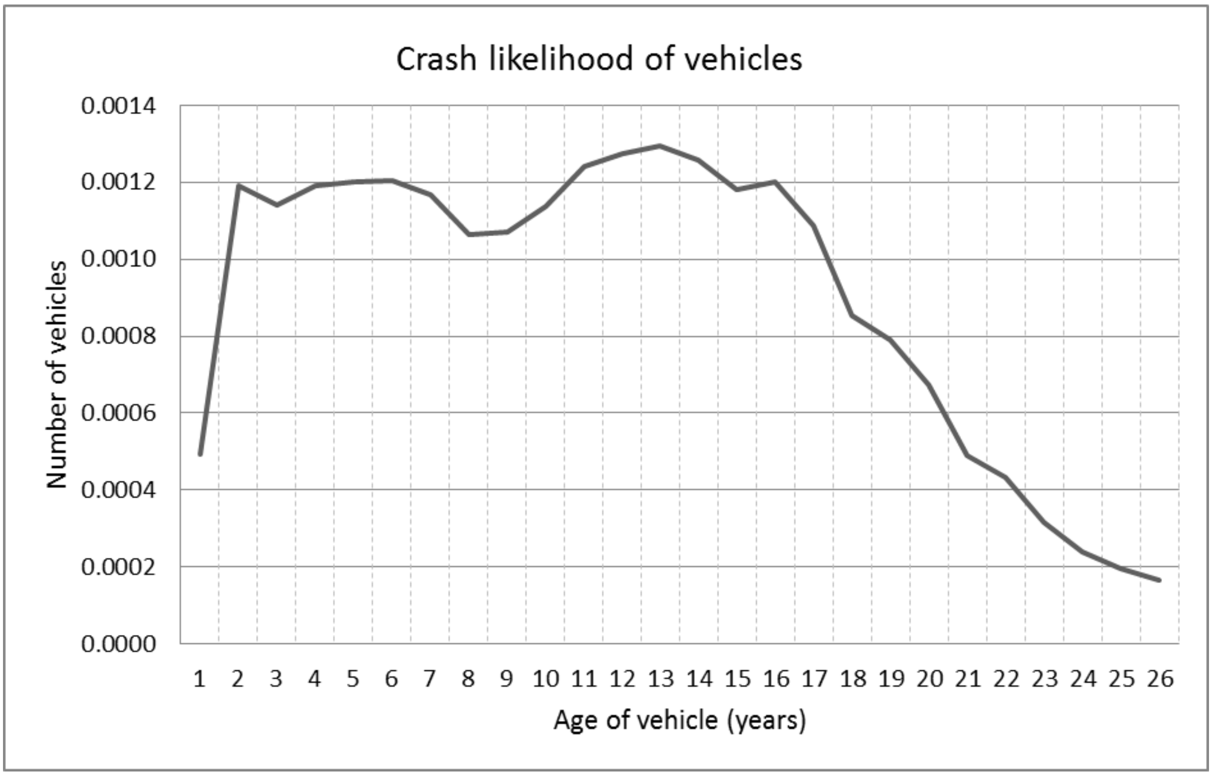


Figure 12 Crash likelihood of vehicles

4. Calculate the net difference in the number of vehicles fitted with ESC between the BAU and each option.

5. For each year and each option, multiply the net number of vehicles fitted with ESC by the likelihood of a crash per registration in that first year. Add this to the likelihoods of all older cars crashing during that year.

6. For each year and each option, multiply the result from step 5 by the effectiveness of ESC in LCVs.

7. Multiply the result from step 6 by the costs associated with the average crash. This gives the benefits.

Table 25 Option 2(a): User information campaigns—targeted awareness

Year	Likelihood of crash per vehicle	Option minus BAU	Age of vehicle (years)																															Total vehicles
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1	0.0005	46806		23																														23
2	0.0012	33776		56	17																													72
3	0.0011	19630		53	40	10																												103
4	0.0012	4298		56	38	23	2																											120
5	0.0012	0		56	40	22	5	0																										124
6	0.0012	0		56	41	23	5	0	0																									125
7	0.0012	0		55	41	24	5	0	0	0																								124
8	0.0011	0		50	39	24	5	0	0	0	0																							118
9	0.0011	0		50	36	23	5	0	0	0	0	0																						114
10	0.0011	0		53	36	21	5	0	0	0	0	0	0																					115
11	0.0012	0		58	38	21	5	0	0	0	0	0	0	0																				122
12	0.0013	0		60	42	22	5	0	0	0	0	0	0	0	0																			128
13	0.0013	0		61	43	24	5	0	0	0	0	0	0	0	0	0																		133
14	0.0013	0		59	44	25	5	0	0	0	0	0	0	0	0	0	0																	133
15	0.0012	0		55	42	25	5	0	0	0	0	0	0	0	0	0	0	0																129
16	0.0012	0		56	40	25	6	0	0	0	0	0	0	0	0	0	0	0	0															126
17	0.0011	0		51	41	23	5	0	0	0	0	0	0	0	0	0	0	0	0	0														120
18	0.0009	0		40	37	24	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0													105
19	0.0008	0		37	29	21	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												92
20	0.0007	0		31	27	17	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											80
21	0.0005	0		23	23	16	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0										65
22	0.0004	0		20	17	13	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									53
23	0.0003	0		15	15	10	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								42
24	0.0002	0		11	11	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							33
25	0.0002	0		9	8	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						25
26	0.0002	0		8	7	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					20
27	0.0000	0			6	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				10
28	0.0000	0				3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			4
29	0.0000	0					1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1
30	0.0000	0						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0.0000	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0.0000	0								0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0.0000	0									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0.0000	0										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0.0000	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0.0000	0												0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0.0000	0													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0.0000	0														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0.0000	0															0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0.0000	0																0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0.0000	0																	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0.0000	0																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 26 Option 2(b): user information campaigns— advertising

Year	Likelihood of crash per vehicle	Option minus BAU	Age of vehicle (years)																															Total vehicles
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1	0.0005	8024		4																														4
2	0.0012	8583		10	4																													14
3	0.0011	9038		9	10	4																												24
4	0.0012	9400		10	10	11	5																											35
5	0.0012	9678		10	10	10	11	5																										46
6	0.0012	9882		10	10	11	11	12	5																									58
7	0.0012	9712		9	10	11	11	11	12	5																								69
8	0.0011	0		9	10	11	11	12	11	12	0																							75
9	0.0011	0		9	9	11	11	12	12	11	0	0																						74
10	0.0011	0		9	9	10	11	12	12	12	0	0	0																					74
11	0.0012	0		10	10	10	10	11	12	12	0	0	0	0																				74
12	0.0013	0		10	11	10	10	10	12	12	0	0	0	0	0																			75
13	0.0013	0		10	11	11	11	10	11	11	0	0	0	0	0	0																		75
14	0.0013	0		10	11	12	12	11	11	10	0	0	0	0	0	0	0																	76
15	0.0012	0		9	11	12	12	12	11	10	0	0	0	0	0	0	0	0																78
16	0.0012	0		10	10	11	12	12	12	11	0	0	0	0	0	0	0	0	0															79
17	0.0011	0		9	10	11	12	13	13	12	0	0	0	0	0	0	0	0	0	0														79
18	0.0009	0		7	9	11	11	12	13	12	0	0	0	0	0	0	0	0	0	0	0													75
19	0.0008	0		6	7	10	11	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0												71
20	0.0007	0		5	7	8	10	12	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0											66
21	0.0005	0		4	6	7	8	11	12	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0										59
22	0.0004	0		3	4	6	7	8	11	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									52
23	0.0003	0		3	4	4	6	8	8	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								44
24	0.0002	0		2	3	4	5	7	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							36
25	0.0002	0		2	2	3	4	5	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						30
26	0.0002	0		1	2	2	3	4	5	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					24
27	0.0000	0			1	2	2	3	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				18
28	0.0000	0				1	2	2	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			13
29	0.0000	0					2	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		9
30	0.0000	0						2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
31	0.0000	0							2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
32	0.0000	0								2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
33	0.0000	0									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0.0000	0										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0.0000	0											0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0.0000	0												0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0.0000	0													0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0.0000	0														0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0.0000	0															0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0.0000	0																0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0.0000	0																	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0.0000	0																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 27 Option 6: mandatory standards under the MVSA

Year	Likelihood of crash per vehicle	Option minus BAU	Age of vehicle (years)																															Total vehicles
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1	0.0005	0		0																														0
2	0.0012	0		0	0																													0
3	0.0011	25829		0	0	13																												13
4	0.0012	53724		0	0	31	26																											57
5	0.0012	39111		0	0	29	64	19																										113
6	0.0012	23243		0	0	31	61	47	11																									150
7	0.0012	13295		0	0	31	64	45	28	7																								174
8	0.0011	2514		0	0	31	64	47	26	16	1																							186
9	0.0011	2615		0	0	30	65	47	28	15	3	1																						189
10	0.0011	2719		0	0	27	63	47	28	16	3	3	1																					188
11	0.0012	2828		0	0	28	57	46	28	16	3	3	3	1																				185
12	0.0013	2941		0	0	29	58	42	27	16	3	3	3	3	1																			186
13	0.0013	3059		0	0	32	61	42	25	16	3	3	3	3	4	2																		193
14	0.0013	3181		0	0	33	67	45	25	14	3	3	3	3	3	4	2																	204
15	0.0012	3308		0	0	33	68	48	26	14	3	3	3	3	4	3	4	2																216
16	0.0012	3441		0	0	32	70	50	29	15	3	3	3	3	4	4	4	4	2															224
17	0.0011	3578		0	0	30	68	51	30	16	3	3	3	3	4	4	4	4	4	2														227
18	0.0009	0		0	0	31	63	49	30	17	3	3	3	3	3	4	4	4	4	4	0													226
19	0.0008	0		0	0	28	65	46	29	17	3	3	3	3	3	4	4	4	4	4	0	0												220
20	0.0007	0		0	0	22	58	47	27	17	3	3	3	3	3	3	4	4	4	4	0	0	0											207
21	0.0005	0		0	0	20	46	43	28	16	3	3	3	4	3	3	3	4	4	4	0	0	0	0										188
22	0.0004	0		0	0	17	42	33	25	16	3	3	4	4	4	3	3	4	4	4	0	0	0	0	0									170
23	0.0003	0		0	0	13	36	31	20	14	3	3	3	4	4	4	4	4	4	4	0	0	0	0	0	0								150
24	0.0002	0		0	0	11	26	26	18	11	3	3	3	4	4	4	4	4	4	4	0	0	0	0	0	0	0							129
25	0.0002	0		0	0	8	23	19	16	11	2	3	3	3	4	4	4	4	4	4	0	0	0	0	0	0	0	0						112
26	0.0002	0		0	0	6	17	17	11	9	2	2	3	3	3	4	4	4	4	4	0	0	0	0	0	0	0	0	0					95
27	0.0000	0			0	5	13	12	10	7	2	2	2	3	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0				80
28	0.0000	0				4	10	9	7	6	1	2	2	2	3	4	4	4	4	5	0	0	0	0	0	0	0	0	0	0	0			69
29	0.0000	0					9	8	6	4	1	1	2	2	3	3	4	4	4	5	0	0	0	0	0	0	0	0	0	0	0	0		55
30	0.0000	0						6	5	3	1	1	1	2	2	3	3	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	40
31	0.0000	0							4	3	1	1	1	1	2	2	3	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	29
32	0.0000	0								2	0	1	1	1	1	2	3	3	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	22
33	0.0000	0									0	1	1	1	1	2	2	3	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	17
34	0.0000	0										0	1	1	1	1	2	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	13
35	0.0000	0											0	1	1	1	1	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	11
36	0.0000	0												0	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	8
37	0.0000	0													0	1	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6
38	0.0000	0														1	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	5
39	0.0000	0															1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3
40	0.0000	0																1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
41	0.0000	0																	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
42	0.0000	0																		1	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 28 Option 2(a): user information campaigns—targeted awareness

Year		Vehicle sales	Option's expected fitment rate	BAU expected (fitment rate	Option minus BAU	Net vehicle crashes avoided	Value of net vehicle crashes avoided (AUD)
0	2012						
1	2013	191,043	147,103	100,298	46,806	6	1,865,593
2	2014	198,685	152,987	119,211	33,776	20	5,848,666
3	2015	206,632	159,107	139,477	19,630	29	8,341,074
4	2016	214,897	165,471	161,173	4,298	34	9,674,082
5	2017	223,493	184,382	184,382		35	10,010,874
6	2018	232,433	209,190	209,190		35	10,119,734
7	2019	241,730	228,435	228,435		35	10,020,748
8	2020	251,400	248,886	248,886		33	9,538,063
9	2021	261,456	258,841	258,841		32	9,228,606
10	2022	271,914	269,195	269,195		32	9,326,800
11	2023	282,790	279,962	279,962		34	9,868,572
12	2024	294,102	291,161	291,161		36	10,378,685
13	2025	305,866	302,807	302,807		37	10,730,844
14	2026	318,101	314,920	314,920		37	10,736,860
15	2027	330,825	327,516	327,516		36	10,391,674
16	2028	344,058	340,617	340,617		35	10,210,209
17	2029	357,820	354,242	354,242		34	9,700,713
18	2030					30	8,510,837
19	2031					26	7,460,757
20	2032					22	6,429,979
21	2033					18	5,239,366
22	2034					15	4,313,448
23	2035					12	3,389,513
24	2036					9	2,628,908
25	2037					7	2,044,868
26	2038					6	1,645,599
27	2039					3	841,961
28	2040					1	328,940
29	2041					0.2	57,208
30	2042						
31	2043						
32	2044						
33	2045						
34	2046						
35	2047						
36	2048						
37	2049						
38	2050						
39	2051						
40	2052						
41	2053						
42							
						NPV 42 years	$95,252,231

Table 29 Option 2(b): user information campaigns—advertising

Year		Vehicle sales	Option's expected fitment rate	BAU expected (voluntary) fitment rate	Option minus BAU	Net single vehicle crashes avoided	Value of net single vehicle crashes avoided (AUD)
0	2012						
1	2013	191,043	108,321	100,298	8,024	1	319,816
2	2014	198,685	127,794	119,211	8,583	4	1,113,950
3	2015	206,632	148,515	139,477	9,038	7	1,924,675
4	2016	214,897	170,573	161,173	9,400	10	2,806,558
5	2017	223,493	194,060	184,382	9,678	13	3,726,323
6	2018	232,433	219,072	209,190	9,882	16	4,674,091
7	2019	241,730	238,147	228,435	9,712	19	5,602,541
8	2020	251,400	248,886	248,886		21	6,066,664
9	2021	261,456	258,841	258,841		21	5,984,742
10	2022	271,914	269,195	269,195		21	5,981,163
11	2023	282,790	279,962	279,962		21	6,002,077
12	2024	294,102	291,161	291,161		21	6,041,507
13	2025	305,866	302,807	302,807		21	6,096,427
14	2026	318,101	314,920	314,920		21	6,166,063
15	2027	330,825	327,516	327,516		22	6,270,070
16	2028	344,058	340,617	340,617		22	6,378,474
17	2029	357,820	354,242	354,242		22	6,357,096
18	2030					21	6,097,178
19	2031					20	5,753,686
20	2032					18	5,302,031
21	2033					16	4,745,750
22	2034					15	4,189,910
23	2035					12	3,526,649
24	2036					10	2,890,035
25	2037					8	2,392,996
26	2038					7	1,914,903
27	2039					5	1,416,741
28	2040					4	1,048,217
29	2041					2	717,902
30	2042					2	472,794
31	2043					1	284,408
32	2044					0	129,272
33	2045						
34	2046						
35	2047						
36	2048						
37	2049						
38	2050						
39	2051						
40	2052						
41	2053						
42							
						NPV 42 years	$50,511,579

Table 30 Option 6: mandatory standards under the MVSA

Year		Vehicle sales	Option's expected fitment rate	BAU expected (voluntary) fitment rate	Option minus BAU	Net single vehicle crashes avoided	Value of net single vehicle crashes avoided (AUD)
0	2012						
1	2013	191,043	100,298	100,298	-	-	-
2	2014	198,685	119,211	119,211	-	-	-
3	2015	206,632	165,306	139,477	25,829	4	1,029,503
4	2016	214,897	214,897	161,173	53,724	16	4,625,951
5	2017	223,493	223,493	184,382	39,111	32	9,105,036
6	2018	232,433	232,433	209,190	23,243	42	12,121,101
7	2019	241,730	241,730	228,435	13,295	49	14,042,342
8	2020	251,400	251,400	248,886	2,514	52	15,009,534
9	2021	261,456	261,456	258,841	2,615	53	15,268,702
10	2022	271,914	271,914	269,195	2,719	53	15,221,242
11	2023	282,790	282,790	279,962	2,828	52	14,955,123
12	2024	294,102	294,102	291,161	2,941	52	15,015,904
13	2025	305,866	305,866	302,807	3,059	54	15,598,163
14	2026	318,101	318,101	314,920	3,181	57	16,516,112
15	2027	330,825	330,825	327,516	3,308	61	17,441,748
16	2028	344,058	344,058	340,617	3,441	63	18,119,619
17	2029	357,820	357,820	354,242	3,578	64	18,360,826
18	2030					63	18,239,079
19	2031					62	17,816,259
20	2032					58	16,748,980
21	2033					53	15,210,787
22	2034					48	13,753,709
23	2035					42	12,096,867
24	2036					36	10,428,874
25	2037					31	9,039,673
26	2038					27	7,678,454
27	2039					23	6,487,484
28	2040					19	5,540,831
29	2041					15	4,461,502
30	2042					11	3,252,616
31	2043					8	2,381,886
32	2044					6	1,799,258
33	2045					5	1,359,371
34	2046					4	1,086,807
35	2047					3	873,664
36	2048					2	670,908
37	2049					2	495,700
38	2050					1	368,023
39	2051					1	252,806
40	2052					1	167,614
41	2053					0.4	102,119
42						0.2	47,628
						NPV 42 years	$130,341,178

8. Calculate the implementation and government costs for each option.

Table 31 Details of the new vehicle fleet (as per Section 7 Economic Aspects—Benefit-Cost Analysis)

Number of vehicles per year	Number of models per year	Number of makes per year
176,940	51	20

Table 32 Costs for fitting ESC

Costs related to:	Estimated cost (AUD)	Option	Notes	Cost impact
Implementation of ESC system	400	All	Per vehicle	Business
Information campaigns—targeted	1,000,000	2(a)	Per 4 month campaign, assume continuous campaign (3 per year)	Government
Information campaigns—advertising	1,500,000	2(b)	Per month, assume continuous campaign (12 months per year	Government
Implementing and maintaining regulation	50,000	6	Per year	Government

Table 33 Option 2(a): user information campaigns—targeted awareness

Year		Fitment costs	Government costs
0	2012		
1	2013	18,722,215	3,000,000
2	2014	13,510,562	3,000,000
3	2015	7,852,020	3,000,000
4	2016	1,719,179	3,000,000
5	2017		
6	2018		
7	2019		
8	2020		
9	2021		
10	2022		
11	2023		
12	2024		
13	2025		
14	2026		
15	2027		
16	2028		
17	2029		
18	2030		
19	2031		
20	2032		
21	2033		
22	2034		
23	2035		
24	2036		
25	2037		
26	2038		
27	2039		
28	2040		
29	2041		
30	2042		
31	2043		
32	2044		
33	2045		
34	2046		
35	2047		
36	2048		
37	2049		
38	2050		
39	2051		
40	2052		
41	2053		
42	2054		
		NPV 42 years	
		$37,019,186	$10,161,634

Table 34 Option 2(b): user information campaigns—advertising

Year		Fitment costs	Government costs
0	2012		
1	2013	3,209,523	18,000,000
2	2014	3,433,272	18,000,000
3	2015	3,615,236	18,000,000
4	2016	3,759,845	18,000,000
5	2017	3,871,136	18,000,000
6	2018	3,952,782	18,000,000
7	2019	3,884,794	18,000,000
8	2020		
9	2021		
10	2022		
11	2023		
12	2024		
13	2025		
14	2026		
15	2027		
16	2028		
17	2029		
18	2030		
19	2031		
20	2032		
21	2033		
22	2034		
23	2035		
24	2036		
25	2037		
26	2038		
27	2039		
28	2040		
29	2041		
30	2042		
31	2043		
32	2044		
33	2045		
34	2046		
35	2047		
36	2048		
37	2049		
38	2050		
39	2051		
40	2052		
41	2053		
42	2054		
		NPV 42 years	
		$19,631,010	$97,007,209

Table 35 Option 6: mandatory standards under the MVSA

Year		Fitment costs	Government costs
0	2012		
1	2013		50,000
2	2014		50,000
3	2015	10,331,606	50,000
4	2016	21,489,740	50,000
5	2017	15,644,531	50,000
6	2018	9,297,321	50,000
7	2019	5,318,068	50,000
8	2020	1,005,598	50,000
9	2021	1,045,822	50,000
10	2022	1,087,655	50,000
11	2023	1,131,161	50,000
12	2024	1,176,408	50,000
13	2025	1,223,464	50,000
14	2026	1,272,403	50,000
15	2027	1,323,299	50,000
16	2028	1,376,231	50,000
17	2029	1,431,280	50,000
18	2030		
19	2031		
20	2032		
21	2033		
22	2034		
23	2035		
24	2036		
25	2037		
26	2038		
27	2039		
28	2040		
29	2041		
30	2042		
31	2043		
32	2044		
33	2045		
34	2046		
35	2047		
36	2048		
37	2049		
38	2050		
39	2051		
40	2052		
41	2053		
42	2054		
		NPV 42 years	
		$50,656,286	$488,161

9. Sum and discount all calculated values for each year using a discount rate of 7 per cent. Calculate the net benefits, total costs, benefit-cost ratios and number of lives saved.

Table 36 Option 2(a): user information campaigns—targeted awareness

Year		Net Benefits	Lives saved
0	2012		
1	2013	-19,856,622	0.16
2	2014	-10,661,896	0.49
3	2015	-2,510,946	0.70
4	2016	4,954,903	0.81
5	2017	10,010,874	0.84
6	2018	10,119,734	0.85
7	2019	10,020,748	0.84
8	2020	9,538,063	0.80
9	2021	9,228,606	0.77
10	2022	9,326,800	0.78
11	2023	9,868,572	0.82
12	2024	10,378,685	0.87
13	2025	10,730,844	0.90
14	2026	10,736,860	0.90
15	2027	10,391,674	0.87
16	2028	10,210,209	0.85
17	2029	9,700,713	0.81
18	2030	8,510,837	0.71
19	2031	7,460,757	0.62
20	2032	6,429,979	0.54
21	2033	5,239,366	0.44
22	2034	4,313,448	0.36
23	2035	3,389,513	0.28
24	2036	2,628,908	0.22
25	2037	2,044,868	0.17
26	2038	1,645,599	0.14
27	2039	841,961	0.07
28	2040	328,940	0.03
29	2041	57,208	0.00
30	2042		
31	2043		
32	2044		
33	2045		
34	2046		
35	2047		
36	2048		
37	2049		
38	2050		
39	2051		
40	2052		
41	2053		
42	2054		
		NPV benefits	**Total lives**
		$48,071,411	17
		BCR	
		2.0	

Table 37 Option 2(b): user information campaigns—advertising

Year		Net Benefits	Lives saved
0	2012		
1	2013	-20,889,707	0.03
2	2014	-20,319,322	0.09
3	2015	-19,690,560	0.16
4	2016	-18,953,287	0.23
5	2017	-18,144,813	0.31
6	2018	-17,278,691	0.39
7	2019	-16,282,253	0.46
8	2020	6,066,664	0.50
9	2021	5,984,742	0.49
10	2022	5,981,163	0.49
11	2023	6,002,077	0.49
12	2024	6,041,507	0.50
13	2025	6,096,427	0.50
14	2026	6,166,063	0.51
15	2027	6,270,070	0.52
16	2028	6,378,474	0.53
17	2029	6,357,096	0.52
18	2030	6,097,178	0.50
19	2031	5,753,686	0.47
20	2032	5,302,031	0.44
21	2033	4,745,750	0.39
22	2034	4,189,910	0.35
23	2035	3,526,649	0.29
24	2036	2,890,035	0.24
25	2037	2,392,996	0.20
26	2038	1,914,903	0.16
27	2039	1,416,741	0.12
28	2040	1,048,217	0.09
29	2041	717,902	0.06
30	2042	472,794	0.04
31	2043	284,408	0.02
32	2044	129,272	0.01
33	2045		
34	2046		
35	2047		
36	2048		
37	2049		
38	2050		
39	2051		
40	2052		
41	2053		
42	2054		
		NPV benefits	**Total lives**
		$-66,126,641	10
		BCR	
		0.4	

Table 38 Option 6: mandatory standards under the MVSA

Year		Net Benefits	Lives saved
0	2012		
1	2013	-50,000	-
2	2014	-50,000	-
3	2015	-9,352,103	0.09
4	2016	-16,913,789	0.39
5	2017	-6,589,494	0.76
6	2018	2,773,780	1.01
7	2019	8,674,274	1.17
8	2020	13,953,935	1.25
9	2021	14,172,879	1.28
10	2022	14,083,587	1.27
11	2023	13,773,962	1.25
12	2024	13,789,496	1.25
13	2025	14,324,699	1.30
14	2026	15,193,710	1.38
15	2027	16,068,449	1.46
16	2028	16,693,388	1.51
17	2029	16,879,546	1.53
18	2030	18,239,079	1.52
19	2031	17,816,259	1.49
20	2032	16,748,980	1.40
21	2033	15,210,787	1.27
22	2034	13,753,709	1.15
23	2035	12,096,867	1.01
24	2036	10,428,874	0.87
25	2037	9,039,673	0.76
26	2038	7,678,454	0.64
27	2039	6,487,484	0.54
28	2040	5,540,831	0.46
29	2041	4,461,502	0.37
30	2042	3,252,616	0.27
31	2043	2,381,886	0.20
32	2044	1,799,258	0.15
33	2045	1,359,371	0.11
34	2046	1,086,807	0.09
35	2047	873,664	0.07
36	2048	670,908	0.06
37	2049	495,700	0.04
38	2050	368,023	0.03
39	2051	252,806	0.02
40	2052	167,614	0.01
41	2053	102,119	0.01
42	2054	47,628	0.00
		NPV benefits	**Total lives**
		$79,196,730	29
		BCR	
		2.5	

Summary

Table 39 Option 2(a)—User information campaigns (total 77 per cent effectiveness, A$3m campaign cost per year)

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$48,071,411	$37,019,186	$10,161,634	2.0	17

Table 40 Option 2(b)—User information campaigns (+8 per cent effectiveness, A$18m campaign cost per year)

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
-$66,126,641	$19,631,010	$97,007,209	0.4	10

Table 41 Option 6—Mandatory standards (total 100 per cent effectiveness)

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$79,196,730	$50,656,286	$488,161	2.5	29

APPENDIX 9—BENEFIT-COST ANALYSIS—SENSITIVITIES

The following sensitivities were tested for Option 6: mandatory standards under the MVSA.

a) Base case

Table 42 Basic output: discount rate 7 per cent, BAU case, 99 per cent by 2020

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$79,196,730	$50,656,286	$488,161	2.5	29

b) Changes to discount rate

Table 43 Discount rate of 3 per cent

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$159,497,543	$62,448,022	$658,306	3.5	29

Table 44 Discount rate of 10 per cent

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$47,464,657	$43,823,414	$401,078	2.1	29

c) Changes to effectiveness

Table 45 Effectiveness of 22.4 per cent (-20 per cent)

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$53,128,495	$50,656,286	$488,161	2.0	24

Table 46 Effectiveness of 33.6 per cent (+20 per cent)

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$105,264,966	$50,656,286	$488,161	3.1	35

Post-consultation sensitivity analysis

d) Changes to the implementation timetable

Table 47 Implementation timetable of 2015 for new models, 2017 for all models

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$68,881,031	$44,098,518	$488,161	2.5	26

e) Changes to the BAU fitment rate

Table 48 Changes to the BAU fitment rates (70 per cent current, 90 per cent end of 2013*, 100 per cent 2018)**

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$21,412,176	$13,922,210	$488,161	2.5	9

Table 49 Changes to the BAU fitment rates (70 per cent current, 90 per cent end of 2013*, 100 per cent 2018)—Option 2a**

Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Number of Lives Saved
$5,060,344	$4,999,256	$2,803,738	1.6	2

* modelled as beginning of 2014

** i.e. 99 per cent, given that FCAI represents most but not all (99 per cent) of vehicle manufacturers and importers

APPENDIX 10—BENEFIT-COST ANALYSIS—ASSUMPTIONS

A number of assumptions were made in the benefit-cost analysis. These are listed below (in no particular order).

1. The effectiveness of ESC for LCVs was obtained from Fitzharris et al (2010). As noted, there is a considerable number of studies around the world that demonstrate the effectiveness of ESC in reducing passenger car and SUV/4WD crashes. Fitzharris et al derived the 32 per cent effectiveness for LCVs from a wide range of effectiveness values relating to passenger cars and SUVs/4WDs as well as limited information available in Australia specific to LCVs. Fitzharris et al assumed that the ESC effectiveness values for passenger cars and 4WDs are similar to the effectiveness for LCVs. This assumption was based on an assessment of crash profile by location and speed zone which showed that the general distribution of crashes across vehicle types is relatively similar (Fitzharris et al. 2010). Refer to Appendix 4—Effectiveness of Electronic Stability Control Systems.

2. A discount rate of seven per cent was assumed, being in line with similar studies. However, a rate of 10 per cent was used as part of the sensitivity checks, as well as a rate of 3 per cent. The expected life of a vehicle was set at 25 years as per the historical data used for the calculations. Refer to Appendix 7—Benefit-Cost Analysis—Methodology. This would not affect the relative merits of the options but may change their final values slightly.

3. A historically based fleet profile was used to adjust the contribution that each vehicle fitted with ESC would provide towards the total benefit. This contribution was based on both the proportion of vehicles in the fleet of any particular age, and the tendency for vehicles of a particular age to be involved in road crashes. It was assumed that this profile could continue to represent the fleet into the future. Refer to Appendix 7—Benefit-Cost Analysis—Methodology. This would not affect the relative merits of the options, but may change how rapidly benefits would be realised and also may change their final values slightly.

4. There were no benefits allocated to the conversion of minor injuries to no injuries and so the scenarios may be slightly conservative. However, such conversions would be too difficult to estimate with any accuracy. It has been noted that other similar studies have not included such estimates. This may underestimate the benefits overall.

APPENDIX 11—TECHNICAL LIAISON GROUP (TLG)

Organisation
Manufacturer Representatives
Australian Road Transport Suppliers Association
Commercial Vehicle Industry Association
Federal Chamber of Automotive Industries
Federation of Automotive Product Manufacturers
Truck Industry Council
Bus Industry Confederation
Consumer Representatives
Australian Automotive Aftermarket Association
Australian Automobile Association
Australian Trucking Association
Australian Motorcycle Council
Government Representatives
Department of Infrastructure and Regional Development, Australian Government
Department of Transport, Energy and Infrastructure, South Australia
Department of Transport and Main Roads, Queensland
Transport for NSW, Centre for Road Safety, New South Wales
VicRoads, Victoria
Department of Transport, Western Australia
Transport Regulation, Justice & Community Safety, Australian Capital Territory
Department of Infrastructure, Energy and Resources, Tasmania
Department of Lands and Planning, Northern Territory
New Zealand Transport Agency
Inter Governmental Agency
National Transport Commission

APPENDIX 12—ACRONYMS

4WD	Four-Wheel Drive
AAA	Australian Automobile Association
AAAA	Australian Automotive Aftermarket Association
ABS	Antilock Braking System
ADR	Australian Design Rule
AFMA	Australasian Fleet Managers Association
ANCAP	Australasian New Car Assessment Program
BAU	Business as Usual
BCR	Benefit-Cost Ratio
BTE	Bureau of Transport Economics
CCA	Competition and Consumer Act 2010
COAG	Council of Australian Governments
DOIT	Department of Infrastructure and Transport
ESC	Electronic Stability Control
EU	European Union
FAPM	Federation of Automotive Product Manufacturers
FCAI	Federal Chamber of Automotive Industries
FMVSS	Federal Motor Vehicle Safety Standard
GTR	Global Technical Regulation
GVM	Gross Vehicle Mass
LCV	Light Commercial Vehicle
MUARC	Monash University Accident Research Centre
MVSA	Motor Vehicle Standards Act 1989
NRMA	National Roads and Motorists' Association
NPV	Net Present Value
NTC	National Transport Commission
RAC	Royal Automobile Club of Western Australia
RACV	Royal Automobile Club of Victoria
RIS	Regulation Impact Statement
SAE	Society of Automotive Engineers
SCOTI	Standing Council on Transport and Infrastructure
SUV	Sports Utility Vehicle
SVC	Single Vehicle Crash
SVSEG	Strategic Vehicle Safety and Environment Group
TCS	Traction Control System
TISOC	Transport and Infrastructure Senior Officials' Committee
TLG	Technical Liaison Group
UCSR	Used Car Safety Ratings
UNECE	United Nations Economic Commission for Europe
WP.29	World Forum for the Harmonisation of Vehicle Regulations
WTO	World Trade Organisation

APPENDIX 13—PUBLIC COMMENT

A summary of the public comment received is provided in Table 50 along with departmental responses. Where comments are discussed further within the RIS, page references are also included.

Table 50 Summary of public comment and departmental responses

Organisation	Comments	Discussed further on page	Departmental response
Australian Automobile Association (AAA)	1. Supports the introduction of mandatory standards under the MVSA to require ESC on all LCVs and supports the proposed implementation timing of 2015 for new models and 2016 for all models	-	1. Noted.
Australasian New Car Assessment Program	1. Supports the introduction of mandatory standards under the MVSA to require ESC on all LCVs.	-	1. Noted.
	2. Supports the continuation of user campaigns until ESC is mandated for LCVs.	-	2. Noted.
Federal Chamber of Automotive Industries (FCAI)	1. While FCAI does not see the need to mandate fitting of BAS to all light vehicles, if the Government takes this action, any ADR should be harmonised with international UN Regulations.	29, 39	1. The benefit-cost analysis shows that mandating ESC for LCVs would generate net benefits of $79m (for a 15-year regulation period) over and above the BAU case. The recommended requirements for ESC are those contained in the international standard UN R13-H.
	2. The implementation dates of any ADR should be (not before): • 1 November 2015 for new models • 1 November 2017 for all models	29, 39	2. This would result in a lead time of four years for all models, which is longer than the usual lead time for bringing in an ADR, particularly where the technology is well-established. However, the final implementation dates may be subject to further negotiation with industry. Further sensitivity testing has shown that the net benefits of Option 6 would remain positive under an extended implementation timetable.
	3. The RIS suggests that the 2012 fitment rate of ESC in LCVs is at 45 per cent, expecting to increase to 90 per cent by 2018 and 99 per cent by 2020. A more recent FCAI	29, 39	3. The benefit-cost analysis was based on current and expected future fitment rates as advised by the FCAI at the time of writing (2012). Further sensitivity testing has shown

		survey indicates the current (2013) fitment rate is above 70 per cent, is expected to be over 90 per cent by the end of this year, and will reach 100 per fitment rate between 2016 and 2018.			that the net benefits of Option 6 would remain positive under a scenario of higher voluntary fitment rates.
	4.	A number of suggestions were made relating to the structure of the ADRs.	-	4.	The detailed structure of the ADRs will be developed in consultation with industry.
Victorian Government (VicRoads)	1.	Supports the introduction of mandatory standards under the MVSA to require ESC on all LCVs.	-	1.	Noted.
	2.	Suggests that the in-service impacts of mandating ESC should be raised with the National Code of Practice for Light Vehicle Construction and Modification (Vehicle Standards Bulletin 14) working group.	-	2.	This can be dealt with through the relevant consultative groups.