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Regulation Impact Statement

for

Brake Assist Systems

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ABSTRACT

During the period 2000 to 2011, on average, 220 pedestrians and 36 cyclists were killed each year in Australia as a result of collisions with vehicles. There have been a number of approaches to reducing the cost to the community of these crashes. However, the problem continues to be a significant one.

Research has shown that Brake Assist Systems (BAS) have significant potential to reduce road trauma involving pedestrians and cyclists by helping to either avoid a collision or reduce its severity. Some studies have shown that BAS may also have broad application to other types of crashes.

The Australian vehicle market is responding on a voluntary basis, with the fitment rate of BAS in Australia at 90 per cent for passenger cars and Sports Utility Vehicles (SUVs) and 45 per cent for Light Commercial Vehicles (LCVs) in 2012.

This Regulation Impact Statement (RIS) examined the case for Australian Government intervention in order to increase the fitment rate of BAS to the new light vehicle fleet in Australia. A total of six options, including both regulatory and non-regulatory options, were considered. The focus of the analysis was on benefits for pedestrians and cyclists.

The results of a benefit-cost analysis showed that, even in the presence of the high fitment rates predicted by the Australian vehicle industry, there is a case for government action to increase the installation of BAS in passenger cars, SUVs and LCVs. Non-regulatory options of running an information campaign and changing government fleet purchasing policies would both be expected to provide a small net benefit to the community. The implementation of a mandatory standard under the *Motor Vehicle Standards Act 1989* (C'th) (MVSA), known as an Australian Design Rule (ADR), would generate the highest net benefits of the options examined. Compared with the business as usual case, this option would provide net benefits of $30m, saving 10 lives and over 200 serious injuries over a 15-year regulation period. It is also likely to be the option that results in the highest ongoing fitment rate of BAS in new vehicles, thereby maximising the benefits that BAS has to offer. Regulation through the MVSA is therefore the recommended option.

The recommended requirements to be applied are those contained in the international standard UN Regulation No. 13-H, as adopted by the United Nations. The proposed implementation timetable is 2015 for new models and 2016 for all models. This timing meets the usual lead time for an ADR change that involves an increase in stringency and also aligns with the timing in the European Union. However, the final timing may be subject to further negotiations with industry.

As part of the 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

Between 2000 and 2011, an average of 220 pedestrians and 36 cyclists were killed each year on Australian roads. Serious injuries averaged at approximately 2,700 per year for pedestrians and 4,000 per year for cyclists over the period 2000 to 2009.

There have been a number of approaches to reducing the cost to the community of these crashes. Most of these have aimed to prevent crashes from occurring through the use of education programs, punitive measures and infrastructure improvements. Although these initiatives have had some success, the problem continues to be a significant one.

Brake Assist Systems (BAS) are driver assistance systems designed to help drivers stop more quickly in an emergency situation. By detecting when a vehicle is undergoing emergency braking and then applying the maximum braking force, BAS can minimise the stopping distance of a vehicle and help to either avoid a collision or reduce its severity. Research has shown that BAS has potential to reduce road trauma involving pedestrians and cyclists and is also likely to have broad application to other types of crashes, such as rear-end collisions, intersection collisions and collisions with obstacles. Detailed work by the Transport Research Laboratory (TRL) has shown an effectiveness of 4 to 16 per cent for vulnerable road user crashes (Lawrence et al, 2006), while other studies have reported indicative effectiveness estimates of 6 to 15 per cent for other crash types (Page et al, 2005, 2009; Breuer et al, 2007).

Regulations for BAS have already been introduced in some overseas markets. At an international level, requirements for BAS were introduced into UN Regulation No. 13-H (UN R 13-H) in 2009 and have applied from November 2011 for newly approved models and will apply from November 2013 for all remaining models. Both light passenger vehicles and light commercial vehicles fall within the scope of the regulation, although light commercial vehicles may also be certified to UN R 13, which has no requirements for BAS. In the European Union (EU), BAS is mandated for both light passenger and light commercial vehicles through Regulation EC No. 78/2009, with a phase-in period from 2009 to 2015.

In terms of BAS, the Australian market is responding. As at July 2012, approximately 90 per cent of passenger cars and Sport Utility Vehicles (SUVs) and 45 per cent of Light Commercial Vehicles (LCVs) were supplied to the market with BAS. In 2012, Australian vehicle manufacturers and importers advised they expect this to increase to 99 per cent by 2018 for passenger cars and SUVs and 90 per cent by 2018 and 99 per cent by 2020 for LCVs (FCAI, 2012).

This RIS examines the case for Australian Government intervention to increase this fitment rate of BAS to the new light vehicle fleet in Australia. It has been written in accordance with Australian Government RIS requirements, as 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 United Nations Economic Commission for Europe (UNECE) 1958 and 1998 Agreements for developing vehicle regulations. These generally require regulation to adopt internationally based standards where possible. With Australia producing just one per cent of the world's motor 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). Benefits-cost analysis was used to help evaluate options 1, 2, 3, and 6. The results are summarised in Table 1 to Table 3. As the focus of the analysis was on vulnerable road users, the benefits presented in these tables reflect the reduction in road trauma involving pedestrian and cyclists that could be achieved through each option. Since BAS is likely to have a positive impact on a much wider range of crashes (with an effectiveness in the order of 6 to 15 per cent as noted above), these benefits may be in the lower range of the likely benefits of this proposal.

Table 1 Summary of net benefits and total benefits for each option

	Net Benefits ($m)			**Total Benefits ($m)**		
	Best Case	Likely Case	Worst Case	Best Case	Likely Case	Worst Case
Option 1 No intervention	-	-	-	-	-	-
Option 2(a) Information campaigns – targeted awareness	8	2	-4	22	22	22
Option 2(b) Information campaigns – advertising	-57	-69	-82	50	50	50
Option 3 Fleet policies	3	2	1	4	4	4
Option 6 Regulation	45	30	16	56	56	56

Table 2 Summary of costs and Benefit-Cost Ratios for each option

	Costs ($m)			**Benefit-Cost Ratio**		
	Best Case	Likely Case	Worst Case	Best Case	Likely Case	Worst Case
Option 1 No intervention	-	-	-	-	-	-
Option 2(a) Information campaigns – targeted awareness	14	20	26	1.6	1.2	0.9
Option 2(b) Information campaigns – advertising	106	119	132	0.5	0.4	0.4
Option 3 Fleet policies	1	2	3	4.8	3.1	1.4
Option 6 Regulation	11	25	40	5.1	3.3	1.4

Table 3 Summary of the number of lives and serious injuries saved for each option

	Lives Saved			Serious Injuries Saved		
	Best Case	Likely Case	Worst Case	Best Case	Likely Case	Worst Case
Option 1 No intervention	-	-	-	-	-	-
Option 2(a) Information campaigns – targeted awareness	3	3	3	62	62	62
Option 2(b) Information campaigns – advertising	7	7	7	148	148	148
Option 3 Fleet policies	0	0	0	11	11	11
Option 6 Regulation	10	10	10	217	217	217

Best Case - minimum costs; Likely Case - average costs; Worst Case - maximum costs

Option 1: No intervention. Based on the most recent industry estimates of voluntary fitment, this option is achieving the objective to deliver safe vehicles to the public to a large extent. However, industry wide installation may not be achieved in the medium term.

Option 2(a): Information campaigns. This option would be expected to increase the BAS fitment rate by a reasonable amount and return a small net benefit to the community. It is also unlikely to result in industry wide installation in the coming years.

Option 2(b): Advertising campaign. History suggests that advertising could achieve a significant rise in the BAS fitment rate. However, the cost of such a campaign is expected to greatly outweigh the benefits to the community.

Option 3: Fleet purchasing policies. Changing government fleet purchasing policies is a very low cost option that would be expected to return only a small net benefit. In other words, it is not significantly different from the status quo.

Option 4: Codes of practice. Given the already high voluntary BAS 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 BAS.

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. This option is estimated to generate the highest net benefits at $30m over a 15-year regulation period, as well as the highest number of lives saved and serious injuries avoided at 10 and 217 respectively. The impact analysis estimates that, due to the mature nature of the technology, there is effectively a small positive net benefit to the community for each vehicle fitted with BAS even as the voluntary rate approaches 100 per cent. It is therefore expected to achieve a higher net benefit than the status quo or the non-regulatory options. As the technology is relatively low cost and would only be applied to a small part of the fleet (due to the high voluntary fitment rate), it is a low cost option that offers additional benefit to vulnerable road users. It is the recommended option.

The calculations 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 for an ADR change involving an increase in stringency and compatible with the timing for the introduction of BAS requirements in the EU.

A sensitivity analysis was carried out for Option 6 and was conducted on three variables: the effectiveness of BAS in reducing vulnerable road user trauma; the crash rate; and the discount rate. The net benefits from Option 6 remained positive under all three scenarios for the likely case (i.e. average costs).

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 of BAS to LCVs that differed from its previous advice. The effects of an extended implementation timetable and alternative voluntary fitment rates were evaluated in additional sensitivity tests. Under both scenarios, the net benefits from Option 6 remained positive and higher than the net benefits of the other options considered feasible.

Therefore, if the preferred Option 6 was to be adopted, the fitment of BAS would be mandated for passenger cars, SUVs and LCVs (Australian vehicle categories of MA, MB, MC and NA) through the Australian Design Rules (ADRs). The requirements to be applied would be those contained in the international standard UN R 13-H, as adopted by the UN. 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. Road crashes result in enormous costs to society in terms of lost productivity and property damage. The cost to the Australian economy has been estimated at $27 billion per annum (Department of Infrastructure and Transport, 2012a). This translates to an average of over $1,100 for every person in Australia. This cost is borne widely by the general public, business and government, with an impact on the wellbeing of families that is not possible to measure.

Around the world, vulnerable road users such as pedestrians and cyclists represent between 10 and 46 per cent of all road related fatalities where a vehicle is involved (Bosch, 2008). In Australia, which has one of the lowest rates at around 16 per cent, this still represents over 200 fatalities per year.

There have been a number of approaches aimed at reducing the cost to the community of crashes between vehicles and pedestrians. These have for the most part involved initiatives to avoid the crashes from occurring, such as education programs, punitive measures and infrastructure improvements. While these approaches have had some success, the problem continues to be a significant one.

Over the past few decades, research conducted in the area of vehicle safety and standards has focused primarily on improving the protection of vehicle occupants. However, more recently, it has shown that vehicle based measures can also reduce the risk of injury to pedestrians and other vulnerable road users. Driver assistance systems, changes to the design of vehicle fronts and improved front and rear visibility all offer potential to improve the safety of pedestrians and other vulnerable road users, both on roads and on off-road areas such as car parks and driveways.

One driver assistance system that has been identified as having significant potential to reduce the number of pedestrian fatalities and injuries is the Brake Assist System (BAS). By detecting when a driver is attempting an emergency stop and then applying the maximum braking force, BAS can minimise the stopping distance of a vehicle and help to either avoid a collision or reduce its severity. BAS may also be referred to as Emergency Brake Assist (EBA).

This Regulation Impact Statement (RIS) examined the case for Australian Government intervention to increase the fitment rate of BAS to the new light vehicle fleet in Australia. While BAS would be beneficial in any crash where braking performance is a factor, this RIS focuses on benefits for vulnerable road users. This is because BAS has been shown to be particularly effective in these types of crashes.

1.2. Background

Crashes that involve vulnerable road users such as pedestrians and cyclists represent a major road safety problem worldwide (Devlin et al, 2010). As noted earlier, between 10 and 46 per cent (16 per cent in Australia) of all road related fatalities in the world where a vehicle is involved impact on this road user group.

In Australia, there have been some successes in reducing this number. The introduction of a 50 km/h urban default speed limit in Australian states and territories between the years of 2001 and 2004 was linked to a 20 per cent reduction in casualty crashes generally, with some evaluation studies identifying particular benefits for pedestrians and other vulnerable groups (Australian Transport Council, 2011). In Victoria, a 24 per cent reduction in pedestrian and cyclist crashes outside schools was observed two years after the adoption of 40 km/h school speed zones in 2003.

While pedestrian trauma affects all groups of pedestrians, the most vulnerable continue to be children, the elderly and the intoxicated (Devlin et al, 2010). A recent literature review by Devlin et al (2010) noted that educational, awareness and behaviour change programs are seen as vital to the success of improving safe pedestrian mobility. However, it also recognised that meeting the mobility and safety needs of pedestrians will require a comprehensive strategy that addresses all aspects of the road transport system including roads, speeds, vehicles and road user behaviour. This is consistent with the internationally accepted Safe System approach which recognises that people using the road network will make mistakes and therefore the whole system needs to be more forgiving of those errors (Australian Transport Council, 2011).

In May 2011, Australian transport Ministers released the *National Road Safety Strategy 2011-2020* (NRSS) which aims is to reduce the number of deaths and serious injuries on the nation's roads by at least 30 per cent by 2020. Based on the Safe System approach, the NRSS contains a range of initiatives in four key areas – Safe Roads, Safe Speeds, Safe Vehicles and Safe People. A number of these are aimed specifically at reducing road trauma for vulnerable road users. For example, the strategy calls for infrastructure improvements for pedestrians and cyclists and the expansion of projects that implement safe speed limits in areas of high pedestrian and cycling activity (Australian Transport Council, 2011).

One of the initiatives listed in the Safe Vehicles section of the NRSS is the consideration of mandating BAS for light vehicles. BAS is a driver assistance system designed to help drivers stop more quickly in an emergency situation. Research into driver behaviour has shown that drivers often do not achieve the maximum possible braking performance during emergency braking. Yoshida et al (1998) carried out experiments in which an emergency was simulated by unexpectedly throwing an object in front of the vehicle. They found that almost half of the drivers did not apply sufficient brake pedal force to activate the Anti-lock Braking System (ABS). They also noted that the maximum pedal force applied by drivers who did not activate ABS was less than one-third of that generated by drivers that did activate ABS. These drivers also had a tendency to reduce the pedal force during the braking manoeuvre. BAS uses information about the brake pedal force and/or speed to detect when a driver intends to make an emergency stop and then works in conjunction with ABS to apply the maximum braking force while also preventing the wheels from locking. Consequently, BAS is able to minimise the stopping distance and either reduce the severity of a collision or help to avoid it altogether. It has been shown to have benefits for pedestrian crashes as well as a number of other crash types. Detailed work by the Transport Research Laboratory (TRL) has shown an effectiveness of 4 to 16 per cent for vulnerable road user crashes (Lawrence et al, 2006), while other studies have reported indicative effectiveness estimates of 6 to 15 per cent for other crash types (Page et al, 2005, 2009; Breuer et al, 2007).

BAS is already being regulated in some overseas markets. In January 2009, the European Commission introduced Regulation (EC) No 78/2009, requiring that all new light passenger and light commercial vehicles be fitted with BAS in accordance with a phase-in schedule from 2009 to 2015. In addition to requiring BAS, this regulation also specifies passive safety requirements for vehicle fronts. The detailed requirements are contained in Regulation (EC) No. 631/2009.

In June 2009, the United Nations Economic Commission for Europe (UNECE), the peak international body for vehicle standards, voted to amend UN Regulation No. 13-H (R 13-H) to introduce requirements for BAS and provide contracting parties to the 1958 Agreement for developing UN regulations, with includes Australia, with the mechanism to mandate BAS in their territories.

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

2 THE EXTENT OF THE PROBLEM

Since 2000, on average, 220 pedestrians were killed in collisions with vehicles each year (Department of Infrastructure and Transport, 2012b). In 2011, pedestrian fatalities accounted for approximately 15 per cent of all fatalities on the roads. Table 4 shows the breakdown of vehicle types involved in fatal pedestrian crashes in Australia for the period 2002 to 2006. Eighty-one per cent of fatal pedestrian crashes where the vehicle type was known involved either passenger cars, vans, utes, four-wheel drives/Sports Utility Vehicles (4WDs/SUVs) and light trucks, which comprised mostly Light Commercial Vehicles (LCVs). Under the ADRs, these vehicles are classed as MA, MB, MC and NA categories. Refer to Appendix 1 - Vehicle Categories for details.

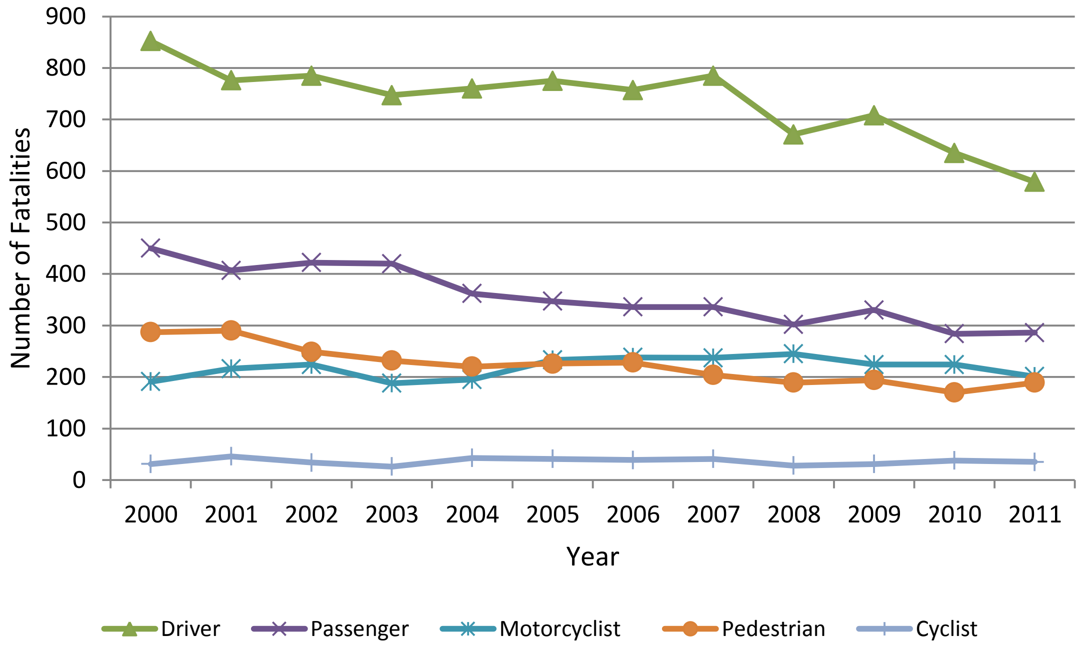
Table 4 Pedestrian deaths by type of vehicle involved, Australia: 2002 to 2006

Vehicle type	Deaths	% of total	% of known
Car	566	51	59
Van/ute/4WD	126	11	13
Heavy truck	119	11	12
Light truck	86	8	9
Bus	44	4	5
MC	13	1	1
Bicycle	4	0	0
Other	9	1	1
Unknown	151	14	-
Total	1118	100	100

Source: BITRE, 2012a

The number of pedestrian fatalities in Australia over the period 2000 to 2011 are shown in Figure 1. As seen in this figure, there has been a slow decline in the number of pedestrian fatalities during this period. However, recent data from the Bureau of Infrastructure, Transport and Regional Economics (BITRE) show that from 2010 to 2011 the number of pedestrian fatalities increased by approximately 11 per cent (BITRE, 2012b). This increase appears to have continued into 2012, with the number of pedestrian fatalities for the 12 months ended July 2012 up by around 13 per cent from the 12 month period ending July 2011 (BITRE, 2012c).

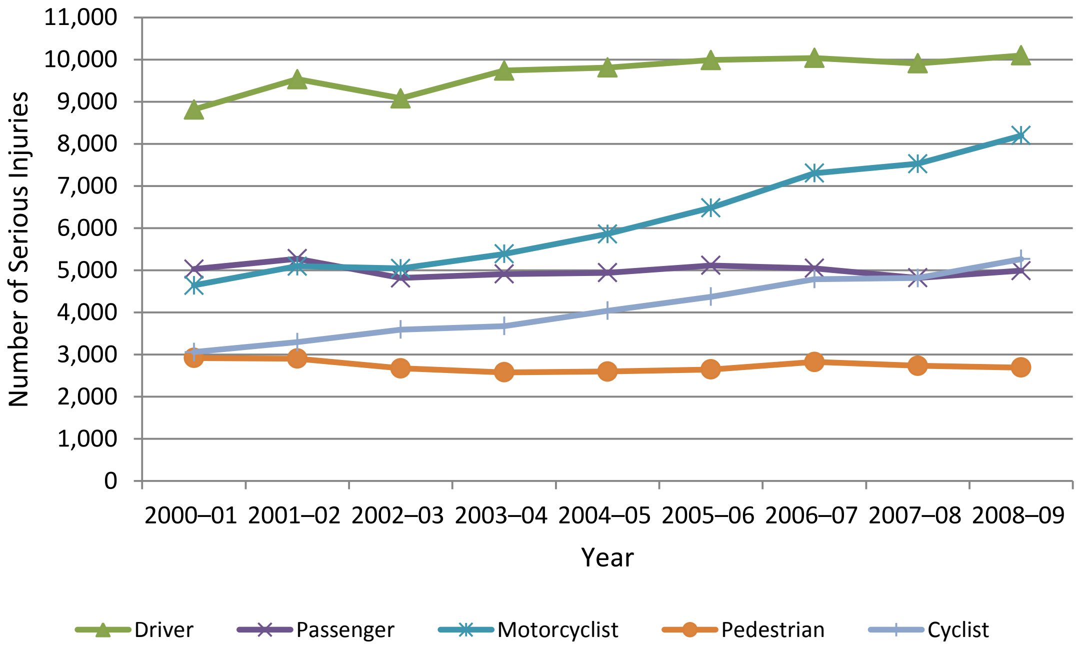
Figure 1 Road deaths by road user, Australia: 2000 to 2011



Source: Department of Infrastructure and Transport, 2012b

Data from the Australian Institute of Health and Welfare show that, during the nine-year period of 2000 to 2009, 24,547 pedestrians were seriously injured in road vehicle traffic crashes, an average of 2,727 per year (Henley and Harrison, 2009, 2012a and 2012b). Figure 2 shows that pedestrian serious injuries have remained relatively stable during this period, decreasing by an average of less than one per cent per year. By comparing Figures 1 and 2 it can be seen that there were approximately 13 serious injuries for each fatality.

Figure 2 Serious injuries due to road vehicle traffic crashes by road user, Australia: 2000 to 2009



Source: Henley and Harrison, 2009, 2012a and 2012b

National data could not be obtained for minor injuries. However, over the period 2000 to 2010, the VicRoads CrashStats database showed that pedestrian crashes in Victoria resulted in 543 fatalities, 6928 serious injuries, and 8531 minor injuries. This equates to 12.8 serious injuries and 15.7 minor injuries per fatality. Given that the ratio of serious injuries to fatalities matched the national data well, it was assumed that the Victorian statistics would be representative of the national case for minor injuries. While the above ratio of injuries is for pedestrian crashes involving all vehicle types, for the purposes of the analysis the ratio of injuries was calculated for pedestrian crashes involving only those vehicles being considered in this RIS, that is, light passenger and light commercial vehicles. The calculation of this ratio is shown at Appendix 2 - Ratio of Injuries.

Although research into the effectiveness of BAS has focused predominantly on pedestrians, several studies have concluded it would also be beneficial for cyclists. Each year, on average, 36 cyclists are killed on Australian roads and a further 4,000 are seriously injured (Department of Infrastructure and Transport, 2012). Figure 1 shows that cyclist fatalities have remained stable over the period 2000 to 2011, while Figure 2 shows that serious injuries have increased by an average of seven per cent per year between 2000 and 2009. It was again assumed that Victorian statistics would be representative of the national case for minor injuries.

There is a growing interest from Australian governments to increase walking and cycling as forms of transport. For example, the *National Cycling Strategy 2011 – 2016* aims to double the number of people cycling in Australia by 2016 (Austroads, 2010), while Victoria's

Pedestrian Access Strategy 2010 aims to increase walking for transport in Victoria (Victorian Government, 2010). If strategies such as these are successful, leading to more pedestrians and cyclists sharing the road network with vehicles, it would be unreasonable to expect that pedestrian and cyclist fatalities and injuries will decline in the future. This is supported by the recent rise in pedestrian fatalities. For the purpose of the analysis it was therefore assumed that the pedestrian and cyclist crash rate would remain constant for the foreseeable future. This assumption was tested later in the sensitivity analysis.

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 pedestrian safety in vehicle crashes, an externality exists that market forces may not be able to correct. This is because, in general, the person responsible for making the purchasing decision regarding the vehicle would not receive the main benefit of the pedestrian safety technology. Instead, the main benefit would be received by the pedestrian, or other vulnerable road user, through the reduction of road trauma. However, as BAS provides benefits in vehicle-to-vehicle crashes as well, this externality would be reduced to some extent.

3.1. Market response

BAS was first introduced by Mercedes-Benz in 1996. Since then it has been adopted by many other manufacturers and is now available in a wide range of vehicles in the Australian fleet. In 2008, Anderson et al conducted a survey of passenger vehicle models comprising the top 80 per cent of sales and found that approximately 63 per cent of these vehicles had some form of BAS. Since 2008, fitment has increased further, with 90 per cent of passenger cars and SUVs now fitted with BAS. This figure is lower for LCVs, with the fitment rate currently at 45 per cent. In 2012, industry advised that it expected the passenger vehicle fitment rate to reach 99 per cent by 2018 and the LCV fitment rate to reach 90 per cent by 2018 and 99 per cent by 2020 (FCAI, 2012).

There have been a number of developments both in Australia and overseas that may have influenced manufacturers' plans to fit BAS. This includes regulatory actions, such as the introduction of requirements for BAS into UN R 13-H and the mandating of BAS in the EU, as well as non-regulatory actions.

The Australasian New Car Assessment Program (ANCAP) crash tests new vehicles and awards star ratings based on the level of safety provided by vehicles. The highest safety rating is five stars. In February 2011, ANCAP released its Rating Road Map following consultation with key stakeholders, including the Federal Chamber of Automotive Industries (FCAI). The Road Map outlines the requirements to achieve different star ratings over the period 2011 to 2017. Progressively over the life of the Road Map, ANCAP will be introducing new tests, new calculation methods and new safety assist technology requirements. Under the Road Map, BAS has been listed as a mandatory safety assist technology and will be required to achieve a 5-star rating from 2013 and a 4-star rating from 2015 (ANCAP, 2012).

However, even though penetration is increasing with time, there is no guarantee that the expected fitment rates will be reached. There is also no guarantee that, in the absence of an appropriate standard, all BAS systems fitted will be capable of a 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 BAS to the new vehicle fleet in Australia.

Where intervention involves the use of regulation and the decision maker is the Australian Government's Cabinet, the Prime Minister, minister, statutory authority, board or other regulator, Australian Government RIS requirements apply. These are outlined 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).

ADRs 31/02 Brake Systems for Passenger Cars and 35/03 Commercial Vehicle Brake Systems are closely related. Together, these ADRs specify the braking performance of passenger and commercial vehicles, including cars, vans, buses, utes and both light and heavy trucks. However, there are currently no ADRs for BAS.

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 BAS using information campaigns (suasion).

Option 3: Fleet purchasing policies
Only allow vehicles fitted with BAS 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 BAS 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 BAS under the C&C Act (regulatory – mandatory).

Option 6: Mandatory standards under the MVSA
Develop (where applicable) and mandate standards for BAS under the MVSA (regulatory – mandatory).

6 DISCUSSION OF THE OPTIONS

6.1. Option 1: No Intervention

The current level of take-up of BAS in Australia has been achieved without regulation. It appears that industry has recognised the benefits of BAS and is responding by fitting these systems. However, as discussed in Section 3.1, there have been a number of actions that have likely contributed to this current position, including the introduction of requirements for BAS into UN R 13-H, the decision to mandate BAS in the EU and the incorporation of BAS into the ANCAP star rating system under the ANCAP Rating Road Map.

The current voluntary fitment of BAS within the Australian new vehicle fleet is 90 per cent for passenger cars and SUVs and 45 per cent for LCVs (FCAI, 2012).

To determine the proportion of the Australian light vehicle fleet expected to be fitted with BAS into the future, Australian manufacturers and importers were requested in mid-2012 through the FCAI to indicate their future plans for fitting BAS.

The FCAI advised the following planned timing for fitting BAS to the Australian light vehicle fleet:

- Passenger cars and SUVs (MA, MB and MC categories)
    - 99 per cent by 1 January 2018
- LCVs (NA category)
    - > 90 per cent during 2018
    - 99 per cent by 1 January 2020

During the public comment period, the FCAI indicated current and expected future voluntary fitment rates of BAS to LCVs which differ from those advised earlier. The effect of this is 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 new technology and so encourage consumer demand. Campaigns may be carried out by the private sector, the public sector or a combination of the two. 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 3 - 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.

In the case of BAS, a targeted approach would be most suitable, as the target market would consist solely of new vehicle buyers. However, it is recognised that these figures are indicative only, as the campaigns do not relate to BAS or even to automotive related topics more generally. Furthermore, it does not necessarily follow that increased awareness will translate directly into increased sales. 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 BAS. A typical cost for a three month campaign consisting of television, newspaper and magazine advertisements is $5m, which equates to approximately $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 3 - Awareness and Advertising Campaigns. Although not directly related to BAS, this campaign is considered highly relevant as it focused on the promotion of a vehicle safety technology.

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 a campaign could continue to generate the same level of effectiveness 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 business as usual (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 5 provides a summary of the cost and effectiveness of the various campaigns discussed.

Table 5 Estimated cost and effectiveness of various campaign types

Campaign	Estimated cost ($m)	Expected effectiveness
Awareness - broad	6	$5 benefit/$1 spent
Awareness – targeted*	1 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

BAS is currently available as either standard or optional in many new passenger car and SUV models in Australia. It is also available in a number of LCV models. The Government could intervene through fleet purchasing by favouring vehicle models fitted with BAS, and by persuading manufacturers to fit BAS to vehicles currently not fitted with it.

According to the Australasian Fleet Managers Association (AFMA), some 50 per cent of new car purchases in Australia are made through fleet purchase programs (“Fleet safety upgrade to flow on”, 2008). This includes vehicles that are provided as part of remuneration packages as well as those used as part of general fleets. Fleet purchasers wield large market power and can influence manufacturers to make certain features as standard (Koppel et al, 2007).

Further advantages of targeting fleet purchasing include:

- 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 2-3 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).

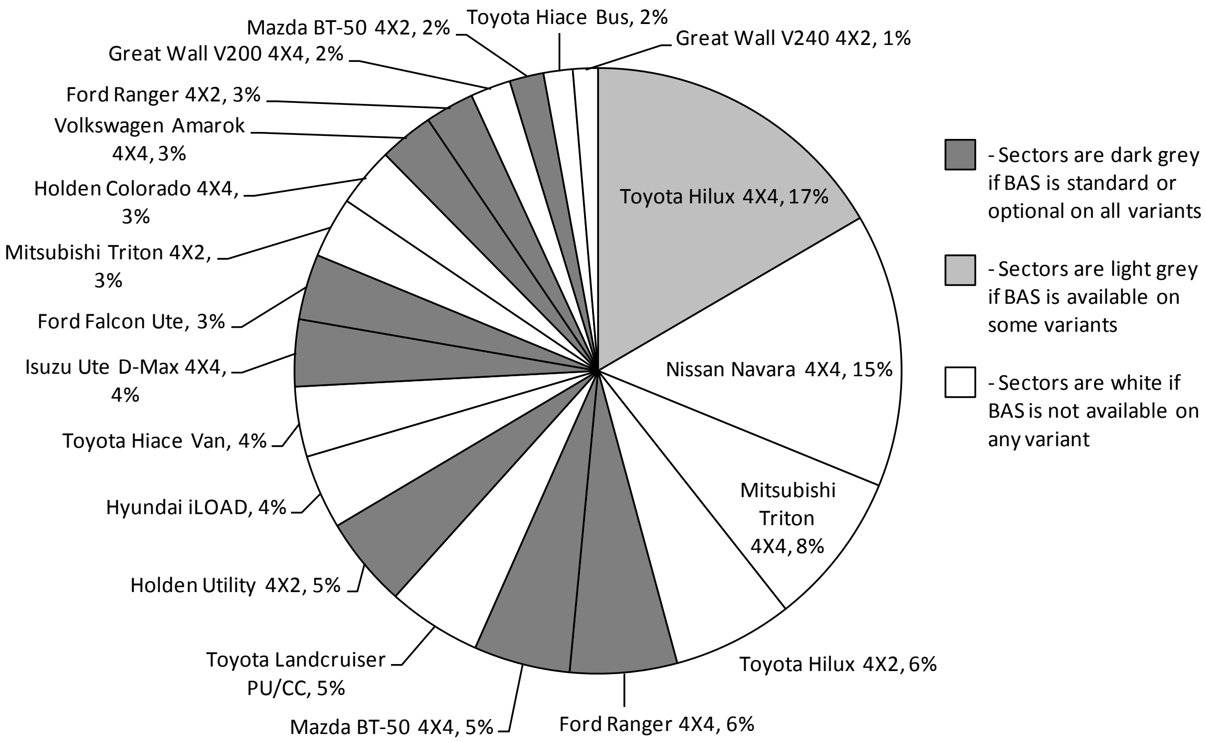
The *National Road Safety Strategy 2011-2020* promotes the adoption of nationally-agreed fleet purchasing policies with practical, evidence-based safety criteria that drive an increase in the safety features required for vehicle purchases (Australian Transport Council, 2011).

In May 2011, the Australian Government introduced requirements for ANCAP star ratings into its fleet purchasing guidelines. As of 1 July 2011, all new Commonwealth fleet passenger vehicles must have a 5-star ANCAP rating while, as of 1 July 2012, LCVs must have a minimum 4-star ANCAP rating, subject to operational requirements (Department of Finance and Deregulation, 2011). Some state and territory governments have adopted similar fleet purchasing polices based on ANCAP star ratings and it is understood others are considering doing so.

As noted in Section 3.1, under the ANCAP Road Map, BAS will be required to achieve a 5-star rating from 2013 and a 4-star rating from 2015. This means that, in effect, BAS will be a requirement for government fleet purchases from 2013 for passenger vehicles and 2015 for LCVs. Therefore, there would be no opportunity to further influence BAS fitment through fleet purchasing policies for passenger cars and SUVs and so this option was not considered further for these vehicles. However, in the case of LCVs, there would be an opportunity to require BAS ahead of when it would otherwise be required under the existing fleet purchasing policy, that is, 2015.

The availability of BAS in the LCV fleet can be approximated by looking at the twenty most popular LCV models in Australia generally. As shown in Figure 3, of the 20 top selling models in the first half of 2012, approximately 53 per cent by sales volume did not have BAS available as standard or optional equipment for any variant within the model range.

Figure 3 Availability of BAS in the 20 most popular LCV models in Australia, 2012



Source: FCAI, 2012; manufacturers' websites

Although around 50 per cent of new vehicle purchases are made through fleet purchase programs, this includes both private and government fleets. In 2011, approximately nine per cent of new LCV purchases were government fleet purchases (VFACTS, 2011). Government fleet purchasing policies could therefore potentially increase the number of LCVs in the market fitted with BAS by at least 53% × 9% = 4.8%.

However, it is expected that the implementation of a government fleet purchasing policy could influence some private fleet purchasers to put in place similar policies, although the extent of this influence is likely to be reduced. For the purposes of the analysis, it was assumed that a government policy could influence around half of private fleet purchasers to implement a similar policy. This means that a government fleet purchasing policy could potentially increase the number of LCVs in the market fitted with BAS by approximately 53% × 30% = 16%. It is expected that vehicles purchased through fleet programs would then flow through the vehicle fleet as ex-fleet vehicles are sold to the public.

The cost of implementing a fleet purchasing policy would be minimal as it would involve a negotiated agreement with fleet managers to select only vehicles equipped with BAS. The costs would be those relating to the negotiation processes (estimated at $50,000 per year) plus any lost opportunity for the fleet in foregoing a vehicle model that may (other than not having BAS) be better placed to meet a particular requirement (this latter aspect was not estimated).

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 to 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 BAS. Of the manufacturers and importers involved with new passenger cars, the Federation of Automotive Product Manufacturers (FAPM) and the FCAI represent 40 per cent and 99 per cent[1] respectively of the total.

In the case of BAS, 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 BAS to all nominated vehicle types by a certain date or to publish and promote information on BAS.

However, any breaches would be difficult to control by the manufacturers' associations or by the Australian Government. Given the sophistication of BAS 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, that is, 99 per cent, 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

[1] The 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.

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 vehicle manufacturers and importers involved with new passenger cars, it would be very difficult for any voluntary code to reach the final 1 per cent.

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 be either voluntary or mandatory as provided for under the C&C Act. There are remedies for those who suffer loss or damage due to a product not meeting prescribed standards.

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

As noted in Section 1.2, UN R 13-H was amended in June 2009 to introduce requirements for BAS. These amendments applied technical requirements to BAS where fitted and provided contracting parties to the 1958 Agreement with the mechanism to mandate the actual fitting of BAS within their own domestic or regional legislation at their discretion. If BAS was to be mandated, the requirements from UN R 13-H could be implemented as annexes to ADRs 31 and 35. UN R 13-H could also be accepted as an alternative means of compliance.

Timing of the regulations

The implementation timing in UN R 13-H is November 2011 for new vehicle models and November 2013 for all vehicle models.

In the EU, European Regulation (EC) No. 78/2009 sets out a phase-in approach as follows:

- Vehicles of category M1 and vehicles of category N1 derived from M1 and not exceeding 2,500 kg Gross Vehicle Mass (GVM) are required to have BAS fitted from:
  - 24 November 2009 for new vehicle types, and
  - 24 February 2011 for all new vehicles.
- Vehicles of category N1 other than those mentioned above are required to have BAS fitted from:
  - 24 February 2015 for new vehicle types, and
  - 24 August 2015 for all new vehicles.

The usual lead time for an ADR change that results in an increase in stringency is around two years.

Scope of the regulations

UN R 13-H applies to vehicles of category M1 and N1 as defined in the Consolidated Resolution on the Construction of Vehicles (ECE, 2011). However, in the case of N1 category vehicles, contracting parties to the 1958 Agreement that apply both Regulations 13 and 13-H recognise approvals to either regulation as equally valid. Therefore, manufacturers may elect to certify N1 vehicles to UN R 13, which has no requirements for BAS.

The UN categories of M1 and N1 translate to Australian categories of MA (passenger cars), MB (passenger vans), MC (four-wheel drives or sports utility vehicles) and NA (light commercial vehicles) (refer Appendix 1 - Vehicle Categories). The NA category consists of passenger car based utilities such as those based on the Holden Commodore or Ford Falcon, as well as light vans such as the Volkswagen Transporter and Hyundai iLoad. It also includes slightly heavier cab-chassis based utilities, such as the Toyota Hilux and Mitsubishi Triton, as well as various campervans, hearses and some ambulances.

Regulation (EC) No. 78/2009 also applies to vehicles of category M1 and N1. In this case, BAS is directly mandated for both categories.

Performance Requirements

UN R 13-H specifies performance requirements for BAS where fitted. Two types of BAS are defined in the regulation, Category A BAS, which detects emergency braking based primarily on the brake pedal force applied by the driver, and Category B BAS, which detects emergency braking based primarily on the brake pedal speed applied by the driver. Either of the two types may be fitted. The assessment of both types of systems involves an initial test to determine the minimum brake pedal force required to achieve full ABS deceleration, as well as the value of this deceleration.

Category A BAS systems must reduce the brake pedal force necessary to achieve full ABS deceleration by between 40 and 80 per cent compared to the pedal force required without the

BAS system in operation. Category B BAS systems must be capable of achieving 85 per cent of the deceleration in full ABS braking when between 50 and 70 per cent of the pedal force required to activate ABS is applied.

For details of the BAS requirements of UN R 13-H refer to Appendix 4 - Overview of United Nations Regulation No. 13-H.

7 ECONOMIC ASPECTS - BENEFIT-COST ANALYSIS

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 indicate 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.

Calculations were started at the current voluntary fitment rate of 90 per cent for passenger cars and SUVs and 45 per cent for LCVs, as initially advised by the FCAI. The results of each option were compared to 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 99 per cent by 2018 for passenger cars and SUVs and 90 per cent by 2018 and 99 per cent by 2020 for LCVs.

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 except for Option 6: Mandatory standards under the MVSA, for which the starting point was set as 2015 (for new models) to 2016 (for all models). The analysis model was then run such that the regulation option remained in force for 15 years from 2015, the phase-in date for new models. This took the analysis to 2029, after which time it was assumed that the regulation would be withdrawn or replaced. Option 2: User information campaigns was also given an end date of 2029. However, Option 3: Fleet purchasing policies was set to run for only two years. This is because BAS will become a requirement in 2015 under the existing fleet purchasing policy and so the benefits and costs for this option were only calculated up to 2015. 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 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 because, generally, the road safety benefits from improving the performance of vehicles are realised gradually as the fleet is first replaced and then the vehicles age and crash over a crash 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 26 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 as well as associated vehicle repair and administration costs. It was assumed that these injuries would remain proportional to vehicle sales into the future.

In the case of vehicle repair costs, it may be argued that a crash involving a pedestrians or cyclist would cause less damage to the vehicle than if the crash had occurred with another vehicle. However, a report by the Bureau of Transport Economics found that vehicle repair costs were correlated to injury severity rather than crash type, with a high degree of post-crash towing found in crashes where injuries were more severe, regardless of the crash type. Post-crash towing in turn was associated through insurance data with higher levels of vehicle damage and so vehicle repair costs (Bureau of Transport Economics, 2000). Vehicle repair costs were determined to be in the order of one quarter of the total cost of an average crash. This value in turn would be reduced by about two thirds if it was assumed that all tow-away crash damage became drive-away damage instead. This equates to around 15 per cent of the total crash costs. Notwithstanding the above, a conservative position was taken in the analysis by reducing the crash costs by this 15 per cent.

A detailed explanation of the method can be found at Appendix 5 - Benefit-Cost Analysis – Methodology.

Vehicle fleet

In the Australian new vehicle market there are a number of vehicles registered each year that fall under the ADR vehicle categories relevant to this analysis. These are detailed in Table 6 below.

Table 6 Details of the new vehicle fleet

<table>
<tr><th>ADR Category</th><th>Description</th><th>Number of Makes</th><th>Number of Models</th><th>Number of Vehicles</th></tr>
<tr><td>MA</td><td>Passenger car</td><td rowspan="3">45</td><td rowspan="2">224</td><td rowspan="2">559,314</td></tr>
<tr><td>MB</td><td>Passenger van</td></tr>
<tr><td>MC</td><td>SUV</td><td>73</td><td>244,136</td></tr>
<tr><td>NA</td><td>Light goods van/ute/SUV</td><td>20</td><td>51</td><td>176,940</td></tr>
</table>

Source: FCAI, 2011

Costs

For the non-regulatory options, the costs were discussed earlier in the RIS and summarised in Table 5. These costs represented the non-regulatory intervention methods (awareness campaigns, advertising campaigns and fleet purchasing policies). The actual fitment, development and (as relevant) regulatory costs are discussed in the following sections.

Source of the costs

BAS is often packaged with other systems such as Electronic Stability Control (ESC), which can make it difficult to isolate costs for BAS alone. In a study towards the development of Regulation (EC) No 78/2009 in the EU, the TRL assumed negligible additional costs for BAS, noting that much of the hardware is shared with ABS/ESC (Lawrence et al, 2006). However, as the costs were to be used for analysis of the Australian market, Australian manufacturers and importers were requested in May 2012 through the FCAI for information on costs related to the implementation of BAS.

Magnitude of the costs

The FCAI provided the following per vehicle costs to implement (i.e. develop, test and install) BAS:

- $100 per vehicle for passenger vehicles (MA, MB and MC categories), which are already required to have an ESC system meeting the requirements of ADR 31/02;
- $400 per vehicle for an ESC system incorporating BAS for LCVs (NA category) that do not have an ESC system; and
- $0 per vehicle (i.e. no additional cost) for LCVs that have an ESC system meeting the requirements of UN R 13-H.

In the case of passenger cars and SUVs, the Australian Government mandated ESC for these vehicles in 2009. This means that all passenger cars and SUVs will have an ESC system meeting ADR 31/02 and the cost to implement BAS in these vehicles would simply be $100 per vehicle. However, in the case of LCVs, the cost of implementing BAS will depend on whether ESC is also mandated for LCVs. This is currently under consideration by the Australian Government through a separate RIS that is subject to the same public comment process: <*http://www.infrastructure.gov.au/roads/motor/design/adr_comment.aspx*>.

For the purposes of the benefit-cost analysis, the minimum and maximum costs to implement BAS in a vehicle were estimated using the above values advised by the FCAI. The minimum cost was based on the scenario that ESC is mandated for LCVs and was estimated at $45 per vehicle. The maximum cost was based on the scenario that ESC is not mandated for LCVs and was estimated at $170. Both of these costs were overall costs for passenger cars, SUVs and LCVs calculated by taking into account the different proportions of these vehicles that would be affected by BAS due to government intervention. Refer to Appendix 6 - Costs of Implementing Brake Assist Systems for detailed calculations of these costs.

There would also be an estimated annual 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. This value was based on Department of Infrastructure and Regional Development experience.

Table 7 provides a summary of the costs for various aspects of fitting BAS to a vehicle. It includes the costs of the non-regulatory options from Table 5.

Table 7 Estimated costs of BAS

Type of cost	Estimated cost ($)	Notes
Implement BAS (min)	45	per vehicle
Implement BAS (max)	170	per vehicle
Information campaigns	3m-18m	per year
Fleet purchasing policies	50,000	per year
Implement and maintain regulation	50,000	per year

Particular costs for each option

There were no costs associated with Option 1: No intervention as this was the BAU case. For the remaining options, there was a basic implementation cost associated with the number of vehicles that would be fitted with BAS due to the particular intervention method (option) used, above and beyond those already fitted voluntarily. For example, if 60 per cent of newly registered vehicles already have BAS fitted, 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.

For each intervention method, this basic implementation cost was added to any other costs related to that particular method.

For Option 2: User information campaigns, there was a basic implementation cost 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)).

For Option 3: Fleet purchasing policies, there was a basic implementation cost as well as a cost of $50,000 per year for the negotiation process.

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

7.1. Benefits and Costs of the Remaining Options

Four scenarios were prepared for estimating the benefits from fitting BAS to light passenger vehicles and LCVs. These represented the four remaining options, Options 1, 2, 3 and 6. The four scenarios were based on the difference between the current voluntary fitment rate of

BAS, and the final expected fitment rate under each particular option. The current voluntary fitment rate is 90 per cent for passenger cars and SUVs and 45 per cent for LCVs.

For Option 1: No intervention, there were no associated benefits or costs as this was the BAU case.

For Option 2: User information campaigns, there was an estimated increase from the Option 1 current fitment rate to a total of 77 per cent fitment rate for an ongoing targeted awareness campaign (Option 2(a)). The campaign would be stopped once the voluntary rate would have otherwise (under the BAU case) reached 77 per cent. Alternatively, through advertising campaigns (Option 2(b)), there was an eight per cent increase on the Option 1 fitment rate in the first year (decreasing by 10 per cent each year thereafter). The campaign would continue until the BAU rate reaches its final level of 99 per cent.

For Option 3: Fleet purchasing policies, there was an added flat 16 per cent increase for LCVs on top of the current voluntary fitment rate. This was capped at 100 per cent.

For Option 6: Mandatory standards under the MVSA, there was a transition from the current voluntary fitment rate to a total of 100 per cent within the 2015 to 2016 period of implementing the regulation.

Effectiveness of Brake Assist Systems

The overall effectiveness of BAS in reducing vulnerable road user trauma was estimated at 8.4 per cent. This was based on research by Lawrence et al (2006) who investigated the effectiveness of BAS in reducing pedestrian and cyclist fatalities and injuries. Refer to Appendix 7 - Effectiveness of Brake Assist Systems for details on how this value was calculated. While the focus of this RIS was on the reduction of vulnerable road user trauma, it must be recognised that BAS would have benefits for any crash type where braking performance is a factor. This would include rear-end and head-on collisions, merging and intersection collisions as well as collisions with obstacles. These benefits are not quantified in this RIS but are discussed further at Appendix 7 - Effectiveness of Brake Assist Systems.

7.2. Results

Appendix 8 - Benefit-Cost Analysis – Details of Results shows the calculations for the benefit-cost analysis. These include the best case, likely case and worst case for each option.

The outputs were constructed by using the minimum cost of $45 for the best case and the maximum cost of $170 for the worst case. The likely case was an average within this range. A discount rate of seven per cent was used for all options.

An overview of the total net benefits, total costs, average Benefit-Cost Ratios (BCRs) and total number of lives and serious injuries saved over the period of analysis for each option is given in Table 8 to Table 10. The distribution of the (undiscounted) benefits and costs over time is shown in Figure 4 to Figure 7. The effect of each option on the BAU fitment rate is shown over time in Figure 8 to Figure 11.

Table 8 Summary of net benefits and total benefits for each option

	Net Benefits ($m)			Total Benefits ($m)		
	Best Case	Likely Case	Worst Case	Best Case	Likely Case	Worst Case
Option 1 No intervention	-	-	-	-	-	-
Option 2(a) Information campaigns – targeted awareness	8	2	-4	22	22	22
Option 2(b) Information campaigns – advertising	-57	-69	-82	50	50	50
Option 3 Fleet policies	3	2	1	4	4	4
Option 6 Regulation	45	30	16	56	56	56

Table 9 Summary of costs and Benefit-Cost Ratios for each option

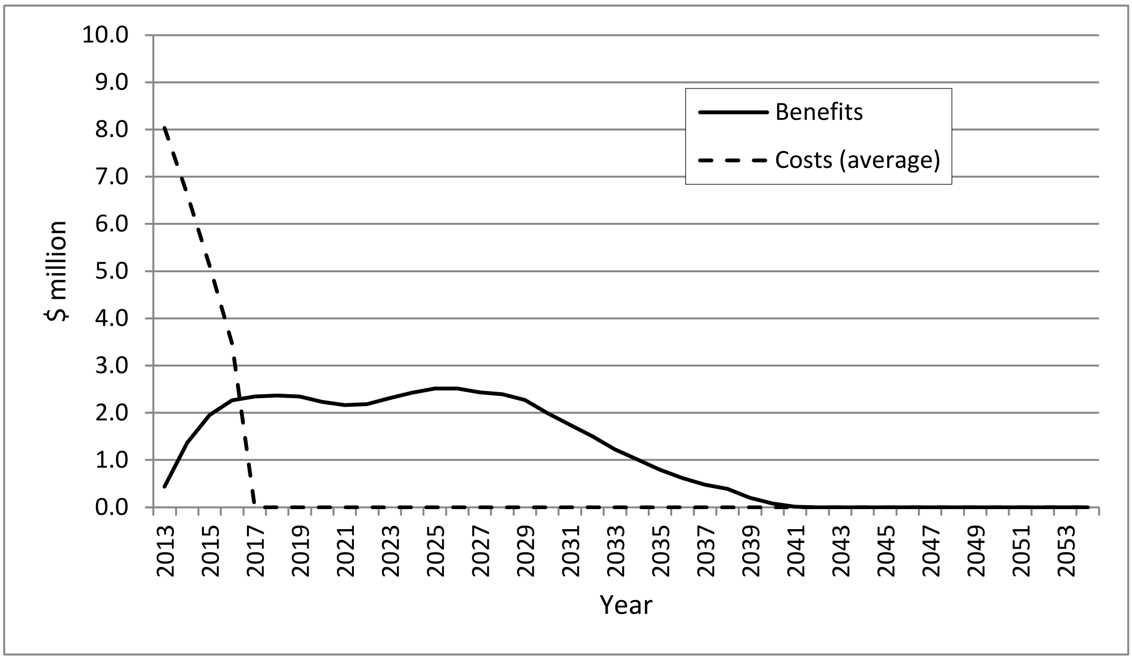
	Costs ($m)			Benefit-Cost Ratio		
	Best Case	Likely Case	Worst Case	Best Case	Likely Case	Worst Case
Option 1 No intervention	-	-	-	-	-	-
Option 2(a) Information campaigns – targeted awareness	14	20	26	1.6	1.2	0.9
Option 2(b) Information campaigns – advertising	106	119	132	0.5	0.4	0.4
Option 3 Fleet policies	1	2	3	4.8	3.1	1.4
Option 6 Regulation	11	25	40	5.1	3.3	1.4

Table 10 Summary of the number of lives and serious injuries saved for each option

	Lives Saved			Serious Injuries Saved		
	Best Case	Likely Case	Worst Case	Best Case	Likely Case	Worst Case
Option 1 No intervention	-	-	-	-	-	-
Option 2(a) Information campaigns – targeted awareness	3	3	3	62	62	62
Option 2(b) Information campaigns – advertising	7	7	7	148	148	148
Option 3 Fleet policies	0	0	0	11	11	11
Option 6 Regulation	10	10	10	217	217	217

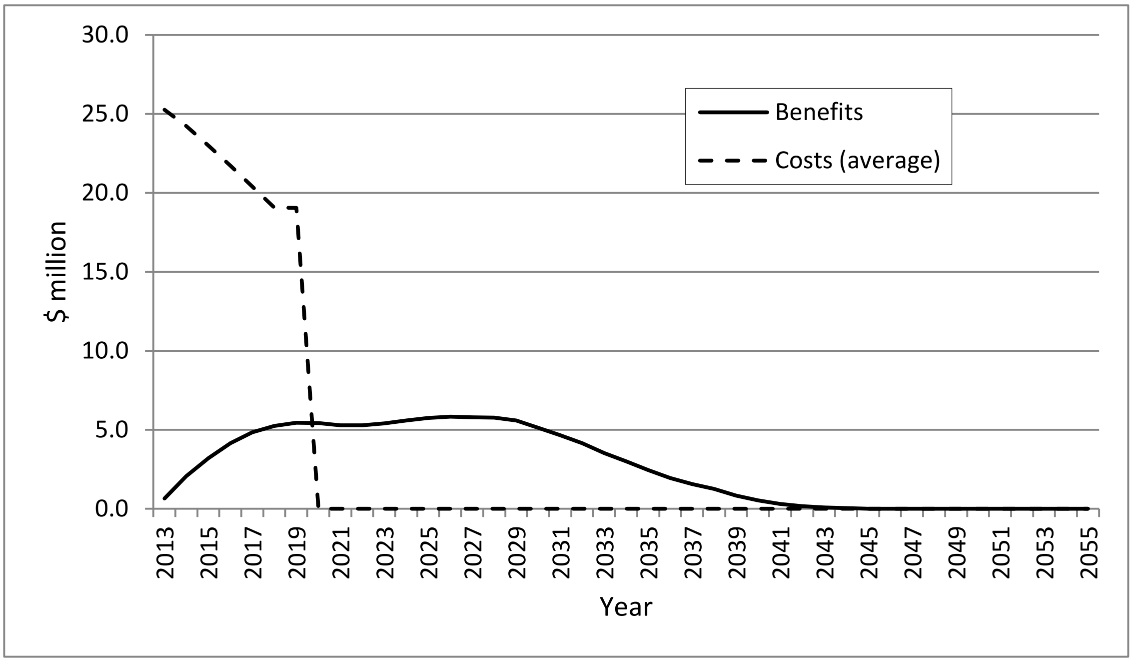
Best Case - 7% discount rate, minimum costs
Likely Case - 7% discount rate, average costs
Worst Case - 7% discount rate, maximum costs

Figure 4 Benefits and Costs of Option 2(a): User information campaigns – awareness



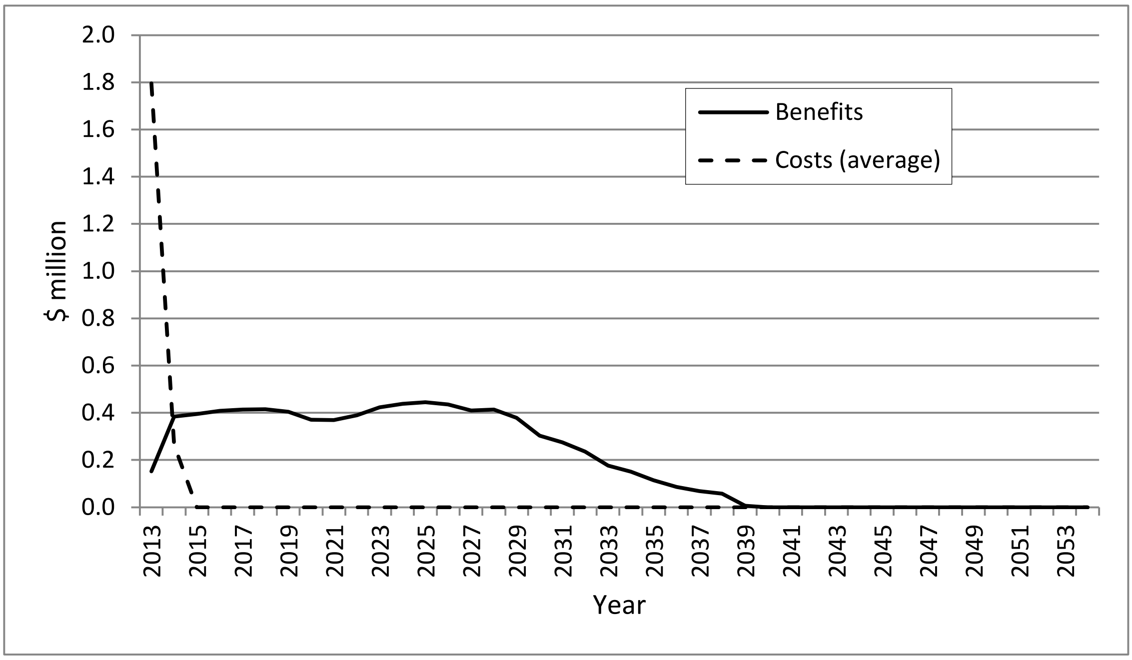
$45-$170 per vehicle cost for developing, testing and installing BAS and $3m per year campaign cost.

Figure 5 Benefits and Costs of Option 2(b): User information campaigns – advertising



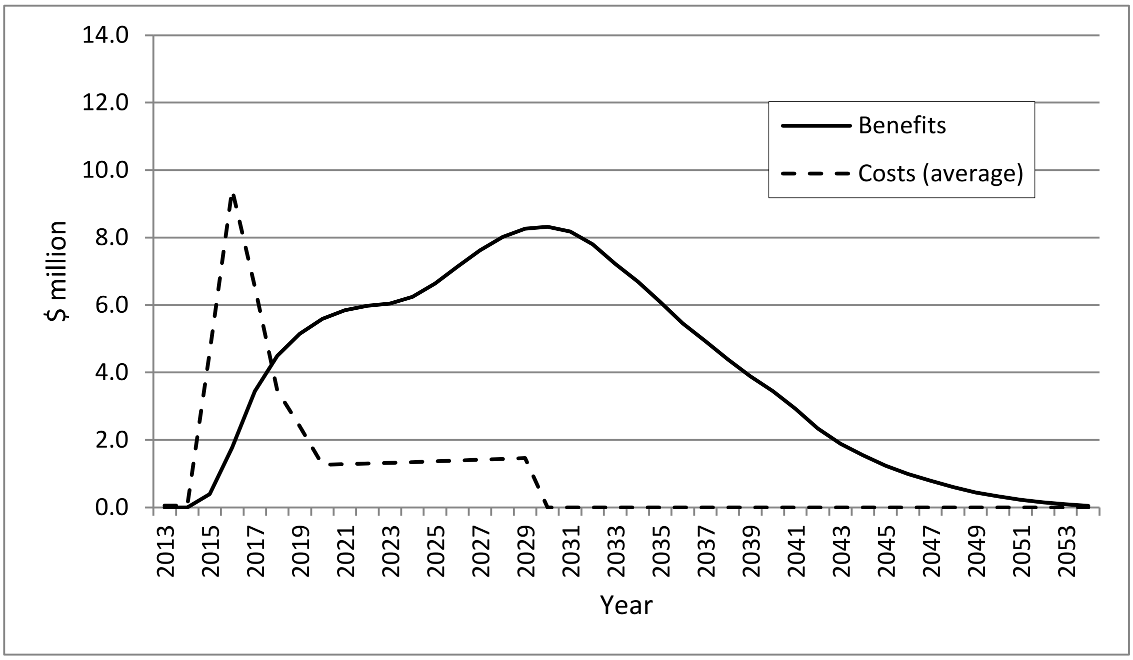
$45-$170 per vehicle cost for developing, testing and installing BAS and $18m per year campaign cost.

Figure 6 Benefits and Costs of Option 3: Fleet purchasing policies



$45-$170 per vehicle cost for developing, testing and installing BAS and $50,000 per year negotiation cost.

Figure 7 Benefits and Costs of Option 6: Mandatory standards under the MVSA



$45-$170 per vehicle cost for developing, testing and installing BAS and $50,000 per year regulation maintenance cost.

Figure 8 Comparison of the expected fitment rate of Option 1: No intervention with Option 2(a): User information campaigns – awareness

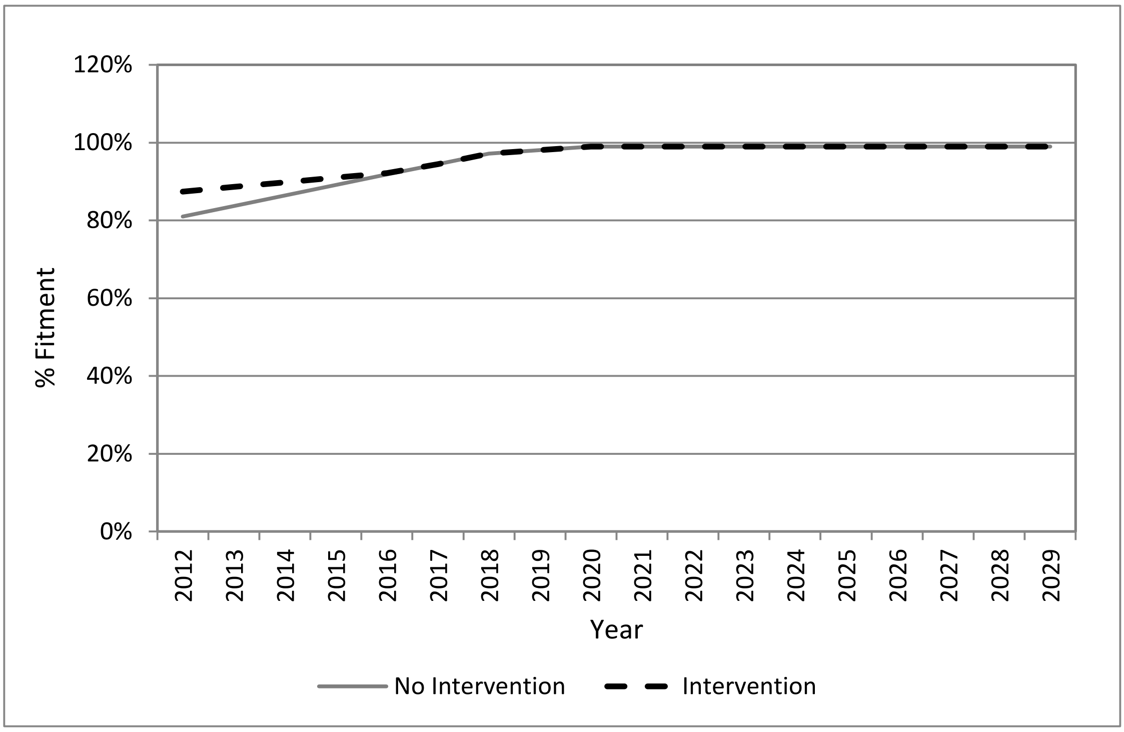


Figure 9 Comparison of the expected fitment rate of Option 1: No intervention with Option 2(b): User information campaigns – advertising

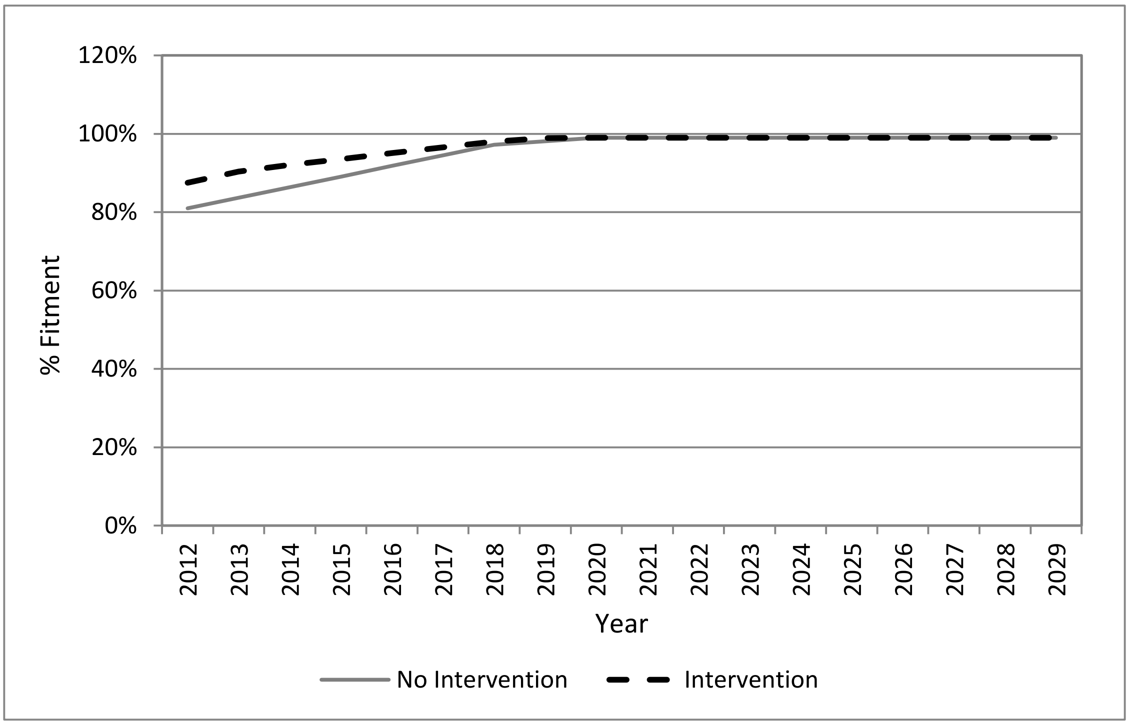


Figure 10 Comparison of the expected fitment rate of Option 1: No intervention with Option 3: Fleet purchasing policies

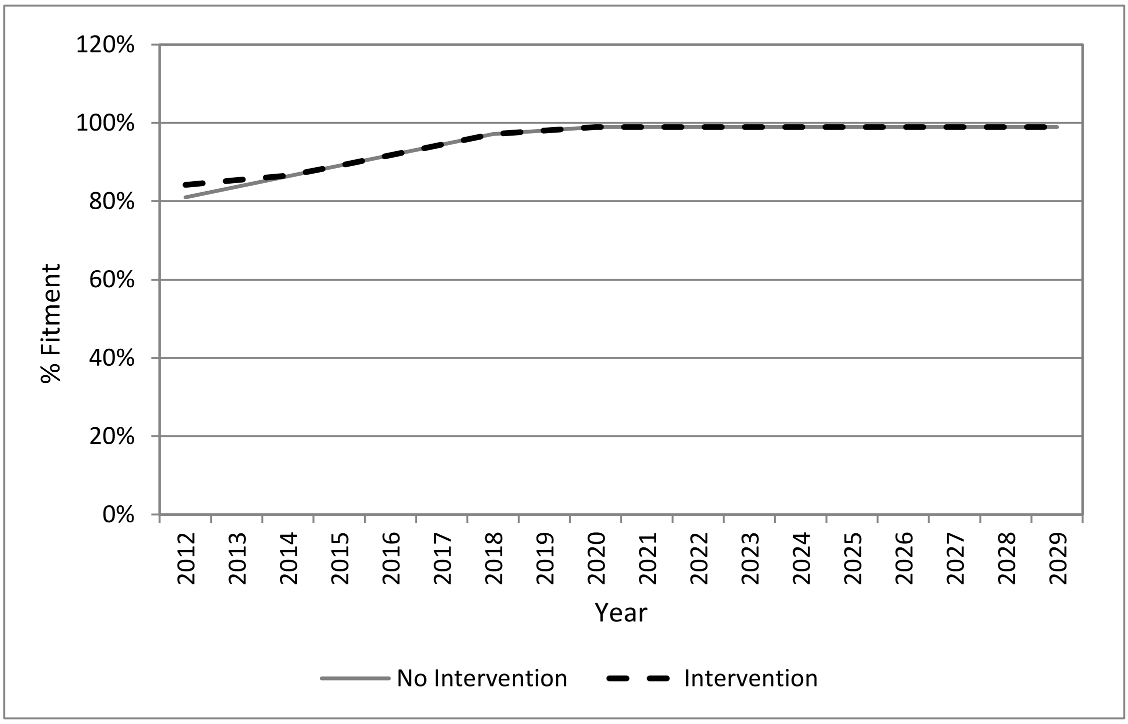
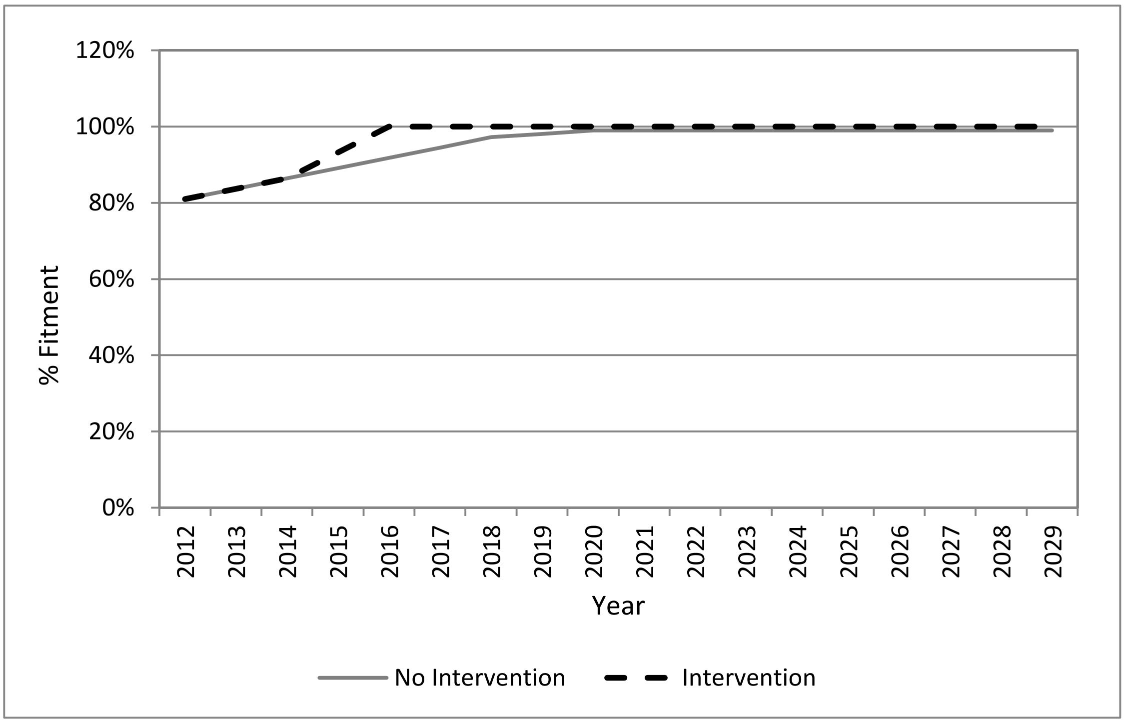


Figure 11 Comparison of the expected fitment rate of Option 1: No intervention with Option 6: Mandatory standards under the MVSA



7.3. Summary of the Results

Option 2(a): User information campaigns – awareness, Option 3: Fleet purchasing policies, and Option 6: Mandatory standards under the MVSA, all gave positive net benefits for the best, likely and worst cases. Of these options, Option 6 gave the highest net benefits, followed by Option 2(a) and Option 3. The net benefits for Option 2(b): User information campaigns – advertising were negative.

The BCRs were above one for options 2(a), 3 and 6, ranging from 1.2 (Option 2(a)) to 3.3 (Option 6) for the likely case. This indicates that these options would provide more benefits through reduced road trauma than they would cost to implement. The BCR for Option 2(b) was 0.4.

In terms of costs over the assumed 15 year life of regulation, Option 2(b) was the most expensive to implement at around $119m (including costs to business and government). Option 6 was second at $25m, followed by Option 2(a) at $20m. Option 3 was the cheapest at $2m.

In terms of the number of lives and serious injuries saved, Option 6 was the highest at 10 lives and 217 serious injuries saved over the assumed 15 year life of regulation. Option 2(b) was next at 7 lives and 148 serious injuries saved, while the lives and serious injuries saved under the remaining two options were significantly lower.

Option 1 was the BAU case and so had no allocated benefits or costs associated with it. It was assumed that the voluntary fitment rate would reach that advised by the FCAI, that is, 99 per cent for passenger cars and SUVs by 2018 and 90 per cent during 2018 and 99 per cent by 2020 for LCVs. After that it was assumed the rate would stay constant for the foreseeable future. This trend can be observed in the No intervention series in Figure 8 to Figure 11. Each of the remaining options affected the Option 1 in a different way.

Under Option 2(a): User information campaigns – awareness it was assumed that an ongoing awareness campaign, costing $3m per year, would bring the fitment rate up to 77 per cent, but do no more than maintain this level in the long term. In the case of passenger cars and SUVs, the voluntary fitment rate already exceeds 77 per cent and so this option would have no effect on these vehicles. For LCVs, Figure 8 shows that for the first five years the fitment rate is raised to 77 per cent. After five years, the LCV rate has also gone beyond 77 per cent under the BAU scenario and so the campaign stops. Figure 4 shows the costs peaking in the first year, then reducing to zero when then the BAU fitment rate for LCVs exceeds 77 per cent and the campaign ends. The benefits then flow on from that batch of vehicles fitted with BAS moving through their life cycle.

Under Option 2(b): User information campaigns – advertising it was assumed that an advertising campaign, costing $18m per year, would increase the fitment rate by 8 per cent during its first year. The effectiveness of the campaign would then decrease by 10 per cent each year thereafter. Figure 9 shows that for the first seven years of the campaign, the BAU fitment rate is raised by a smaller and smaller percentage until it reaches 99 per cent in 2019. By 2020, the BAU rates for passenger cars and SUVs as well as for LCVs have both exceeded 99 per cent and so the campaign ends.

Figure 5 shows the costs declining over the first eight years as the campaign increases the fitment rate by a smaller and smaller percentage. The costs briefly level off as the passenger car and SUV BAU rate reaches its final level of 99 per cent in 2018, and then decline to zero in 2020 when the LCV BAU fitment rate also reaches 99 per cent and the campaign finishes. The benefits then flow on from that batch of BAS fitted vehicles moving through their life cycle.

Under Option 3: Fleet purchasing policies a flat increase approach was used. It was assumed that initial fleet negotiations would increase the initial fitment rate by 16 per cent for LCVs. This reflects the potential gains identified earlier in the RIS. As noted in Section 7, this option would only continue up until 2015, at which point BAS will become a requirement under the existing fleet purchasing policy. This is why the government costs are very low at only $90,000. The benefits gained are also relatively low. Figure 6 shows the costs peaking in the first year and then reducing to zero in 2015 as the fleet negotiations finish. The benefits flow on from that batch of vehicles fitted with BAS moving through their life cycle.

Under Option 6: Mandatory standards under the MVSA there is a transition 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, regulation is ongoing and forces compliance to 100 per cent. This can be seen in Figure 11. It can also be seen in Figure 7 that the costs rise steeply 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 in 2018 when the BAU fitment rate for passenger cars and SUVs reaches 99 per cent followed by a second smaller drop when the LCV BAU fitment rate reaches 99 per cent two years later. The costs remain steady from this point on, with only a gradual rise in line with the increasing fleet size. The benefits will continue to accrue as long as the BAU level would have otherwise have remained below the level achieved through intervention, in this case 100 per cent.

7.4. Sensitivity Analysis

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

The cost to implement (i.e. develop, test and install) BAS was considered to be reasonably accurate as it was provided through the relevant industry and government sources. The possible range of costs for implementing BAS were considered in the main benefit-cost analysis through the best, likely and worst case scenarios.

The main inputs that could affect the options were the effectiveness, the crash rate and the discount rate of the benefits and costs. A sensitivity analysis was undertaken on each of these variables as presented below for the likely case (i.e. average costs). Detailed results of the sensitivity tests can be found at Appendix 9 - Benefit- Cost Analysis – Sensitivities.

Effectiveness

The effectiveness of BAS was considered to be reasonably accurate, as it was taken from a comprehensive study. However, to account for any uncertainty, the effectiveness of 8.4 per cent was varied by ±20 per cent. As seen in Table 11, the net benefits are positive even when the effectiveness is reduced by 20 per cent.

Table 11 Impact of changes to effectiveness on the likely case net benefits and BCR

Scenario	Net Benefits ($m)	Benefit-Cost Ratio
Low effectiveness (6.7%)	19	2.6
Base case effectiveness (8.4%)	30	3.3
High effectiveness (10.1%)	42	3.9

Crash rate

As noted earlier in the RIS, it was assumed that pedestrian and cyclist crash rate would remain constant into the future. This is considered a reasonable assumption given the recent rise in pedestrian fatalities and increasing promotion of walking and cycling as sustainable modes of transport. Notwithstanding this, a sensitivity test was conducted with the crash rate reduced by 20 per cent and also by 50 per cent. As shown in Table 12, the net benefits are positive under both scenarios.

Table 12 Impact of changes to the crash rate on the likely case net benefits and BCR

Scenario	Net Benefits ($m)	Benefit-Cost Ratio
Base case crash rate	30	3.3
Crash rate reduced by 20%	19	2.6
Crash rate reduced by 50%	3	1.6

Discount rate

A sensitivity test was also conducted using discount rates of 3 and 10 per cent. Table 13 shows that the net benefits are positive under all three discount rates.

Table 13 Impact of changes to the discount rate on the likely case net benefits and BCR

Scenario	Net Benefits ($m)	Benefit-Cost Ratio
Low discount rate (3%)	66	4.5
Base case discount rate (7%)	30	3.3
High discount rate (10%)	17	2.7

Post-consultation sensitivity analysis

During the public comment period, the FCAI requested an extended implementation timetable of 2015 for new models and 2017 for all models. The FCAI also indicated current and expected future voluntary fitment rates of BAS to LCVs that were higher than those it had provided 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. The results are shown in Table 14 and Table 15. 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 net benefit of Option 6 under the increased voluntary fitment rate is still higher than the net benefit of the other options under the standard voluntary fitment rate. Therefore Option 6 remains the highest expected net benefit under the increased voluntary fitment rate scenario. The delayed implementation date only applies to Option 6 and will reduce the expected net benefit. Under this scenario, the net benefit is still positive and greater than the net benefits of the other options considered earlier in the RIS.

Table 14 Impact of changes to the implementation timetable on the likely case net benefits and BCR

Scenario	Net Benefits ($m)	Benefit-Cost Ratio
Base case implementation dates (2015 new models, 2016 all models)	30	3.3
Alternative implementation dates (2015 new models, 2017 all models)	27	3.2

Table 15 Impact of changes to the BAU fitment rate on the likely case net benefits and BCR

Scenario	Net Benefits ($m)	Benefit-Cost Ratio
Base case BAU fitment rates (45% - 2012, 90% - 2018, 99% - 2020)	30	3.3
Alternative BAU fitment rates (70% - current, 90% - end of 2013*, 100% - 2018**)	18	3.2

* modelled as beginning of 2014

** i.e. 99% given that the FCAI covers most but not all vehicle manufacturers and importers

Assumptions

A number of assumptions were made in the benefit-cost analysis. Details of these 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 BAS, 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 the topic of this RIS include the:

- 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

There were four options that were considered feasible: 1) No intervention, 2) User information campaigns, 3) Fleet purchasing policies and 6) Mandatory standards (internationally based) under the MVSA. This section looks at the impact of each option in terms of quantifying the expected benefits and costs, and identifies how these would be distributed within the community. This is discussed below and summarised in Table 16 on page 40.

Option 1: No intervention

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

Option 2: User 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 (Option 1). The fitment of BAS 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 fitted with BAS due to the user information campaign.

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 BAS due to the information campaign, and who avoid or minimise the effects of a crash due to the action of BAS.

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 BAS due to the user information campaign, and who avoid or minimise the effects of a crash due to the action of BAS.

This option would add between $22m and $50m 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 and consumers (over and above that of Option 1) as a result of additional design, fitment and testing costs for vehicles that are sold fitted with

BAS due to the user information campaign. This would add between $4m and $35m over and above Option 1.

Governments

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

Option 3: Fleet purchasing policies

As this option involves direct intervention to change demand in the market place, the benefits and costs are those that would occur on a voluntary basis, over and above those in the BAU case. The fitment of BAS would remain a commercial decision within this changed environment.

<u>Benefits</u>

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 BAS due to fleet purchasing policies.

Consumers

There would be a direct benefit to fleet 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 fleet vehicle fitted with BAS due to fleet purchasing policies, and who avoid or minimise the effects of a crash due to the action of BAS.

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 BAS due to fleet purchasing policies, and who avoid or minimise the effects of a crash due to the action of BAS.

This option would add $4m over and above Option 1. This benefit would be shared with governments and so the community.

<u>Costs</u>

Business/consumers

There would be a direct cost to business/fleet owners (over and above that of Option 1) as a result of additional design, fitment and testing costs for vehicles that are sold fitted with BAS due to fleet purchasing policies. This would add between $0.8m and $3m over and above Option 1. This cost would be passed on to the consumer.

Governments

There would be a cost to governments for administering fleet purchasing policies that require the purchase of vehicles fitted with BAS. This is estimated at $0.1m.

Option 6: Mandatory standards under the MVSA

As this option involves direct intervention to change the specification of the product supplied to the market place, the benefits and costs are those that would occur on a mandatory basis, over and above those in the BAU case. The fitment of BAS 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 on vehicles that are sold fitted with BAS 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 BAS due to the Australian Government mandating standards, and who avoid or minimise the effects of a crash due to the action of BAS.

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 BAS due to the Australian Government mandating standards, and who avoid or minimise the effects of a crash due to the action of BAS.

This would add $56m 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 that of Option 1) as a result of additional design, fitment and testing costs for vehicles that are sold fitted with BAS due to the Australian Government mandating standards. This would add between $10m and $39m over and above Option 1. This cost would be passed on to the consumer.

Governments

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

Table 16 Summary of the benefits and costs of BAS over a 42-year period of analysis

Affected Parties	**Option 1** **No intervention**		**Option 2** **User information campaigns**		**Option 3** **Fleet purchasing policies**		**Option 6** **Mandatory standards under the MVSA**	
	Benefits	**Costs**	**Benefits**	**Costs**	**Benefits**	**Costs**	**Benefits**	**Costs**
Business	n/a	n/a	None	Increased costs of vehicles $4m - $35m	None	Increased costs of vehicles $0.8m - $3m	None	Increased costs of vehicles $10m - $39m
Consumers	n/a		Reduced road trauma $22m - $50m		Reduced road trauma $4m		Reduced road trauma $56m	
Government		n/a		Cost of funding and running campaigns $10m - $97m		Cost of administering fleet purchasing policies $0.1m		Cost of implementing and administering regulations $0.5m
Lives Saved	n/a		3-7		0		10	
BCR	n/a		0.4-1.6		1.4-4.8		1.4-5.1	

Note: Total benefits are shown. The Summary in Appendix 8 - Benefit-Cost Analysis – Details of Results shows the split between Business/Consumers and Government costs.

9 DISCUSSION

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

- Option 1: No intervention;
- Option 2: User information campaigns;
- Option 3: Fleet purchasing policies; 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 by a significant margin at $30m for the likely case, 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 2(a): User information campaigns – awareness and Option 3: Fleet purchasing policies also had positive net benefits, both at $2m for the likely case. Option 2(b): User information campaigns – advertising resulted in negative net benefits of -$69m. As noted in Section 6.2, the quantification of Option 2(b) 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 had the highest BCR at a likely value of 3.3. Option 3 had the next highest BCR at a likely value of 3.1, followed by Option 2(a) with a BCR of 1.2 for the likely case. Option 2(b) had a BCR of less than one at 0.4. The high BCR of Option 3 reflects the relatively low cost needed to negotiate a fleet purchasing agreement.

9.3. Lives Saved

Option 6 had the highest number of lives and serious injuries saved at 10 and 217 respectively over the assumed 15 year life of regulation. This was followed by Option 2(b) with 7 lives and 148 serious injuries saved. The lives and serious injuries saved under the remaining two options were significantly lower, with 3 lives and 62 serious injuries saved under Option 2(a) and 0 lives and 11 serious injuries saved under Option 3.

9.4. The Case for Intervention

This RIS has identified a current road safety problem for Australia. Each year, over 200 fatalities and many additional injuries occur due to collisions between vehicles and pedestrians or cyclists. Research has shown that BAS has the potential to reduce these fatalities and injuries by around 8 per cent.

The voluntary fitment rate of BAS is increasing, with industry predicting it will reach

99 per cent by 2018 for passenger cars and SUVs and 90 per cent by 2018 and 99 per cent by 2020 for LCVs. While examining the case for government intervention may seem counter intuitive given the increasing voluntary fitment of the technology, the benefit-cost analysis shows that intervention would still provide significant benefits in the presence of the high fitment rates predicted by industry. Option 6: Mandatory standards under the MVSA has the potential to offer positive net benefits of $30m over a 15-year regulation period, saving 10 lives as well as over 200 serious injuries. This demonstrates the potential that the provision of BAS through government intervention has to reduce vulnerable road user trauma. While Option 2: User information campaigns and Option 3: Fleet purchasing policies would also offer positive net benefits, these would be less than those offered by Option 6.

Option 6 offers the further advantage of being the option that is likely to result in the highest ongoing fitment rate of BAS in new vehicles. There would be no guarantee that non-regulatory options would deliver an enduring result, or that the BAU fitment rates predicted by industry would be reached and then maintained. Factors such as changing economic pressures or the entry of new players into the market could cause a shift away from the current move to provide BAS equipped vehicles. By setting uniform performance requirements for BAS, Option 6 would also ensure that all BAS systems would have a minimum level of performance. In the absence of intervention, or even with intervention through non-regulatory means, this would not be guaranteed.

It is likely that measures such as those proposed in Options 2 and 3 have already contributed to the current level of take-up of BAS. These could continue in one form or another regardless of the recommendations of this RIS. It is important to note that the benefits of Options 2 and 3 are less assured than those of Option 6 and so would likely lie somewhere in between the BAU case and the calculated values. 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 respond to any increase in demand.

It is possible that the number of pedestrian and cyclist fatalities and injuries could decline, thereby reducing the net benefits of the options. Although this is considered unlikely given the recent rise in pedestrian fatalities and increasing promotion of walking and cycling as active modes of transport, a sensitivity analysis was performed using a reduced crash rate. Under this scenario, Option 6 still provided positive net benefits for the likely case.

9.5. Recommendation

Option 6: Mandatory standards under the MVSA is the recommended option. This option provides the highest net benefits of the options considered and has potential to provide significant benefits even in the presence of high voluntary fitment rates, making it an effective and robust option. It is also likely to be the option that results in the highest ongoing fitment rate of BAS in new vehicles, thereby maximising the benefits that BAS has to offer. Given the relatively low cost of BAS and the fact that it would only be applied to a small part of the fleet (due to the voluntary fitment rate), this is a very low cost option that offers significant benefits for vulnerable road users.

9.6. Impacts

Business/Consumers

The four 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: Mandatory standards under the MVSA involves regulation based development and testing with forced compliance of all applicable models. Manufacturers or those importing from the European Union are most likely to be already compliant or able to comply easily. Vehicles imported from the EU represent around 30 per cent of Australia's total imports of passenger 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 Australian Design Rules (ADRs). There are costs incurred in operating this service. A cost recovery model is used and so these costs are recovered from business.

State and territory governments would generally need to review in-service regulations and the effect that a safety technology would have on allowable vehicle modifications, given the principle of continued compliance to the ADRs. However, the types of modifications that would affect BAS would not typically be carried out in the aftermarket.

9.7. Timing of the Preferred Option

If Option 6 was to be adopted, it was noted earlier that the recommended requirements for BAS would be those contained in the international standard UN R 13-H. As a contracting party to the 1958 Agreement, it is Australia's policy to harmonise the ADRs with the international regulations adopted by the UN under the 1958 Agreement, except where it is necessary to take account of unique Australian conditions. This includes aligning with internationally agreed timing under the 1958 Agreement as much as possible. The harmonisation of the ADRs with the UN regulations is important because approximately 85 per cent of motor vehicles supplied to the Australian market are imported by global vehicle manufacturers, while vehicle sales in Australia represent less than one per cent of the total world production of motor vehicles. This means the model range available to consumers in Australia is sensitive to any unique Australian requirements. However, in the case of UN R 13-H, the new models implementation date of November 2011 has already passed.

In the EU, European Regulation (EC) No. 78/2009 sets out a phase-in approach. Vehicles of category M1 and vehicles of category N1 derived from M1 and not exceeding 2,500 kg GVM are required to have BAS fitted from 24 November 2009 for new models and 24 February 2011 for new vehicles. For other N1 vehicles the dates are 24 February 2015 for new models and 24 August 2015 for all new vehicles.

Given that the UN timing has already passed, the proposed implementation timetable for BAS is 2015 for new models and 2016 for all models. This timing is considered appropriate as BAS is well established and there is already an international regulation that sets out technical specifications where fitted. This timing would meet the typical lead time for an ADR change resulting in an increase in stringency and would also align with the final phase-in date in the EU as well as the proposed timing for the implementation of ESC (which BAS is likely to be packaged with) in LCVs, which is also currently under consideration.

However, industry has noted that, although the technology is well established, it may need some redesigning to meet the regulation, particularly in the case of ESC, and that there is a longer 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 6.6, both UN R 13-H and Regulation (EC) No. 78/2009 apply to vehicles of category M1 and N1. This translates to the Australian categories of MA (passenger cars), MB (passenger vans), MC (four-wheel drives or Sports Utility Vehicles) and NA (light commercial vehicles). It is recommended that this be adopted for the scope of any Australian regulation.

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 BAS is an initiative of the *National Road Safety Strategy 2011-2020*. 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 BAS. 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 business 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. These comments are discussed further below.

Discussion of responses

As noted above, the proposal to mandate BAS for light passenger vehicles and LCVs was discussed a number of times at SVSEG and TLG meetings where it was broadly supported. During the public comment period, additional comments were received from the AAA, FCAI and the Victorian Government (VicRoads).

The AAA and VicRoads strongly supported the introduction of mandatory standards under the MVSA to require BAS on all light vehicles (Option 6). The AAA also noted its support for the proposed timing of 2015 for new models and 2016 for all models.

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 BAS for passenger cars, SUVs and LCVs. Compared with the BAU case, this option would provide net benefits of $30m, saving 10 lives and over 200 serious injuries over a 15-year regulation period.

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, and is also compatible with the timing for the introduction of BAS requirements in the EU. 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 a well-established one like BAS. 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 BAS 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 BAS 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. 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 BAS 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 reported in Section 7.4. Under both scenarios, the net benefits remained positive and higher than the net benefits of the other options considered feasible. Therefore, Option 6 remains the recommended option.

11 CONCLUSION AND RECOMMENDED OPTION

Studies have shown that BAS has significant potential to reduce the incidence and severity of collisions between vehicles and pedestrians or cyclists. These collisions account for over 200 fatalities and many additional injuries that occur each year in Australia.

The Australian market is responding, with the current fitment rate of BAS at 90 per cent for passenger cars and SUVs and 45 per cent for LCVs. In 2012, the Australian vehicle industry advised it expected this to reach 99 per cent by 2018 for passenger cars and SUVs and 90 per cent by 2018 and 99 per cent by 2020 for LCVs.

This RIS examined the case for Australian Government intervention in order to complement the current voluntary fitment rate of BAS to new passenger cars, SUVs and LCVs in Australia. Under the ADRs, these vehicles are classified as MA, MB, MC and NA categories. It found that, while the voluntary fitment is already high and increasing, there are a number of options that could provide some benefit to the community. Both an information campaign and government fleet purchasing policies would be expected to produce a very small net benefit. However, Option 6: Mandatory standards under the MVSA is expected to offer the largest positive net benefits of $30m over a 15-year regulation period, saving 10 lives and as well as over 200 serious injuries.

Option 6 involves regulation based development and testing with forced compliance of all applicable models. Manufacturers or those importing from the European Union are most likely to be already compliant or able to comply easily. Vehicles imported from the EU represent around 30 per cent of Australia's total imports of passenger 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 BAS even as the voluntary rate approaches 100 per cent. As the technology is relatively low cost and would only be applied to a small part of the fleet (due to the high voluntary fitment rate), it is a low cost option that offers some additional benefit to the community by reducing road trauma.

Therefore, the adoption of mandatory standards under the MVSA is the recommended option. It is recommended that the requirements contained in UN R 13-H be implemented as annexes to ADRs 31 and 35 and applied to the Australian vehicle categories of MA (passenger cars), MB (passenger vans), MC (four-wheel drives or SUVs) and NA (LCVs). The proposed implementation timetable is 2015 for new models and 2016 for all models. This timing would meet the usual lead time for an ADR change resulting in an increase in stringency and align with the final phase-in date in the EU. However, 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.

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 - 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 goods 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 2 - RATIO OF INJURIES

Table 17 Pedestrian and cyclist casualties from crashes involving light passenger and light commercial vehicles by injury type, Victoria: 2000 to 2010

Injury Type	Pedestrian	(as % of total)	Cyclist	(as % of total)	Total (pedestrian and cyclist)
Fatal	463	91%	48	9%	511
Serious	6535	66%	3330	34%	9865
Minor	8115	52%	7543	48%	15658
All injuries	15113	58%	10921	42%	26034

Source: VicRoads CrashStats database

The ratio between injury types was calculated from the data in Table 17. For example, the ratio between pedestrian fatalities and serious injuries was calculated as 6535/463 = 14.1.

Table 18 Ratio between injury types

	Pedestrian	Cyclist	Total (pedestrian and cyclist)
Fatal	1	1	1
Serious	14.1	69.4	19.3
Minor	17.5	157.1	30.6

The ratios shown in Table 18 are used to later to determine the overall effectiveness of BAS in reducing vulnerable road user trauma. Refer to Appendix 7 - Effectiveness of Brake Assist Systems.

APPENDIX 3 - AWARENESS AND ADVERTISING CAMPAIGNS

Awareness Campaigns

Providing accurate costings 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 a 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 a BAS 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 a vehicle safety technology, in this case 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. Although not directly related to BAS, this campaign is considered relevant as it focused on the promotion of a vehicle safety technology.

APPENDIX 4 - OVERVIEW OF UNITED NATIONS REGULATION NO. 13-H

The following is an overview of the BAS requirements of UN Regulation No. 13-H. For the full requirements refer to the UNECE website at: <*http://www.unece.org/trans/main/wp29/wp29regs.html*>.

UN R 13-H specifies performance requirements for BAS where fitted and, through the transitional provisions, provides contracting parties to the 1958 Agreement with the mechanism to mandate the fitting of BAS in their territories. It applies to vehicles of categories M_1 and N_1 and contains requirements for both Category A BAS, which detects an emergency braking condition based primarily on the brake pedal force applied by the driver, and Category B BAS, which detects an emergency braking condition based primarily on the brake pedal speed applied by the driver.

<u>General Performance Characteristics</u>

Category A BAS

When an emergency condition has been sensed by a relative high pedal force, the additional pedal force to cause full cycling of the ABS shall be reduced compared to the pedal force required without the BAS system in operation.

Category B BAS

When an emergency condition has been sensed, at least by a very fast application of the pedal, the BAS system shall raise the pressure to deliver the maximum achievable braking rate or cause full cycling of the ABS.

<u>General Test Requirements</u>

Brake pedal force, vehicle velocity, vehicle deceleration, brake temperature, brake pressure (where applicable) and brake pedal speed shall be measured by means of appropriate transducers. Accuracy, operating ranges, filtering techniques, data processing and other requirements are described in ISO Standard 150371-1:2006.

Test Conditions

The vehicle shall be unladen, though there may be a second person, additional to the driver, on the front seat who is responsible for noting the results of the tests.

Braking tests shall be carried out on a dry surface affording good adhesion.

Test Method

Tests shall be carried out from a test speed of 100 ± 2 km/h. The vehicle shall be driven at the test speed in a straight line.

The average temperature of the service brakes on the hottest axle of the vehicle must be between 65 and 100°C prior to any brake application.

Reference Test

An initial test shall be carried out to determine a reference value for vehicle deceleration which indicates that ABS is fully cycling (denoted as a_{ABS}), and for the minimum brake pedal force required to achieve that deceleration value (F_{ABS}).

The method requires five tests in which the brake pedal is applied slowly with a constant increase of deceleration (without activating the BAS in the case of category B systems) until the ABS is activated. During these tests, the full deceleration must be reached within the timeframe of 2.0 ± 0.5 seconds. Once full deceleration has been achieved, the brake pedal shall be operated so that the ABS continues fully cycling.

To determine F_{ABS} and a_{ABS}, the five tests are averaged and compared to the ultimate deceleration achieved by the vehicle.

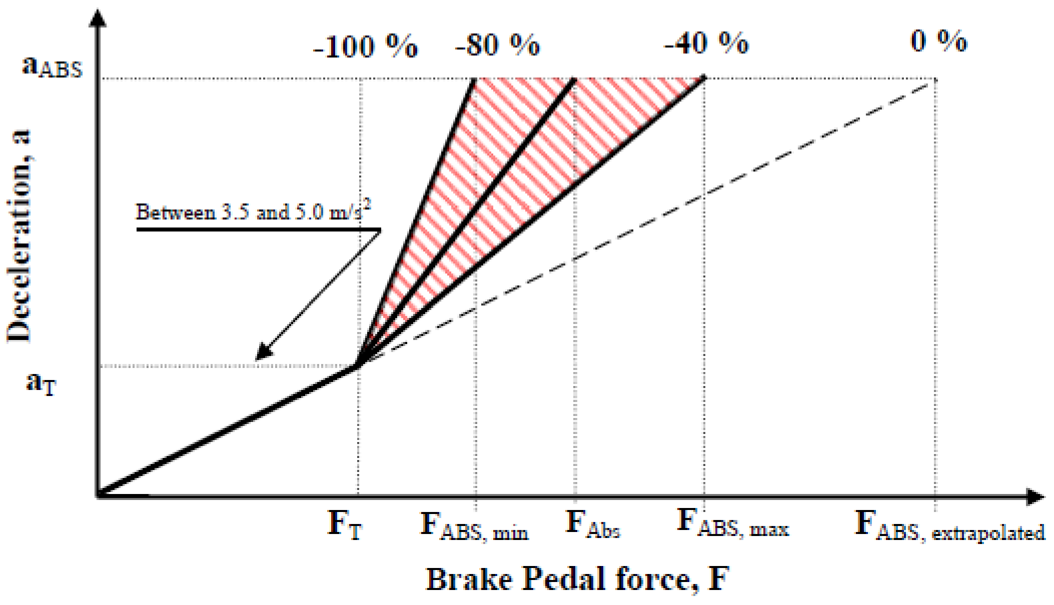
Assessment of the Presence of Category A BAS

A test shall be conducted to check for the activation of BAS. The vehicle shall be brought to a stop from the test speed under simulated emergency braking. Once an emergency braking condition has been detected, there shall be a significant increase in the ratio of vehicle deceleration to brake pedal force.

The manufacturer shall supply the value of the brake pedal force at which point the BAS activates; this is the threshold force, F_T, and shall correspond to a threshold deceleration, a_T, of between 3.5 m/s^2 and 5.0 m/s^2.

The performance requirements for category A BAS are met if the required brake pedal force (additional to the threshold force) to achieve a_{ABS} exhibits a decrease of between 40 per cent and 80 per cent compared to the required brake pedal force if BAS was not activated ($F_{ABS, extrapolated}$); this is the shaded region in Figure 12.

Figure 12 Pedal force needed in order to achieve maximum deceleration with category A BAS.



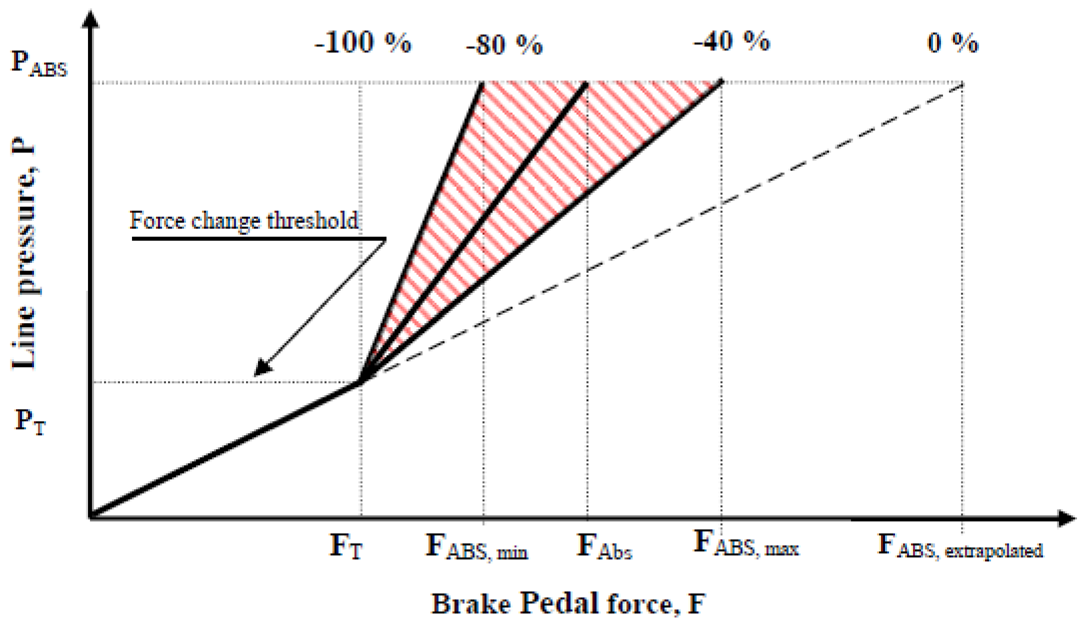
As an alternative, which can be selected for vehicles of category N_1 (or M_1 derived from those N_1 vehicles) with a gross vehicle mass greater than 2,500 kg, the figures for brake pedal force can be derived from brake line pressure instead of vehicle deceleration. In this case, once an emergency braking condition has been detected, there shall be a significant increase in the ratio of brake line pressure to brake pedal force.

The reference test described above shall be carried out and a reference value for the brake line pressure at which ABS cycling commences, denoted as P_{ABS}, shall be determined.

The manufacturer shall supply the value of the brake line pressure at which point the BAS activates; this is the threshold pressure, P_T, and shall correspond to a threshold deceleration, a_T, of between 2.5 m/s^2 and 4.5 m/s^2.

When the vehicle is brought to a stop under simulated emergency braking, the presence of category A BAS is proven if the required brake pedal force (additional to the threshold force) to achieve P_{ABS} exhibits a decrease of between 40 per cent and 80 per cent compared to the required brake pedal force if BAS was not activated ($F_{ABS,\ extrapolated}$); this is the shaded region in Figure 13.

Figure 13 Pedal force needed in order to achieve maximum deceleration with category A BAS, showing brake line pressure.



Assessment of the Presence of Category B BAS

Following the reference test to determine a_{ABS} and F_{ABS}, a test shall be conducted to test for the presence of BAS. The manufacturer shall advise the required brake pedal input to activate the BAS.

The vehicle shall be brought to a stop from the test speed under simulated emergency braking, using the brake pedal application as specified by the manufacturer, so that BAS is activated and ABS is fully cycling.

From 0.8 seconds after the initial pedal application until the vehicle speed slows to 15 km/h, the brake pedal force shall be maintained between 50 per cent and 70 per cent of F_{ABS}, though it may fall below 50 per cent provided the performance requirements below are met.

The performance requirements for category B BAS are met if the average deceleration of the vehicle, from 0.8 seconds after the initial brake pedal application until the vehicle speed has been reduced to 15 km/h, is at least 85 per cent of a_{ABS}.

APPENDIX 5 - 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 between 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 passenger cars and SUVs as well as for LCVs was established for the years 1999 to 2011. Sales data for this period showed a rise in vehicle sales of around 1.4 per cent per year for passenger cars and SUVs and 4.2 per cent per year for LCVs. These trends were then extrapolated to 2029 by assuming an annual growth rate in new vehicle sales of 1 per cent for passenger cars and SUVs and 4 per cent for LCVs.

2. The voluntary fitment rates of BAS in passenger cars and SUVs and in LCVs were established for the BAU case, starting at the current rate of 90 per cent for passenger cars and SUVs and 45 per cent for LCVs, and reaching 99 per cent by 2018 and 2020 respectively. The fitment rates were then established for each of the options. These were higher than the BAU rate, with the actual rate depending on the characteristics of the proposed intervention.

3. The likelihood of a registered car 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 26 years.

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

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

6. The net number of vehicles from Step 4 was multiplied by the number of expected crashes for that year as determined in Step 5. The result was then multiplied by the overall effectiveness of BAS (as determined in Appendix 7 - Effectiveness of Brake Assist Systems), the outcome being the number of pedestrian and cyclist crashes that could be influenced by BAS due to the intervention option.

7. The crashes in Step 6 were multiplied by the value of an average casualty crash. This gave the savings associated with the reduction in the number and severity of crashes, which in turn became the benefits for each option. Research undertaken by the Bureau of Transport Economics (2000) in Australia found that 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 annual inflation rate of 2.6 per cent (Reserve Bank of Australia, 2012), to $615,187 and $20,772 respectively. The cost of a fatality was then modified to reflect willingness to pay terms. This was done using a base cost of $3.587m (Abelson, 2007), with added other costs from the Bureau of Transport Economics (2000) to a value of $922, 551, to reach a final value for a fatal crash of $4.51m (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 $5m. The values for fatal, serious injury and minor injury crashes were proportioned using the ratio between injuries (calculated at Appendix 2 - Ratio of Injuries) and then reduced by 15 per cent to account for the possibility that crashes between vehicles and pedestrian or cyclists could result in lower vehicle repair costs to arrive at the cost of an average casualty crash of $292,338.

8. The implementation and government costs (as relevant) of each option were then calculated using the values from Section 7. The implementation costs were based on the net number of vehicles determined in Step 4.

9. All calculated values were discounted and summed, allowing calculations of net benefits, total costs, benefit-cost ratios and number of lives and serious injuries saved. A discount rate of 7 per cent was assumed, this being in line with similar studies. However, discount rates of 3 per cent and 10 per cent were used as part of a sensitivity check.

APPENDIX 6 - COSTS OF IMPLEMENTING BRAKE ASSIST SYSTEMS

The minimum and maximum costs of implementing BAS in a vehicle were calculated using the following costs provided by the FCAI:

- $100 per vehicle for passenger vehicles (MA, MB and MC categories), which are already required to have an ESC system meeting the requirements of ADR 31/02;
- $400 per vehicle for an ESC system incorporating BAS for LCVs (NA category) that do not have an ESC system; and
- $0 per vehicle (i.e. no additional cost) for LCVs that have an ESC system meeting the requirements of UN R 13-H.

As noted earlier in the RIS, the Australian Government mandated ESC for light passenger vehicles in 2009. All light passenger vehicles will therefore have an ESC system meeting ADR 31/02 and the cost to implement BAS in these vehicles would be $100 per vehicle.

Minimum cost – ESC is mandated for LCVs

If ESC is mandated for LCVs, there would be no additional cost to implement BAS in an LCV, as all LCVs would have an ESC system meeting UN R 13-H. The $100 per vehicle cost for passenger vehicles and $0 per vehicle cost for LCVs were then averaged, taking into account the different proportions of these vehicles that would be affected by BAS due to government intervention. While passenger cars and SUVs represent approximately 80 per cent of the total new sales of passenger cars, SUVs and LCVs, only 10 per cent of these are not already fitted with BAS. LCVs represent the remaining 20 per cent of sales but more than half of these (55 per cent) are not currently fitted with BAS. This gave an overall cost of $42. For the purposes of the cost-benefit analysis, a conservative value of $45 was adopted as the minimum cost to implement BAS in a vehicle.

$$Minimum cost\ to\ implement\ BAS = \frac{\$100 \times 0.8 \times 0.1 + \$0 \times 0.2 \times 0.55}{0.8 \times 0.1 + 0.2 \times 0.55} = \$42$$

Maximum cost – ESC is not mandated for LCVs

If ESC is not mandated for LCVs, the cost of implementing BAS in an LCV would be an average of $0 for vehicles already fitted with ESC and $400 for vehicles not fitted with ESC.

$$Average cost\ for\ LCVs = \$0 \times 0.45 + \$400 \times 0.55 = \$220$$

The $100 per vehicle cost for passenger vehicles and $220 per vehicle cost for LCVs were then averaged, again taking into account their different sales volumes and current BAS fitment rates, to give a cost of $170. This was used in the benefit-cost analysis as the maximum cost to implement BAS in a vehicle.

$$Maximum cost\ to\ implement\ BAS = \frac{\$100 \times 0.8 \times 0.1 + \$220 \times 0.2 \times 0.55}{0.8 \times 0.1 + 0.2 \times 0.55} = \$170$$

APPENDIX 7 - EFFECTIVENESS OF BRAKE ASSIST SYSTEMS

Lawrence et al (2006) from the Transport Research Laboratory (TRL) in the United Kingdom evaluated the effectiveness of BAS in reducing pedestrian and cyclist fatalities and injuries. A summary of their effectiveness estimates is shown in Table 19.

Table 19 Effectiveness of BAS in reducing vulnerable road user casualties

Type of Injury	Pedestrian	Cyclist
Fatal	7.7%	4.2%
Serious	10.1%	5.7%
Minor	15.7%	7.3%

Source: Lawrence et al, 2006

The effectiveness values estimated by Lawrence et al are consistent with values estimated in other studies. Page et al (2005) reported that BAS would reduce pedestrian fatalities in France by 10 to 12 per cent, while Breuer et al (2007) concluded that severe pedestrian accidents involving vehicles with BAS were reduced by 13 per cent compared with vehicles without BAS. These studies also assessed the effectiveness of BAS in other crash types. Page et al (2005) estimated that occupant fatalities in France could be reduced by 6.5 to 9 per cent when vehicles are equipped with BAS and Breuer et al found that rear-end collisions involving vehicles with BAS were reduced by 8 per cent compared with vehicles without BAS. In a more recent study, Page et al (2009) found that fitting BAS to a car that has been given four stars by the European New Car Assessment Programme would lead to a 15 per cent reduction in fatalities and severe injuries for vehicle occupants.

A brief description of how the effectiveness estimates shown in Table 19 were derived is provided below. However, the method used by Lawrence et al (2006) is extensive and should be referred to directly if more detailed information is desired.

The method used in-depth accident data to estimate the proportion of pedestrian and cyclist fatalities and injuries that could be prevented by BAS. On a case-by-case basis, the authors estimated what the impact speed would have been had the vehicle been equipped with BAS. In cases where there was no braking or where the braking was less than an assumed BAS threshold, this speed would be the same as the actual impact speed and so there would be no benefit from having BAS. In cases where the assumed BAS activation threshold was exceeded, the impact speed with BAS fitted was estimated using information about the accident, such as the mean braking deceleration and the braking length. This estimated impact speed would generally be lower than the actual impact speed, or the impact may be avoided altogether.

An injury risk distribution was then produced from the accident data, with the severity and impact speed data banded into 10 km/h wide bands. The set of estimated impact speeds with BAS fitted was then applied to the injury risk distribution and summed over all cases to give the number of casualties. The reduction in the number of casualties compared with the original number of casualties gave the effectiveness of BAS. This calculation was carried out for both frontal and non-frontal impacts (typically front corner or glancing impacts). It is important to note that the evaluation of BAS in the EU was carried out as part of the evaluation of a larger legislative package on pedestrian safety, which also included passive pedestrian safety requirements. In calculating the benefits of BAS in frontal impacts, the authors discounted all casualties that could be saved by passive measures (e.g. energy absorbing vehicle front structures). Therefore, the benefit of BAS included only the additional casualties that could be saved by BAS.

Overall Effectiveness

For the purposes of the benefit-cost analysis, an overall effectiveness of BAS in reducing vulnerable road trauma was calculated using the estimates by Lawrence et al (2006) shown in Table 19. These were averaged according to the proportions of casualties resulting from pedestrian and cyclist crashes, shown in Table 18, to produce a combined (pedestrian and cyclist) effectiveness of 7.4 per cent for a fatal injury, 8.6 per cent for a serious injury and 11.7 per cent for a minor injury. For example, the combined effectiveness for a fatal injury was calculated as $7.7\% \times 0.91 + 4.2\% \times 0.09 = 7.4\%$.

The overall effectiveness of BAS in reducing pedestrian and cyclist trauma was then calculated in a series of steps outlined below and summarised in Table 20.

1. Column A – the proportion of all injuries was calculated using the ratio between injury types calculated at Appendix 2 - Ratio of Injuries. For example, serious injuries as a proportion of all injuries was calculated as 19.3/50.9 = 0.379.

2. Column C – the 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). This was reduced by 15 per cent to account for the possibility that crashes between vehicles and pedestrian or cyclists would result in less damage to the vehicle and therefore lower vehicle repair costs. This column was summed to arrive at $292,338, the overall value of an average casualty crash.

3. Column D – the saving for an average casualty crash was calculated by multiplying column C by the effectiveness of BAS for the particular crash type. For example, the saving for an average fatal crash was calculated as $83,450*0.074 = $6,151. Column D was summed to give $24,469, the overall saving for an average casualty crash.

4. Column E – the overall effectiveness was calculated as the total of column D divided by the total of column C to give 8.4 per cent. This value was used in the benefit-cost analysis to calculate the benefits of BAS in reducing pedestrian and cyclist fatalities and injuries, expressed in monetary terms. For the purposes of calculating the number of lives saved from BAS, the effectiveness of 7.4 per cent as shown above for a fatal injury was used.

Table 20 Calculation of overall effectiveness of BAS

Type of Injury	Ratio between injury types	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 (E)
Fatal	1	0.020	$4,997,154	$83,450	$6,151	
Serious	19.3	0.379	$615,187	$198,274	$17,081	
Minor	30.6	0.601	$20,772	$10,615	$1,237	
Total	**50.9**	**1**		**$292,338**	**$24,469**	**8.4%**

APPENDIX 8 - BENEFIT-COST ANALYSIS – DETAILS OF RESULTS

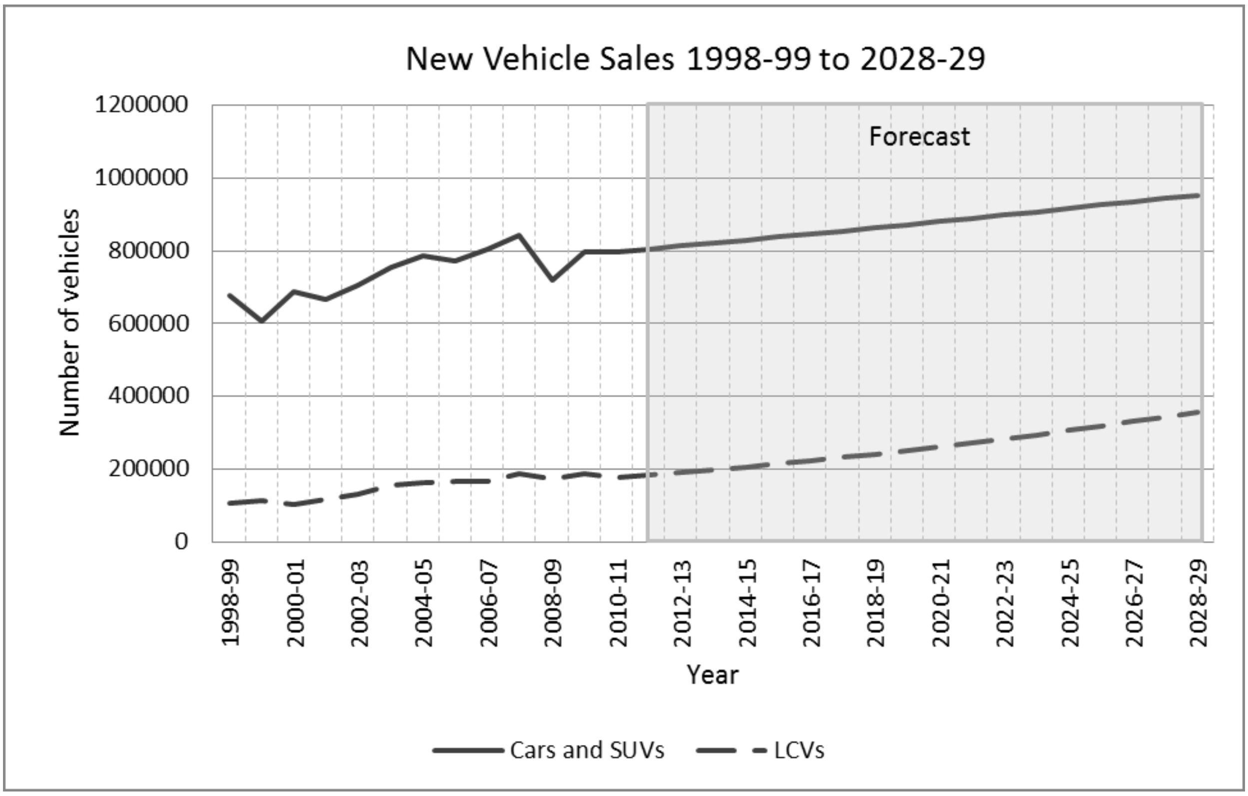
1. Establish the trend in new vehicle sales data for passenger cars, SUVs and LCVs for the years 1999 to 2011. Extrapolate to 2029 by assuming an annual growth rate in new vehicle sales of 1 per cent for passenger cars and SUVs and 4 per cent for LCVs.

Table 21 New vehicle sales 1998-99 to 2029-30

Year	Cars and SUVs	LCVs
1998-99	677482	107703
1999-00	607036	113779
2000-01	685835	103113
2001-02	666672	115744
2002-03	704170	131253
2003-04	755338	155098
2004-05	785985	164348
2005-06	772685	166748
2006-07	804478	167388
2007-08	842756	186868
2008-09	718834	174501
2009-10	798308	186234
2010-11	796944	176630
2011-12	804913	183695
2012-13	812963	191043
2013-14	821092	198685
2014-15	829303	206632
2015-16	837596	214897
2016-17	845972	223493
2017-18	854432	232433
2018-19	862976	241730
2019-20	871606	251400
2020-21	880322	261456
2021-22	889125	271914
2022-23	898016	282790
2023-24	906997	294102
2024-25	916067	305866
2025-26	925227	318101
2026-27	934480	330825
2027-28	943824	344058
2028-29	953263	357820
2029-30	962795	372133

Source: Australian Bureau of Statistics, 2009 and FCAI 2010-11

Figure 14 New vehicle sales from 1998-99 to 2028-29



2. Establish the fitment rate of BAS for the BAU case. Establish the fitment rate for each of the options.

Table 22 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 (see p16 for details on effectiveness)
Option 2(b): User information campaigns – advertising	8%	Increase in existing sales in the first year (decreasing by 10 per cent each year thereafter) (see p16 for details on effectiveness)
Option 3: Fleet purchasing policies (LCVs only)	16%	Increase per new fleet per year (see p17 for details on effectiveness)
Option 6: Mandatory standards under the MVSA	100%	Total per new fleet per year

Table 23 Option 2(a): User information campaigns – targeted awareness

	Fitment Rate					
	Cars and SUVs		LCVS		Total	
	BAU	Option	BAU	Option	BAU	Option
2012	0.900	0.900	0.450	0.770	0.810	0.874
2013	0.915	0.915	0.525	0.770	0.837	0.886
2014	0.930	0.930	0.600	0.770	0.864	0.898
2015	0.945	0.945	0.675	0.770	0.891	0.910
2016	0.960	0.960	0.750	0.770	0.918	0.922
2017	0.975	0.975	0.825	0.825	0.945	0.945
2018	0.990	0.990	0.900	0.900	0.972	0.972
2019	0.990	0.990	0.945	0.945	0.981	0.981
2020	0.990	0.990	0.990	0.990	0.990	0.990
2021	0.990	0.990	0.990	0.990	0.990	0.990
2022	0.990	0.990	0.990	0.990	0.990	0.990
2023	0.990	0.990	0.990	0.990	0.990	0.990
2024	0.990	0.990	0.990	0.990	0.990	0.990
2025	0.990	0.990	0.990	0.990	0.990	0.990
2026	0.990	0.990	0.990	0.990	0.990	0.990
2027	0.990	0.990	0.990	0.990	0.990	0.990
2028	0.990	0.990	0.990	0.990	0.990	0.990
2029	0.990	0.990	0.990	0.990	0.990	0.990

Table 24 Option 2(b): User information campaigns – advertising

	Fitment Rate					
	Cars and SUVs		LCVS		Total	
	BAU	Option	BAU	Option	BAU	Option
2012	0.900	0.972	0.450	0.486	0.810	0.875
2013	0.915	0.988	0.525	0.567	0.837	0.904
2014	0.930	0.990	0.600	0.643	0.864	0.921
2015	0.945	0.990	0.675	0.719	0.891	0.936
2016	0.960	0.990	0.750	0.794	0.918	0.951
2017	0.975	0.990	0.825	0.868	0.945	0.966
2018	0.990	0.990	0.900	0.943	0.972	0.981
2019	0.990	0.990	0.945	0.985	0.981	0.989
2020	0.990	0.990	0.990	0.990	0.990	0.990
2021	0.990	0.990	0.990	0.990	0.990	0.990
2022	0.990	0.990	0.990	0.990	0.990	0.990
2023	0.990	0.990	0.990	0.990	0.990	0.990
2024	0.990	0.990	0.990	0.990	0.990	0.990
2025	0.990	0.990	0.990	0.990	0.990	0.990
2026	0.990	0.990	0.990	0.990	0.990	0.990
2027	0.990	0.990	0.990	0.990	0.990	0.990
2028	0.990	0.990	0.990	0.990	0.990	0.990
2029	0.990	0.990	0.990	0.990	0.990	0.990

Table 25 Option 3: Fleet purchasing policies

	Fitment Rate					
	Cars and SUVs		LCVS		Total	
	BAU	Option	BAU	Option	BAU	Option
2012	0.900	0.900	0.450	0.610	0.810	0.842
2013	0.915	0.915	0.525	0.610	0.837	0.854
2014	0.930	0.930	0.600	0.610	0.864	0.866
2015	0.945	0.945	0.675	0.675	0.891	0.891
2016	0.960	0.960	0.750	0.750	0.918	0.918
2017	0.975	0.975	0.825	0.825	0.945	0.945
2018	0.990	0.990	0.900	0.900	0.972	0.972
2019	0.990	0.990	0.945	0.945	0.981	0.981
2020	0.990	0.990	0.990	0.990	0.990	0.990
2021	0.990	0.990	0.990	0.990	0.990	0.990
2022	0.990	0.990	0.990	0.990	0.990	0.990
2023	0.990	0.990	0.990	0.990	0.990	0.990
2024	0.990	0.990	0.990	0.990	0.990	0.990
2025	0.990	0.990	0.990	0.990	0.990	0.990
2026	0.990	0.990	0.990	0.990	0.990	0.990
2027	0.990	0.990	0.990	0.990	0.990	0.990
2028	0.990	0.990	0.990	0.990	0.990	0.990
2029	0.990	0.990	0.990	0.990	0.990	0.990

Table 26 Option 6: Mandatory standards under the MVSA

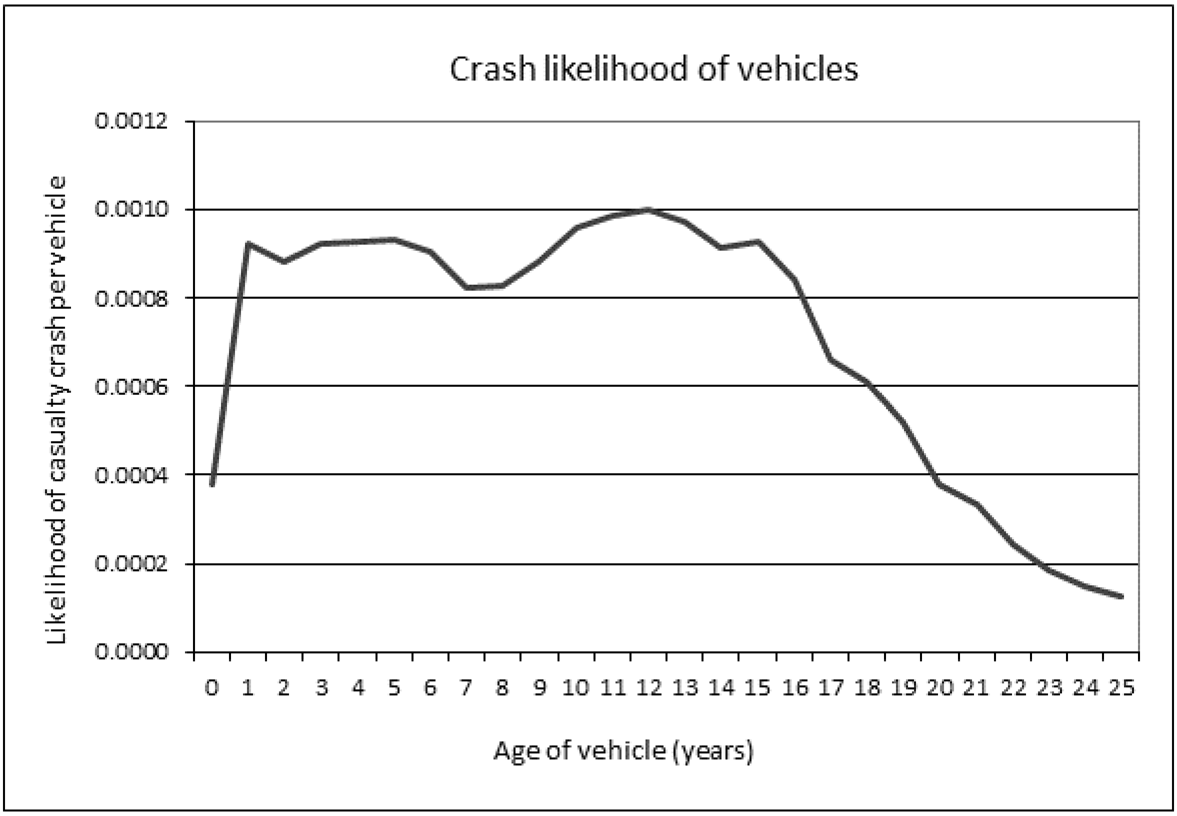
	Fitment Rate					
	Cars and SUVs		LCVS		Total	
	BAU	Option	BAU	Option	BAU	Option
2012	0.900	0.900	0.450	0.450	0.810	0.810
2013	0.915	0.915	0.525	0.525	0.837	0.837
2014	0.930	0.930	0.600	0.600	0.864	0.864
2015	0.945	0.965	0.675	0.800	0.891	0.932
2016	0.960	1.000	0.750	1.000	0.918	1.000
2017	0.975	1.000	0.825	1.000	0.945	1.000
2018	0.990	1.000	0.900	1.000	0.972	1.000
2019	0.990	1.000	0.945	1.000	0.981	1.000
2020	0.990	1.000	0.990	1.000	0.990	1.000
2021	0.990	1.000	0.990	1.000	0.990	1.000
2022	0.990	1.000	0.990	1.000	0.990	1.000
2023	0.990	1.000	0.990	1.000	0.990	1.000
2024	0.990	1.000	0.990	1.000	0.990	1.000
2025	0.990	1.000	0.990	1.000	0.990	1.000
2026	0.990	1.000	0.990	1.000	0.990	1.000
2027	0.990	1.000	0.990	1.000	0.990	1.000
2028	0.990	1.000	0.990	1.000	0.990	1.000
2029	0.990	1.000	0.990	1.000	0.990	1.000

3. Establish the likelihood of a registered car having a crash where a pedestrian or cyclist is injured in some way (including fatally) for each year of a car's life as given in Fildes (2002).

Table 27 Crash likelihood

Age of vehicle	Crashes	Annual registrations	Likelihood of casualty crash
1	1087	760523	0.0004
2	2556	740998	0.0009
3	2572	778997	0.0009
4	2412	698916	0.0009
5	2194	630869	0.0009
6	2142	613261	0.0009
7	1990	588550	0.0009
8	1637	530947	0.0008
9	1635	526303	0.0008
10	1591	482099	0.0009
11	2038	567202	0.0010
12	2008	544296	0.0010
13	1790	477461	0.0010
14	1510	414467	0.0010
15	1636	478197	0.0009
16	2176	625061	0.0009
17	1827	579925	0.0008
18	1297	524515	0.0007
19	1330	580654	0.0006
20	1082	555753	0.0005
21	804	565653	0.0004
22	667	532710	0.0003
23	489	532473	0.0002
24	360	517449	0.0002
25	314	556300	0.0002
26	263	551011	0.0001

Figure 15 Crash likelihood of vehicles



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

5. For each year and each option, multiply the net number of vehicles fitted with BAS 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 overall effectiveness of BAS.

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

Table 28 Option 2(a): User information campaigns – targeted awareness (cars and SUVs)

Year	Likelihood of crash per vehicle	Option minus BAU - Cars and SUVs	Year																															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	0.0004	0		0																														0
2	0.0009	0		0	0																													0
3	0.0009	0		0	0	0																												0
4	0.0009	0		0	0	0	0																											0
5	0.0009	0		0	0	0	0	0																										0
6	0.0009	0		0	0	0	0	0	0																									0
7	0.0009	0		0	0	0	0	0	0	0																								0
8	0.0008	0		0	0	0	0	0	0	0	0																							0
9	0.0008	0		0	0	0	0	0	0	0	0	0																						0
10	0.0009	0		0	0	0	0	0	0	0	0	0	0																					0
11	0.0010	0		0	0	0	0	0	0	0	0	0	0	0																				0
12	0.0010	0		0	0	0	0	0	0	0	0	0	0	0	0																			0
13	0.0010	0		0	0	0	0	0	0	0	0	0	0	0	0	0																		0
14	0.0010	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0																	0
15	0.0009	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																0
16	0.0009	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															0
17	0.0008	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0														0
18	0.0007	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0													0
19	0.0006	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												0
20	0.0005	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											0
21	0.0004	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0										0
22	0.0003	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									0
23	0.0002	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
24	0.0002	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
25	0.0002	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
26	0.0001	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
27	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
28	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
29	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
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 29 Option 2(a): User information campaigns – targeted awareness (LCVs)

Year	Likelihood of crash per vehicle	Option minus BAU - LCVs	Year																															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	0.0004	46806		18																														18
2	0.0009	33776		43	13																													56
3	0.0009	19630		41	31	7																												80
4	0.0009	4298		43	30	18	2																											93
5	0.0009	0		43	31	17	4	0																										96
6	0.0009	0		44	31	18	4	0	0																									97
7	0.0009	0		42	31	18	4	0	0	0																								96
8	0.0008	0		38	30	18	4	0	0	0	0																							91
9	0.0008	0		39	28	18	4	0	0	0	0	0																						88
10	0.0009	0		41	28	16	4	0	0	0	0	0	0																					89
11	0.0010	0		45	30	16	4	0	0	0	0	0	0	0																				94
12	0.0010	0		46	32	17	4	0	0	0	0	0	0	0	0																			99
13	0.0010	0		47	33	19	4	0	0	0	0	0	0	0	0	0																		103
14	0.0010	0		45	34	19	4	0	0	0	0	0	0	0	0	0	0																	103
15	0.0009	0		43	33	20	4	0	0	0	0	0	0	0	0	0	0	0																99
16	0.0009	0		43	31	19	4	0	0	0	0	0	0	0	0	0	0	0	0															98
17	0.0008	0		39	31	18	4	0	0	0	0	0	0	0	0	0	0	0	0	0														93
18	0.0007	0		31	28	18	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0													81
19	0.0006	0		29	22	16	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												71
20	0.0005	0		24	21	13	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											61
21	0.0004	0		18	18	12	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0										50
22	0.0003	0		16	13	10	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									41
23	0.0002	0		11	11	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								32
24	0.0002	0		9	8	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							25
25	0.0002	0		7	6	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						20
26	0.0001	0		6	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					16
27	0.0000	0			4	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				8
28	0.0000	0				2	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			3
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 30 Option 2(b): User information campaigns – advertising (cars and SUVs)

Year	Likelihood of crash per vehicle	Option minus BAU - Cars and SUVs	Year																														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	0.0004	59509		23																														23
2	0.0009	49266		55	19																													74
3	0.0009	37319		52	45	14																												112
4	0.0009	25128		55	43	34	10																											142
5	0.0009	12690		55	45	33	23	5																										161
6	0.0009	0		55	46	34	22	12	0																									169
7	0.0009	0		54	46	35	23	11	0	0																								168
8	0.0008	0		49	44	35	23	12	0	0	0																							163
9	0.0008	0		49	41	34	23	12	0	0	0	0																						159
10	0.0009	0		52	41	31	23	12	0	0	0	0	0																					158
11	0.0010	0		57	43	31	21	11	0	0	0	0	0	0																				163
12	0.0010	0		59	47	33	21	10	0	0	0	0	0	0	0																			170
13	0.0010	0		60	48	36	22	11	0	0	0	0	0	0	0	0																		176
14	0.0010	0		58	49	37	24	11	0	0	0	0	0	0	0	0	0																	179
15	0.0009	0		54	48	37	25	12	0	0	0	0	0	0	0	0	0	0																176
16	0.0009	0		55	45	36	25	12	0	0	0	0	0	0	0	0	0	0	0															174
17	0.0008	0		50	46	34	24	13	0	0	0	0	0	0	0	0	0	0	0	0														167
18	0.0007	0		39	41	35	23	12	0	0	0	0	0	0	0	0	0	0	0	0	0													151
19	0.0006	0		36	32	31	23	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0												135
20	0.0005	0		31	30	25	21	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											119
21	0.0004	0		23	26	23	17	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0										98
22	0.0003	0		20	19	19	15	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									82
23	0.0002	0		15	16	14	13	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								66
24	0.0002	0		11	12	12	10	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							52
25	0.0002	0		9	9	9	8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						40
26	0.0001	0		8	7	7	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					32
27	0.0000	0			6	6	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				20
28	0.0000	0				5	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			11
29	0.0000	0					3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		5
30	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	0	0	2
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 31 Option 2(b): User information campaigns – advertising (LCVs)

Year	Likelihood of crash per vehicle	Option minus BAU - LCVs	Year																															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	0.0004	8024		3																														3
2	0.0009	8583		7	3																													11
3	0.0009	9038		7	8	3																												18
4	0.0009	9400		7	8	8	4																											27
5	0.0009	9678		7	8	8	9	4																										36
6	0.0009	9882		7	8	8	8	9	4																									45
7	0.0009	9712		7	8	8	9	9	9	4																								54
8	0.0008	0		7	8	8	9	9	9	9	0																							58
9	0.0008	0		7	7	8	9	9	9	9	0	0																						57
10	0.0009	0		7	7	7	8	9	9	9	0	0	0																					57
11	0.0010	0		8	8	7	8	9	9	9	0	0	0	0																				57
12	0.0010	0		8	8	8	8	8	9	9	0	0	0	0	0																			58
13	0.0010	0		8	8	9	8	8	8	9	0	0	0	0	0	0																		58
14	0.0010	0		8	9	9	9	9	8	8	0	0	0	0	0	0	0																	59
15	0.0009	0		7	8	9	9	9	9	8	0	0	0	0	0	0	0	0																60
16	0.0009	0		7	8	9	9	10	9	9	0	0	0	0	0	0	0	0	0															61
17	0.0008	0		7	8	8	9	10	10	9	0	0	0	0	0	0	0	0	0	0														61
18	0.0007	0		5	7	8	9	9	10	10	0	0	0	0	0	0	0	0	0	0	0													58
19	0.0006	0		5	6	8	9	9	10	10	0	0	0	0	0	0	0	0	0	0	0	0												55
20	0.0005	0		4	5	6	8	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0											51
21	0.0004	0		3	4	6	6	8	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0										45
22	0.0003	0		3	3	5	6	6	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									40
23	0.0002	0		2	3	3	5	6	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								34
24	0.0002	0		1	2	3	4	5	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							28
25	0.0002	0		1	2	2	3	4	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						23
26	0.0001	0		1	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					18
27	0.0000	0			1	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				14
28	0.0000	0				1	1	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			10
29	0.0000	0					1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		7
30	0.0000	0						1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
31	0.0000	0							1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
32	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	1
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 32 Option 3: Fleet purchasing policies (cars and SUVs)

Year	Likelihood of crash per vehicle	Option minus BAU - Cars and SUVs	Year																															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	0.0004	0		0																														0
2	0.0009	0		0	0																													0
3	0.0009	0		0	0	0																												0
4	0.0009	0		0	0	0	0																											0
5	0.0009	0		0	0	0	0	0																										0
6	0.0009	0		0	0	0	0	0	0																									0
7	0.0009	0		0	0	0	0	0	0	0																								0
8	0.0008	0		0	0	0	0	0	0	0	0																							0
9	0.0008	0		0	0	0	0	0	0	0	0	0																						0
10	0.0009	0		0	0	0	0	0	0	0	0	0	0																					0
11	0.0010	0		0	0	0	0	0	0	0	0	0	0	0																				0
12	0.0010	0		0	0	0	0	0	0	0	0	0	0	0	0																			0
13	0.0010	0		0	0	0	0	0	0	0	0	0	0	0	0	0																		0
14	0.0010	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0																	0
15	0.0009	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																0
16	0.0009	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0															0
17	0.0008	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0														0
18	0.0007	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0													0
19	0.0006	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												0
20	0.0005	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											0
21	0.0004	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0										0
22	0.0003	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									0
23	0.0002	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
24	0.0002	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
25	0.0002	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
26	0.0001	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
27	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
28	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
29	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
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 33 Option 3: Fleet purchasing policies (LCVs)

Year	Likelihood of crash per vehicle	Option minus BAU - LCVs	Year																															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	0.0004	16239		6																														6
2	0.0009	1987		15	1																													16
3	0.0009	0		14	2	0																												16
4	0.0009	0		15	2	0	0																											17
5	0.0009	0		15	2	0	0	0																										17
6	0.0009	0		15	2	0	0	0	0																									17
7	0.0009	0		15	2	0	0	0	0	0																								16
8	0.0008	0		13	2	0	0	0	0	0	0																							15
9	0.0008	0		13	2	0	0	0	0	0	0	0																						15
10	0.0009	0		14	2	0	0	0	0	0	0	0	0																					16
11	0.0010	0		16	2	0	0	0	0	0	0	0	0	0																				17
12	0.0010	0		16	2	0	0	0	0	0	0	0	0	0	0																			18
13	0.0010	0		16	2	0	0	0	0	0	0	0	0	0	0	0																		18
14	0.0010	0		16	2	0	0	0	0	0	0	0	0	0	0	0	0																	18
15	0.0009	0		15	2	0	0	0	0	0	0	0	0	0	0	0	0	0																17
16	0.0009	0		15	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0															17
17	0.0008	0		14	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0														15
18	0.0007	0		11	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0													12
19	0.0006	0		10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												11
20	0.0005	0		8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											10
21	0.0004	0		6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0										7
22	0.0003	0		5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									6
23	0.0002	0		4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								5
24	0.0002	0		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							3
25	0.0002	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	0						3
26	0.0001	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	0	0					2
27	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
28	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
29	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
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 34 Option 6: Mandatory standards under the MVSA (regulation) (cars and SUVs)

Year	Likelihood of crash per vehicle	Option minus BAU - Cars and SUVs	Year																															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	0.0004	0		0																														0
2	0.0009	0		0	0																													0
3	0.0009	16586		0	0	6																												6
4	0.0009	33504		0	0	15	13																											28
5	0.0009	21149		0	0	15	31	8																										53
6	0.0009	8544		0	0	15	30	19	3																									67
7	0.0009	8630		0	0	15	31	19	8	3																								76
8	0.0008	8716		0	0	15	31	19	8	8	3																							85
9	0.0008	8803		0	0	15	31	20	8	8	8	3																						93
10	0.0009	8891		0	0	14	30	20	8	8	8	8	3																					99
11	0.0010	8980		0	0	14	28	19	8	8	8	8	8	3																				104
12	0.0010	9070		0	0	15	28	17	8	8	8	8	8	8	3																			111
13	0.0010	9161		0	0	16	29	18	7	8	8	8	8	8	8	3																		122
14	0.0010	9252		0	0	16	32	19	7	7	8	8	8	8	8	8	4																	134
15	0.0009	9345		0	0	17	33	20	8	7	7	8	8	8	8	8	9	4																145
16	0.0009	9438		0	0	16	33	21	8	8	7	7	8	8	8	8	8	9	4															154
17	0.0008	9533		0	0	15	33	21	8	8	8	7	7	8	8	8	9	8	9	4														162
18	0.0007	0		0	0	15	31	21	9	8	8	8	7	7	8	9	9	9	8	9	0													165
19	0.0006	0		0	0	14	31	19	8	9	9	8	8	7	7	8	9	9	9	8	0	0												164
20	0.0005	0		0	0	11	28	20	8	8	9	9	9	8	8	8	8	9	9	9	0	0	0											158
21	0.0004	0		0	0	10	22	18	8	8	8	9	9	9	8	8	8	8	9	9	0	0	0	0										150
22	0.0003	0		0	0	9	20	14	7	8	8	9	9	9	9	8	8	8	9	9	0	0	0	0	0									142
23	0.0002	0		0	0	6	17	13	6	7	8	8	9	9	9	9	8	8	8	9	0	0	0	0	0	0								133
24	0.0002	0		0	0	6	13	11	5	6	7	8	8	9	9	9	9	8	8	8	0	0	0	0	0	0	0							123
25	0.0002	0		0	0	4	11	8	4	5	6	7	8	8	9	9	9	9	8	8	0	0	0	0	0	0	0	0						115
26	0.0001	0		0	0	3	8	7	3	4	5	6	7	8	8	9	9	9	9	8	0	0	0	0	0	0	0	0	0					106
27	0.0000	0			0	2	6	5	3	3	5	5	6	8	8	8	9	9	9	9	0	0	0	0	0	0	0	0	0	0				97
28	0.0000	0				2	5	4	2	3	3	5	5	6	8	9	8	9	9	9	0	0	0	0	0	0	0	0	0	0	0			88
29	0.0000	0					4	3	2	2	3	3	5	5	6	8	9	9	9	10	0	0	0	0	0	0	0	0	0	0	0	0		77
30	0.0000	0						3	1	2	2	3	3	5	6	6	8	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	65
31	0.0000	0							1	1	2	2	3	3	5	6	6	8	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	54
32	0.0000	0								1	1	2	2	3	3	5	6	6	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	46
33	0.0000	0									1	1	2	2	3	3	5	6	6	8	0	0	0	0	0	0	0	0	0	0	0	0	0	38
34	0.0000	0										1	1	2	2	3	4	5	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	30
35	0.0000	0											1	1	2	2	3	4	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	24
36	0.0000	0												1	1	2	2	3	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	18
37	0.0000	0													1	1	2	2	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	13
38	0.0000	0														1	1	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	10
39	0.0000	0															1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	7
40	0.0000	0																1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4
41	0.0000	0																	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3
42	0.0000	0																		1	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 35 Option 6: Mandatory standards under the MVSA (regulation) (LCVs)

Year	Likelihood of crash per vehicle	Option minus BAU - LCVs	Year																															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	0.0004	0		0																														0
2	0.0009	0		0	0																													0
3	0.0009	25829		0	0	10																												10
4	0.0009	53724		0	0	24	20																											44
5	0.0009	39111		0	0	23	49	15																										87
6	0.0009	23243		0	0	24	47	36	9																									116
7	0.0009	13295		0	0	24	49	34	21	5																								134
8	0.0008	2514		0	0	24	50	36	20	12	1																							144
9	0.0008	2615		0	0	23	50	36	21	12	2	1																						146
10	0.0009	2719		0	0	21	48	36	22	12	2	2	1																					146
11	0.0010	2828		0	0	21	44	35	22	12	2	2	3	1																				143
12	0.0010	2941		0	0	23	45	32	21	12	2	2	2	3	1																			144
13	0.0010	3059		0	0	25	47	32	19	12	2	2	3	2	3	1																		149
14	0.0010	3181		0	0	25	51	34	19	11	2	2	3	3	3	3	1																	158
15	0.0009	3308		0	0	26	53	37	20	11	2	2	3	3	3	3	3	1																167
16	0.0009	3441		0	0	25	54	38	22	12	2	2	2	3	3	3	3	3	1															173
17	0.0008	3578		0	0	24	52	39	23	13	2	2	2	3	3	3	3	3	3	1														176
18	0.0007	0		0	0	24	49	38	23	13	2	2	2	2	3	3	3	3	3	3	0													174
19	0.0006	0		0	0	22	50	36	23	13	2	3	2	2	2	3	3	3	3	3	0	0												170
20	0.0005	0		0	0	17	45	36	21	13	3	3	3	2	2	3	3	3	3	3	0	0	0											160
21	0.0004	0		0	0	16	35	33	22	12	2	3	3	3	3	3	3	3	3	3	0	0	0	0										145
22	0.0003	0		0	0	13	33	26	20	12	2	3	3	3	3	3	3	3	3	3	0	0	0	0	0									132
23	0.0002	0		0	0	10	28	24	15	11	2	2	3	3	3	3	3	3	3	3	0	0	0	0	0	0								116
24	0.0002	0		0	0	9	20	20	14	9	2	2	2	3	3	3	3	3	3	3	0	0	0	0	0	0	0							100
25	0.0002	0		0	0	6	18	15	12	8	2	2	3	3	3	3	3	3	3	3	0	0	0	0	0	0	0	0						86
26	0.0001	0		0	0	5	13	13	9	7	2	2	2	3	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0					73
27	0.0000	0			0	4	10	10	8	5	1	2	2	2	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0				62
28	0.0000	0				3	8	7	6	4	1	1	2	2	2	3	3	3	3	4	0	0	0	0	0	0	0	0	0	0	0			53
29	0.0000	0					7	6	4	3	1	1	1	2	2	3	3	3	3	4	0	0	0	0	0	0	0	0	0	0	0	0		43
30	0.0000	0						5	3	2	1	1	1	1	2	2	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	31
31	0.0000	0							3	2	0	1	1	1	2	2	2	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	23
32	0.0000	0								2	0	0	1	1	1	2	2	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	17
33	0.0000	0									0	0	1	1	1	1	2	2	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	13
34	0.0000	0										0	0	1	1	1	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	10
35	0.0000	0											0	0	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	8
36	0.0000	0												0	0	1	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6
37	0.0000	0													0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
38	0.0000	0														0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
39	0.0000	0															0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
40	0.0000	0																0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
41	0.0000	0																	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
42	0.0000	0																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 36 Option 2(a): User information campaigns – targeted awareness

Year		Vehicle Sales			Option's Expected Fitment Rate			BAU Expected (Voluntary) Fitment Rate			Option minus BAU			Net Vehicle Crashes Influenced			Value of Net Vehicle Crashes Influenced		
		Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total
0	2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2013	812,963	191,043	1,004,006	743,861	147,103	890,964	743,861	100,298	844,158	-	46,806	46,806	-	1	1	-	436,581	436,581
2	2014	821,092	198,685	1,019,777	763,616	152,987	916,603	763,616	119,211	882,827	-	33,776	33,776	-	5	5	-	1,368,688	1,368,688
3	2015	829,303	206,632	1,035,935	783,691	159,107	942,798	783,691	139,477	923,168	-	19,630	19,630	-	7	7	-	1,951,954	1,951,954
4	2016	837,596	214,897	1,052,494	804,092	165,471	969,563	804,092	161,173	965,265	-	4,298	4,298	-	8	8	-	2,263,901	2,263,901
5	2017	845,972	223,493	1,069,465	824,823	184,382	1,009,205	824,823	184,382	1,009,205	-	-	-	-	8	8	-	2,342,716	2,342,716
6	2018	854,432	232,433	1,086,865	845,888	209,190	1,055,077	845,888	209,190	1,055,077	-	-	-	-	8	8	-	2,368,191	2,368,191
7	2019	862,976	241,730	1,104,707	854,346	228,435	1,082,782	854,346	228,435	1,082,782	-	-	-	-	8	8	-	2,345,027	2,345,027
8	2020	871,606	251,400	1,123,005	862,890	248,886	1,111,775	862,890	248,886	1,111,775	-	-	-	-	8	8	-	2,232,070	2,232,070
9	2021	880,322	261,456	1,141,778	871,519	258,841	1,130,360	871,519	258,841	1,130,360	-	-	-	-	7	7	-	2,159,652	2,159,652
10	2022	889,125	271,914	1,161,039	880,234	269,195	1,149,429	880,234	269,195	1,149,429	-	-	-	-	7	7	-	2,182,631	2,182,631
11	2023	898,016	282,790	1,180,807	889,036	279,962	1,168,999	889,036	279,962	1,168,999	-	-	-	-	8	8	-	2,309,415	2,309,415
12	2024	906,997	294,102	1,201,099	897,927	291,161	1,189,088	897,927	291,161	1,189,088	-	-	-	-	8	8	-	2,428,790	2,428,790
13	2025	916,067	305,866	1,221,933	906,906	302,807	1,209,713	906,906	302,807	1,209,713	-	-	-	-	9	9	-	2,511,202	2,511,202
14	2026	925,227	318,101	1,243,328	915,975	314,920	1,230,895	915,975	314,920	1,230,895	-	-	-	-	9	9	-	2,512,609	2,512,609
15	2027	934,480	330,825	1,265,304	925,135	327,516	1,252,651	925,135	327,516	1,252,651	-	-	-	-	8	8	-	2,431,830	2,431,830
16	2028	943,824	344,058	1,287,882	934,386	340,617	1,275,003	934,386	340,617	1,275,003	-	-	-	-	8	8	-	2,389,364	2,389,364
17	2029	953,263	357,820	1,311,083	943,730	354,242	1,297,972	943,730	354,242	1,297,972	-	-	-	-	8	8	-	2,270,133	2,270,133
18	2030	-	-	-	-	-	-	-	-	-	-	-	-	-	7	7	-	1,991,682	1,991,682
19	2031	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	-	1,745,945	1,745,945
20	2032	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5	-	1,504,725	1,504,725
21	2033	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	-	1,226,102	1,226,102
22	2034	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	1,009,421	1,009,421
23	2035	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	793,204	793,204
24	2036	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	615,209	615,209
25	2037	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	478,534	478,534
26	2038	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	385,098	385,098
27	2039	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	197,033	197,033
28	2040	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	76,978	76,978
29	2041	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	13,388	13,388
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	$0	$22,290,656	$22,290,656

Table 37 Option 2(b): User information campaigns – advertising

Year		Vehicle Sales			Option's Expected Fitment Rate			BAU Expected (Voluntary) Fitment Rate			Option minus BAU			Net Vehicle Crashes Influenced			Value of Net Vehicle Crashes Influenced		
		Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total
0	2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2013	812,963	191,043	1,004,006	803,370	108,321	911,691	743,861	100,298	844,158	59,509	8,024	67,533	2	0	2	555,071	74,842	629,914
2	2014	821,092	198,685	1,019,777	812,881	127,794	940,675	763,616	119,211	882,827	49,266	8,583	57,849	6	1	7	1,799,128	260,684	2,059,811
3	2015	829,303	206,632	1,035,935	821,010	148,515	969,525	783,691	139,477	923,168	37,319	9,038	46,357	9	2	11	2,739,338	450,407	3,189,745
4	2016	837,596	214,897	1,052,494	829,220	170,573	999,793	804,092	161,173	965,265	25,128	9,400	34,527	12	2	14	3,476,225	656,783	4,133,007
5	2017	845,972	223,493	1,069,465	837,512	194,060	1,031,572	824,823	184,382	1,009,205	12,690	9,678	22,367	14	3	16	3,948,271	872,024	4,820,295
6	2018	854,432	232,433	1,086,865	845,888	219,072	1,064,959	845,888	209,190	1,055,077	-	9,882	9,882	14	4	18	4,142,147	1,093,817	5,235,964
7	2019	862,976	241,730	1,104,707	854,346	238,147	1,092,494	854,346	228,435	1,082,782	-	9,712	9,712	14	4	19	4,122,405	1,311,091	5,433,496
8	2020	871,606	251,400	1,123,005	862,890	248,886	1,111,775	862,890	248,886	1,111,775	-	-	-	14	5	19	3,991,196	1,419,703	5,410,899
9	2021	880,322	261,456	1,141,778	871,519	258,841	1,130,360	871,519	258,841	1,130,360	-	-	-	13	5	18	3,881,966	1,400,532	5,282,499
10	2022	889,125	271,914	1,161,039	880,234	269,195	1,149,429	880,234	269,195	1,149,429	-	-	-	13	5	18	3,875,032	1,399,695	5,274,726
11	2023	898,016	282,790	1,180,807	889,036	279,962	1,168,999	889,036	279,962	1,168,999	-	-	-	14	5	18	3,998,614	1,404,589	5,403,203
12	2024	906,997	294,102	1,201,099	897,927	291,161	1,189,088	897,927	291,161	1,189,088	-	-	-	14	5	19	4,156,412	1,413,816	5,570,229
13	2025	916,067	305,866	1,221,933	906,906	302,807	1,209,713	906,906	302,807	1,209,713	-	-	-	15	5	20	4,315,564	1,426,668	5,742,232
14	2026	925,227	318,101	1,243,328	915,975	314,920	1,230,895	915,975	314,920	1,230,895	-	-	-	15	5	20	4,381,193	1,442,964	5,824,158
15	2027	934,480	330,825	1,265,304	925,135	327,516	1,252,651	925,135	327,516	1,252,651	-	-	-	15	5	20	4,315,541	1,467,304	5,782,845
16	2028	943,824	344,058	1,287,882	934,386	340,617	1,275,003	934,386	340,617	1,275,003	-	-	-	15	5	20	4,259,492	1,492,672	5,752,164
17	2029	953,263	357,820	1,311,083	943,730	354,242	1,297,972	943,730	354,242	1,297,972	-	-	-	14	5	19	4,083,850	1,487,669	5,571,519
18	2030	-	-	-	-	-	-	-	-	-	-	-	-	13	5	17	3,683,768	1,426,844	5,110,612
19	2031	-	-	-	-	-	-	-	-	-	-	-	-	11	5	16	3,306,011	1,346,461	4,652,472
20	2032	-	-	-	-	-	-	-	-	-	-	-	-	10	4	14	2,899,658	1,240,766	4,140,424
21	2033	-	-	-	-	-	-	-	-	-	-	-	-	8	4	12	2,402,179	1,110,587	3,512,766
22	2034	-	-	-	-	-	-	-	-	-	-	-	-	7	3	10	1,997,785	980,511	2,978,296
23	2035	-	-	-	-	-	-	-	-	-	-	-	-	6	3	8	1,614,322	825,296	2,439,618
24	2036	-	-	-	-	-	-	-	-	-	-	-	-	4	2	7	1,264,698	676,318	1,941,016
25	2037	-	-	-	-	-	-	-	-	-	-	-	-	3	2	5	989,578	560,002	1,549,580
26	2038	-	-	-	-	-	-	-	-	-	-	-	-	3	2	4	790,563	448,120	1,238,683
27	2039	-	-	-	-	-	-	-	-	-	-	-	-	2	1	3	481,064	331,542	812,606
28	2040	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	266,419	245,301	511,720
29	2041	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1	125,014	168,001	293,016
30	2042	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	39,527	110,642	150,169
31	2043	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	66,556	66,556
32	2044	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	30,252	30,252
33	2045	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	2046	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	2047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	2048	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	2049	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	2050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	2051	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	2052	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	2053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	2054	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
																NPV 42 years	$37,892,960	$11,820,576	$49,713,536

Table 38 Option 3: Fleet purchasing policies

Year		Vehicle Sales			Option's Expected Fitment Rate			BAU Expected (Voluntary) Fitment Rate			Option minus BAU			Net Vehicle Crashes Influenced			Value of Net Vehicle Crashes Influenced		
		Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total
0	2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2013	812,963	191,043	1,004,006	743,861	116,536	860,397	743,861	100,298	844,158	-	16,239	16,239	-	1	1	-	151,467	151,467
2	2014	821,092	198,685	1,019,777	763,616	121,198	884,813	763,616	119,211	882,827	-	1,987	1,987	-	1	1	-	384,080	384,080
3	2015	829,303	206,632	1,035,935	783,691	139,477	923,168	783,691	139,477	923,168	-	-	-	-	1	1	-	394,619	394,619
4	2016	837,596	214,897	1,052,494	804,092	161,173	965,265	804,092	161,173	965,265	-	-	-	-	1	1	-	408,534	408,534
5	2017	845,972	223,493	1,069,465	824,823	184,382	1,009,205	824,823	184,382	1,009,205	-	-	-	-	1	1	-	413,298	413,298
6	2018	854,432	232,433	1,086,865	845,888	209,190	1,055,077	845,888	209,190	1,055,077	-	-	-	-	1	1	-	415,240	415,240
7	2019	862,976	241,730	1,104,707	854,346	228,435	1,082,782	854,346	228,435	1,082,782	-	-	-	-	1	1	-	403,608	403,608
8	2020	871,606	251,400	1,123,005	862,890	248,886	1,111,775	862,890	248,886	1,111,775	-	-	-	-	1	1	-	370,578	370,578
9	2021	880,322	261,456	1,141,778	871,519	258,841	1,130,360	871,519	258,841	1,130,360	-	-	-	-	1	1	-	369,194	369,194
10	2022	889,125	271,914	1,161,039	880,234	269,195	1,149,429	880,234	269,195	1,149,429	-	-	-	-	1	1	-	390,012	390,012
11	2023	898,016	282,790	1,180,807	889,036	279,962	1,168,999	889,036	279,962	1,168,999	-	-	-	-	1	1	-	423,564	423,564
12	2024	906,997	294,102	1,201,099	897,927	291,161	1,189,088	897,927	291,161	1,189,088	-	-	-	-	1	1	-	437,545	437,545
13	2025	916,067	305,866	1,221,933	906,906	302,807	1,209,713	906,906	302,807	1,209,713	-	-	-	-	2	2	-	445,132	445,132
14	2026	925,227	318,101	1,243,328	915,975	314,920	1,230,895	915,975	314,920	1,230,895	-	-	-	-	1	1	-	434,699	434,699
15	2027	934,480	330,825	1,265,304	925,135	327,516	1,252,651	925,135	327,516	1,252,651	-	-	-	-	1	1	-	409,796	409,796
16	2028	943,824	344,058	1,287,882	934,386	340,617	1,275,003	934,386	340,617	1,275,003	-	-	-	-	1	1	-	413,284	413,284
17	2029	953,263	357,820	1,311,083	943,730	354,242	1,297,972	943,730	354,242	1,297,972	-	-	-	-	1	1	-	379,001	379,001
18	2030	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	302,898	302,898
19	2031	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	274,799	274,799
20	2032	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	236,021	236,021
21	2033	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	175,872	175,872
22	2034	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	151,119	151,119
23	2035	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	113,557	113,557
24	2036	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	85,636	85,636
25	2037	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	68,837	68,837
26	2038	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	57,901	57,901
27	2039	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	6,189	6,189
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			$0	$4,073,271	$4,073,271

Table 39 Option 6: Mandatory standards under the MVSA (regulation)

Year		Vehicle Sales			Option's Expected Fitment Rate			BAU Expected (Voluntary) Fitment Rate			Option minus BAU			Net Vehicle Crashes Influenced			Value of Net Vehicle Crashes Influenced		
		Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total	Cars and SUVs	LCVs	Total
0	2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2013	812,963	191,043	1,004,006	743,861	100,298	844,158	743,861	100,298	844,158	-	-	-	-	-	-	-	-	-
2	2014	821,092	198,685	1,019,777	763,616	119,211	882,827	763,616	119,211	882,827	-	-	-	-	-	-	-	-	-
3	2015	829,303	206,632	1,035,935	800,278	165,306	965,583	783,691	139,477	923,168	16,586	25,829	42,415	1	1	1	154,707	240,921	395,628
4	2016	837,596	214,897	1,052,494	837,596	214,897	1,052,494	804,092	161,173	965,265	33,504	53,724	87,228	2	4	6	685,877	1,082,552	1,768,429
5	2017	845,972	223,493	1,069,465	845,972	223,493	1,069,465	824,823	184,382	1,009,205	21,149	39,111	60,261	4	7	12	1,308,853	2,130,735	3,439,588
6	2018	854,432	232,433	1,086,865	854,432	232,433	1,086,865	845,888	209,190	1,055,077	8,544	23,243	31,788	6	10	15	1,651,241	2,836,545	4,487,786
7	2019	862,976	241,730	1,104,707	862,976	241,730	1,104,707	854,346	228,435	1,082,782	8,630	13,295	21,925	6	11	18	1,859,539	3,286,149	5,145,688
8	2020	871,606	251,400	1,123,005	871,606	251,400	1,123,005	862,890	248,886	1,111,775	8,716	2,514	11,230	7	12	19	2,074,453	3,512,488	5,586,941
9	2021	880,322	261,456	1,141,778	880,322	261,456	1,141,778	871,519	258,841	1,130,360	8,803	2,615	11,418	8	12	20	2,266,378	3,573,138	5,839,516
10	2022	889,125	271,914	1,161,039	889,125	271,914	1,161,039	880,234	269,195	1,149,429	8,891	2,719	11,610	8	12	20	2,412,282	3,562,032	5,974,314
11	2023	898,016	282,790	1,180,807	898,016	282,790	1,180,807	889,036	279,962	1,168,999	8,980	2,828	11,808	9	12	21	2,537,582	3,499,755	6,037,337
12	2024	906,997	294,102	1,201,099	906,997	294,102	1,201,099	897,927	291,161	1,189,088	9,070	2,941	12,011	9	12	21	2,721,662	3,513,979	6,235,641
13	2025	916,067	305,866	1,221,933	916,067	305,866	1,221,933	906,906	302,807	1,209,713	9,161	3,059	12,219	10	12	23	2,983,440	3,650,238	6,633,677
14	2026	925,227	318,101	1,243,328	925,227	318,101	1,243,328	915,975	314,920	1,230,895	9,252	3,181	12,433	11	13	24	3,272,272	3,865,053	7,137,326
15	2027	934,480	330,825	1,265,304	934,480	330,825	1,265,304	925,135	327,516	1,252,651	9,345	3,308	12,653	12	14	26	3,540,525	4,081,668	7,622,193
16	2028	943,824	344,058	1,287,882	943,824	344,058	1,287,882	934,386	340,617	1,275,003	9,438	3,441	12,879	13	15	27	3,774,095	4,240,302	8,014,397
17	2029	953,263	357,820	1,311,083	953,263	357,820	1,311,083	943,730	354,242	1,297,972	9,533	3,578	13,111	14	15	28	3,961,412	4,296,748	8,258,160
18	2030	-	-	-	-	-	-	-	-	-	-	-	-	14	15	28	4,046,778	4,268,257	8,315,035
19	2031	-	-	-	-	-	-	-	-	-	-	-	-	14	14	28	4,004,060	4,169,310	8,173,370
20	2032	-	-	-	-	-	-	-	-	-	-	-	-	13	13	27	3,874,273	3,919,549	7,793,822
21	2033	-	-	-	-	-	-	-	-	-	-	-	-	13	12	25	3,662,368	3,559,585	7,221,953
22	2034	-	-	-	-	-	-	-	-	-	-	-	-	12	11	23	3,473,342	3,218,604	6,691,946
23	2035	-	-	-	-	-	-	-	-	-	-	-	-	11	10	21	3,258,800	2,830,874	6,089,674
24	2036	-	-	-	-	-	-	-	-	-	-	-	-	10	8	19	3,017,046	2,440,535	5,457,582
25	2037	-	-	-	-	-	-	-	-	-	-	-	-	10	7	17	2,809,233	2,115,438	4,924,671
26	2038	-	-	-	-	-	-	-	-	-	-	-	-	9	6	15	2,595,262	1,796,890	4,392,152
27	2039	-	-	-	-	-	-	-	-	-	-	-	-	8	5	13	2,370,235	1,518,182	3,888,418
28	2040	-	-	-	-	-	-	-	-	-	-	-	-	7	4	12	2,147,121	1,296,649	3,443,770
29	2041	-	-	-	-	-	-	-	-	-	-	-	-	6	4	10	1,884,039	1,044,068	2,928,107
30	2042	-	-	-	-	-	-	-	-	-	-	-	-	5	3	8	1,580,583	761,168	2,341,751
31	2043	-	-	-	-	-	-	-	-	-	-	-	-	5	2	6	1,327,554	557,402	1,884,956
32	2044	-	-	-	-	-	-	-	-	-	-	-	-	4	1	5	1,125,868	421,057	1,546,925
33	2045	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4	918,390	318,116	1,236,507
34	2046	-	-	-	-	-	-	-	-	-	-	-	-	2	1	3	729,627	254,331	983,958
35	2047	-	-	-	-	-	-	-	-	-	-	-	-	2	1	3	581,553	204,452	786,006
36	2048	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	443,450	157,004	600,454
37	2049	-	-	-	-	-	-	-	-	-	-	-	-	1	0	2	325,555	116,002	441,558
38	2050	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	239,503	86,124	325,627
39	2051	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	163,226	59,161	222,387
40	2052	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	107,156	39,225	146,380
41	2053	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	64,514	23,898	88,411
42	2054	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	29,693	11,146	40,839
																NPV 42 years	$25,268,569	$30,502,071	$55,770,640

8. Calculate the implementation and government costs (where relevant) for each option.

Table 40 Costs of fitting BAS

Cost related to:	Estimated cost ($)	Option	Notes	Cost Impact
Implementation of BAS – min	45	all	per vehicle	Business
Implementation of BAS – max	170	all	per vehicle	Business
Information campaigns – targeted awareness	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
Fleet purchasing policies	50,000	3	per year	Government
Implement and maintain regulation	50,000	6	per year	Government

Table 41 Option 2(a): User information campaigns – targeted awareness

Year		Fitment Costs			Government Costs		
		Min 45	Max 170	Average	Min	Max	Average
0	2012	-	-	-	-	-	-
1	2013	2,106,249	7,956,941	5,031,595	3,000,000	3,000,000	3,000,000
2	2014	1,519,938	5,741,989	3,630,963	3,000,000	3,000,000	3,000,000
3	2015	883,352	3,337,109	2,110,230	3,000,000	3,000,000	3,000,000
4	2016	193,408	730,651	462,029	3,000,000	3,000,000	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	$4,164,658	$15,733,154	$9,948,906	$10,161,634	$10,161,634	$10,161,634

Table 42 Option 2(b): User information campaigns – advertising

Year		Fitment Costs			Government Costs		
		Min	Max	Average	Min	Max	Average
		45	170				
0	2012	-	-	-	-	-	-
1	2013	3,038,970	11,480,553	7,259,762	18,000,000	18,000,000	18,000,000
2	2014	2,603,192	9,834,281	6,218,737	18,000,000	18,000,000	18,000,000
3	2015	2,086,053	7,880,644	4,983,348	18,000,000	18,000,000	18,000,000
4	2016	1,553,737	5,869,674	3,711,706	18,000,000	18,000,000	18,000,000
5	2017	1,006,534	3,802,462	2,404,498	18,000,000	18,000,000	18,000,000
6	2018	444,688	1,679,932	1,062,310	18,000,000	18,000,000	18,000,000
7	2019	437,039	1,651,038	1,044,038	18,000,000	18,000,000	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		$9,288,192	$35,088,726	$22,188,459	$97,007,209	$97,007,209	$97,007,209

Table 43 Option 3: Fleet purchasing policies

Year		Fitment Costs			Government Costs		
		Min 45	Max 170	Average	Min	Max	Average
0	2012	-	-	-	-	-	-
1	2013	730,740	2,760,571	1,745,655	50,000	50,000	50,000
2	2014	89,408	337,764	213,586	50,000	50,000	50,000
3	2015	-	-	-	-	-	-
4	2016	-	-	-	-	-	-
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	$761,027	$2,874,990	$1,818,008	$90,401	$90,401	$90,401

Table 44 Option 6: Mandatory standards under the MVSA (regulation)

Year		Fitment Costs			Government Costs		
		Min 45	Max 170	Average	Min	Max	Average
0	2012	-	-	-	-	-	-
1	2013	-	-	-	50,000	50,000	50,000
2	2014	-	-	-	50,000	50,000	50,000
3	2015	1,908,678	7,210,563	4,559,621	50,000	50,000	50,000
4	2016	3,925,269	14,828,793	9,377,031	50,000	50,000	50,000
5	2017	2,711,728	10,244,307	6,478,018	50,000	50,000	50,000
6	2018	1,430,443	5,403,896	3,417,169	50,000	50,000	50,000
7	2019	986,622	3,727,238	2,356,930	50,000	50,000	50,000
8	2020	505,352	1,909,109	1,207,231	50,000	50,000	50,000
9	2021	513,800	1,941,022	1,227,411	50,000	50,000	50,000
10	2022	522,468	1,973,766	1,248,117	50,000	50,000	50,000
11	2023	531,363	2,007,372	1,269,367	50,000	50,000	50,000
12	2024	540,494	2,041,868	1,291,181	50,000	50,000	50,000
13	2025	549,870	2,077,285	1,313,578	50,000	50,000	50,000
14	2026	559,498	2,113,657	1,336,577	50,000	50,000	50,000
15	2027	569,387	2,151,017	1,360,202	50,000	50,000	50,000
16	2028	579,547	2,189,399	1,384,473	50,000	50,000	50,000
17	2029	589,987	2,228,840	1,409,414	50,000	50,000	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	$10,419,867	$39,363,942	$24,891,905	$488,161	$488,161	$488,161

9. Sum and discount all the 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 and serious injuries saved.

Table 45 Option 2(a): User information campaigns – targeted awareness

Year		Net Benefits			Lives Saved	Serious Injuries Saved
		Min	Max	Average		
0	2012	-	-	-	-	-
1	2013	-10,520,361	-4,669,669	-7,595,015	0.03	0.58
2	2014	-7,373,301	-3,151,250	-5,262,275	0.08	1.83
3	2015	-4,385,154	-1,931,398	-3,158,276	0.12	2.61
4	2016	-1,466,750	-929,506	-1,198,128	0.13	3.02
5	2017	2,342,716	2,342,716	2,342,716	0.14	3.13
6	2018	2,368,191	2,368,191	2,368,191	0.14	3.16
7	2019	2,345,027	2,345,027	2,345,027	0.14	3.13
8	2020	2,232,070	2,232,070	2,232,070	0.13	2.98
9	2021	2,159,652	2,159,652	2,159,652	0.13	2.88
10	2022	2,182,631	2,182,631	2,182,631	0.13	2.91
11	2023	2,309,415	2,309,415	2,309,415	0.14	3.08
12	2024	2,428,790	2,428,790	2,428,790	0.14	3.24
13	2025	2,511,202	2,511,202	2,511,202	0.15	3.35
14	2026	2,512,609	2,512,609	2,512,609	0.15	3.35
15	2027	2,431,830	2,431,830	2,431,830	0.14	3.25
16	2028	2,389,364	2,389,364	2,389,364	0.14	3.19
17	2029	2,270,133	2,270,133	2,270,133	0.13	3.03
18	2030	1,991,682	1,991,682	1,991,682	0.12	2.66
19	2031	1,745,945	1,745,945	1,745,945	0.10	2.33
20	2032	1,504,725	1,504,725	1,504,725	0.09	2.01
21	2033	1,226,102	1,226,102	1,226,102	0.07	1.64
22	2034	1,009,421	1,009,421	1,009,421	0.06	1.35
23	2035	793,204	793,204	793,204	0.05	1.06
24	2036	615,209	615,209	615,209	0.04	0.82
25	2037	478,534	478,534	478,534	0.03	0.64
26	2038	385,098	385,098	385,098	0.02	0.51
27	2039	197,033	197,033	197,033	0.01	0.26
28	2040	76,978	76,978	76,978	0.00	0.10
29	2041	13,388	13,388	13,388	0.00	0.02
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			**3**	**62**
		-$3,604,132	**$7,964,363**	**$2,180,116**		
		BCR				
		0.9	**1.6**	**1.2**		

Table 46 Option 2(b): User information campaigns – advertising

Year		Net Benefits			Lives Saved	Serious Injuries Saved
		Min	Max	Average		
0	2012	-	-	-	-	-
1	2013	- 28,850,640	- 20,409,056	- 24,629,848	0.04	0.84
2	2014	- 25,774,470	- 18,543,381	- 22,158,926	0.12	2.75
3	2015	- 22,690,899	- 16,896,308	- 19,793,603	0.19	4.26
4	2016	- 19,736,667	- 15,420,730	- 17,578,699	0.24	5.52
5	2017	- 16,982,167	- 14,186,239	- 15,584,203	0.29	6.43
6	2018	- 14,443,968	- 13,208,724	- 13,826,346	0.31	6.99
7	2019	- 14,217,542	- 13,003,544	- 13,610,543	0.32	7.25
8	2020	5,410,899	5,410,899	5,410,899	0.32	7.22
9	2021	5,282,499	5,282,499	5,282,499	0.31	7.05
10	2022	5,274,726	5,274,726	5,274,726	0.31	7.04
11	2023	5,403,203	5,403,203	5,403,203	0.32	7.21
12	2024	5,570,229	5,570,229	5,570,229	0.33	7.44
13	2025	5,742,232	5,742,232	5,742,232	0.34	7.67
14	2026	5,824,158	5,824,158	5,824,158	0.34	7.77
15	2027	5,782,845	5,782,845	5,782,845	0.34	7.72
16	2028	5,752,164	5,752,164	5,752,164	0.34	7.68
17	2029	5,571,519	5,571,519	5,571,519	0.33	7.44
18	2030	5,110,612	5,110,612	5,110,612	0.30	6.82
19	2031	4,652,472	4,652,472	4,652,472	0.28	6.21
20	2032	4,140,424	4,140,424	4,140,424	0.25	5.53
21	2033	3,512,766	3,512,766	3,512,766	0.21	4.69
22	2034	2,978,296	2,978,296	2,978,296	0.18	3.98
23	2035	2,439,618	2,439,618	2,439,618	0.14	3.26
24	2036	1,941,016	1,941,016	1,941,016	0.11	2.59
25	2037	1,549,580	1,549,580	1,549,580	0.09	2.07
26	2038	1,238,683	1,238,683	1,238,683	0.07	1.65
27	2039	812,606	812,606	812,606	0.05	1.08
28	2040	511,720	511,720	511,720	0.03	0.68
29	2041	293,016	293,016	293,016	0.02	0.39
30	2042	150,169	150,169	150,169	0.01	0.20
31	2043	66,556	66,556	66,556	0.00	0.09
32	2044	30,252	30,252	30,252	0.00	0.04
33	2045	-	-	-	-	-
34	2046	-	-	-	-	-
35	2047	-	-	-	-	-
36	2048	-	-	-	-	-
37	2049	-	-	-	-	-
38	2050	-	-	-	-	-
39	2051	-	-	-	-	-
40	2052	-	-	-	-	-
41	2053	-	-	-	-	-
42	2054	-	-	-	-	-
		NPV Benefits			**7**	**148**
		-$82,382,400	**-$56,581,866**	**-$69,482,133**		
		BCR				
		0.4	**0.5**	**0.4**		

Table 47 Option 3: Fleet purchasing policies

Year		Net Benefits Min	Net Benefits Max	Net Benefits Average	Lives Saved	Serious Injuries Saved
0	2012	-	-	-	-	-
1	2013	-2,659,105	-629,273	-1,644,189	0.01	0.20
2	2014	-3,684	244,672	120,494	0.02	0.51
3	2015	394,619	394,619	394,619	0.02	0.53
4	2016	408,534	408,534	408,534	0.02	0.55
5	2017	413,298	413,298	413,298	0.02	0.55
6	2018	415,240	415,240	415,240	0.02	0.55
7	2019	403,608	403,608	403,608	0.02	0.54
8	2020	370,578	370,578	370,578	0.02	0.49
9	2021	369,194	369,194	369,194	0.02	0.49
10	2022	390,012	390,012	390,012	0.02	0.52
11	2023	423,564	423,564	423,564	0.03	0.57
12	2024	437,545	437,545	437,545	0.03	0.58
13	2025	445,132	445,132	445,132	0.03	0.59
14	2026	434,699	434,699	434,699	0.03	0.58
15	2027	409,796	409,796	409,796	0.02	0.55
16	2028	413,284	413,284	413,284	0.02	0.55
17	2029	379,001	379,001	379,001	0.02	0.51
18	2030	302,898	302,898	302,898	0.02	0.40
19	2031	274,799	274,799	274,799	0.02	0.37
20	2032	236,021	236,021	236,021	0.01	0.32
21	2033	175,872	175,872	175,872	0.01	0.23
22	2034	151,119	151,119	151,119	0.01	0.20
23	2035	113,557	113,557	113,557	0.01	0.15
24	2036	85,636	85,636	85,636	0.01	0.11
25	2037	68,837	68,837	68,837	0.00	0.09
26	2038	57,901	57,901	57,901	0.00	0.08
27	2039	6,189	6,189	6,189	0.00	0.01
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 Benefits			**0**	**11**
		$1,107,881	**$3,221,844**	**$2,164,862**		
		BCR				
		1.4	**4.8**	**3.1**		

Table 48 Option 6: Mandatory standards under the MVSA (regulation)

Year		Net Benefits			Lives Saved	Serious Injuries Saved
		Min	Max	Average		
0	2012	-	-	-	-	-
1	2013	-50,000	-50,000	-50,000	-	-
2	2014	-50,000	-50,000	-50,000	-	-
3	2015	-6,864,935	-1,563,050	-4,213,992	0.02	0.53
4	2016	-13,110,365	-2,206,840	-7,658,603	0.10	2.36
5	2017	-6,854,719	677,859	-3,088,430	0.20	4.59
6	2018	-966,110	3,007,343	1,020,617	0.27	5.99
7	2019	1,368,450	4,109,066	2,738,758	0.30	6.87
8	2020	3,627,832	5,031,589	4,329,710	0.33	7.46
9	2021	3,848,494	5,275,716	4,562,105	0.35	7.80
10	2022	3,950,548	5,401,846	4,676,197	0.35	7.98
11	2023	3,979,966	5,455,974	4,717,970	0.36	8.06
12	2024	4,143,773	5,645,146	4,894,460	0.37	8.32
13	2025	4,506,392	6,033,808	5,270,100	0.39	8.86
14	2026	4,973,668	6,527,828	5,750,748	0.42	9.53
15	2027	5,421,176	7,002,806	6,211,991	0.45	10.18
16	2028	5,774,997	7,384,850	6,579,924	0.47	10.70
17	2029	5,979,320	7,618,173	6,798,746	0.49	11.02
18	2030	8,315,035	8,315,035	8,315,035	0.49	11.10
19	2031	8,173,370	8,173,370	8,173,370	0.48	10.91
20	2032	7,793,822	7,793,822	7,793,822	0.46	10.40
21	2033	7,221,953	7,221,953	7,221,953	0.43	9.64
22	2034	6,691,946	6,691,946	6,691,946	0.40	8.93
23	2035	6,089,674	6,089,674	6,089,674	0.36	8.13
24	2036	5,457,582	5,457,582	5,457,582	0.32	7.29
25	2037	4,924,671	4,924,671	4,924,671	0.29	6.57
26	2038	4,392,152	4,392,152	4,392,152	0.26	5.86
27	2039	3,888,418	3,888,418	3,888,418	0.23	5.19
28	2040	3,443,770	3,443,770	3,443,770	0.20	4.60
29	2041	2,928,107	2,928,107	2,928,107	0.17	3.91
30	2042	2,341,751	2,341,751	2,341,751	0.14	3.13
31	2043	1,884,956	1,884,956	1,884,956	0.11	2.52
32	2044	1,546,925	1,546,925	1,546,925	0.09	2.07
33	2045	1,236,507	1,236,507	1,236,507	0.07	1.65
34	2046	983,958	983,958	983,958	0.06	1.31
35	2047	786,006	786,006	786,006	0.05	1.05
36	2048	600,454	600,454	600,454	0.04	0.80
37	2049	441,558	441,558	441,558	0.03	0.59
38	2050	325,627	325,627	325,627	0.02	0.43
39	2051	222,387	222,387	222,387	0.01	0.30
40	2052	146,380	146,380	146,380	0.01	0.20
41	2053	88,411	88,411	88,411	0.01	0.12
42	2054	40,839	40,839	40,839	0.00	0.05
		NPV Benefits			**10**	**217**
		$15,918,537	**$44,862,612**	**$30,390,575**		
		BCR				
		1.4	**5.1**	**3.3**		

Summary

Table 49 Option 2(a): User information campaigns – targeted awareness (total 77 per cent effectiveness, $3m per year)

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$7,964,363	$4,164,658	$10,161,634	1.6		
Likely Case	**$2,180,116**	**$9,948,906**	**$10,161,634**	**1.2**	**3**	**62**
Worst Case	-$3,604,132	$15,733,154	$10,161,634	0.9		

Table 50 Option 2(b): User information campaigns – advertising (up to +8 per cent effectiveness, $18m per year)

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	-$56,581,866	$9,288,192	$97,007,209	0.5		
Likely Case	**-$69,482,133**	**$22,188,459**	**$97,007,209**	**0.4**	**7**	**148**
Worst Case	-$82,382,400	$35,088,726	$97,007,209	0.4		

Table 51 Option 3: Fleet purchasing policies (+16 per cent effectiveness on initial voluntary rate for LCVs, $50,000 per year)

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$3,221,844	$761,027	$90,401	4.8		
Likely Case	**$2,164,862**	**$1,818,008**	**$90,401**	**3.1**	**0**	**11**
Worst Case	$1,107,881	$2,874,990	$90,401	1.4		

Table 52 Option 6: Mandatory standards under the MVSA (total 100 per cent effectiveness)

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$44,862,612	$10,419,867	$488,161	5.1		
Likely Case	**$30,390,575**	**$24,891,905**	**$488,161**	**3.3**	**10**	**217**
Worst Case	$15,918,537	$39,363,942	$488,161	1.4		

Best Case - 7% discount rate, minimum costs
Likely Case - 7% discount rate, average costs
Worst Case - 7% discount rate, maximum costs

APPENDIX 9 - BENEFIT- COST ANALYSIS – SENSITIVITIES

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

(a) Base case

Table 53 Basic output with base case effectiveness, crash rate and discount rate

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$44,862,612	$10,419,867	$488,161	5.1		
Likely Case	**$30,390,575**	**$24,891,905**	**$488,161**	**3.3**	**10**	**217**
Worst Case	$15,918,537	$39,363,942	$488,161	1.4		

(b) Changes to effectiveness

Table 54 Output with effectiveness of 6.7 per cent (20 per cent reduction)

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$33,708,484	$10,419,867	$488,161	4.1		
Likely Case	**$19,236,447**	**$24,891,905**	**$488,161**	**2.6**	**8**	**174**
Worst Case	$4,764,409	$39,363,942	$488,161	1.1		

Table 55 Output with effectiveness of 10.1 per cent (20 per cent increase)

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$56,016,740	$10,419,867	$488,161	6.1		
Likely Case	**$41,544,703**	**$24,891,905**	**$488,161**	**3.9**	**12**	**260**
Worst Case	$27,072,665	$39,363,942	$488,161	1.7		

(c) Changes to crash rate

Table 56 Output with rate of pedestrian and cyclist crashes reduced by 20 per cent

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$33,708,484	$10,419,867	$488,161	4.1		
Likely Case	**$19,236,447**	**$24,891,905**	**$488,161**	**2.6**	**8**	**174**
Worst Case	$4,764,409	$39,363,942	$488,161	1.1		

Table 57 Output with rate of pedestrian and cyclist crashes reduced by 50 per cent

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$16,977,292	$10,419,867	$488,161	2.6		
Likely Case	**$2,505,254**	**$24,891,905**	**$488,161**	**1.6**	**5**	**108**
Worst Case	-$11,966,783	$39,363,942	$488,161	0.7		

(d) Changes to the discount rate

Table 58 Output with discount rate of 3 per cent

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$84,955,526	$13,345,952	$658,306	7.1		
Likely Case	**$66,419,482**	**$31,881,996**	**$658,306**	**4.5**	**10**	**217**
Worst Case	$47,883,438	$50,418,040	$658,306	1.9		

Table 59 Output with discount rate of 10 per cent

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$29,137,846	$8,811,854	$401,078	4.2		
Likely Case	**$16,899,160**	**$21,050,539**	**$401,078**	**2.7**	**10**	**217**
Worst Case	$4,660,475	$33,289,225	$401,078	1.1		

(e) Changes to the implementation timetable

Table 60 Output with implementation timetable of 2015 for new models and 2017 for all models

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$39,461,536	$9,178,907	$488,161	5.1		
Likely Case	**$26,713,054**	**$21,927,389**	**$488,161**	**3.2**	**9**	**195**
Worst Case	$13,964,572	$34,675,871	$488,161	1.4		

(f) Changes to the BAU fitment rates

Table 61 Output with alternative BAU fitment rates (70% - current, 90% - end of 2013*, 100% - 2018**)

	Net Benefit	Cost to Business	Cost to Government	Benefit Cost Ratio	Lives Saved	Serious Injuries Saved
Best Case	$26,876,215	$6,287,283	$488,161	5.0		
Likely Case	**$18,143,877**	**$15,019,621**	**$488,161**	**3.2**	**6**	**142**
Worst Case	$9,411,539	$23,751,959	$488,161	1.4		

* modelled as beginning of 2014

** i.e. 99% given that the FCAI covers most but not all 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 potential benefits were based on the identified cost of a fatality, serious injury and minor injury for a vulnerable road user crash in Australia. The ratio between fatalities and serious injuries in Australia for these crashes was known, however, the ratio to minor injuries could not be obtained at a national level. Therefore, this ratio was determined from statistics for pedestrian and cyclist crashes in Victoria, sourced from the Victorian CrashStats database. Given that the ratio of serious injuries to fatalities matched the national data reasonably well, it was assumed that the ratio calculated from the Victorian statistics is representative of the national case.

2. The effectiveness of BAS was based on a study conducted by the Transport Research Laboratory in the United Kingdom. In line with the assumptions made in this study, it was assumed that BAS would not reduce the frequency of minor injuries in cases where the impact speed was reduced. However, where BAS would enable the car to stop before reaching the pedestrian, it was assumed a minor injury could be prevented. It was also assumed that the impact speed profiles for pedestrian collisions in Australia and Europe are similar. This was supported by statistics for pedestrian fatalities which showed that, in Europe, approximately 35 per cent of fatalities occurred at impact speeds of 50km/h or less, while in Australia, approximately 29 per cent of fatalities occurred in areas with a posted speed limit of 50km/h or below. No adjustment was made to the effectiveness based on these statistics as the Australian data was for the posted speed limit and not impact speed.

3. A discount rate of 7 per cent was assumed, this being in line with similar studies. However, a rate of 10 per cent was used as part of the sensitivity checks. The expected crash life of a vehicle was set at 26 years as per the historical data used for the calculations. Refer Appendix 5 - Benefit-Cost Analysis – Methodology. This would not affect the relative merits of the options but may change their final values slightly.

4. A historically based fleet profile was used to adjust the contribution that each vehicle fitted with BAS 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 Appendix 5 - Benefit-Cost Analysis – Methodology. This would not affect the relative merits of the options but may change how rapidly the benefits would be realised and may change their final values slightly.

5. It was assumed that the rate of fatalities and injuries would remain constant for the foreseeable future. This assumption was discussed in Section 2 and tested in the sensitivity analysis.

APPENDIX 11 - TECHNICAL LIAISON GROUP (TLG)

Organisation
Manufacturer Representatives
Australian Road Transport Suppliers Association Bus Industry Confederation Commercial Vehicle Industry Association of Australia Federal Chamber of Automotive Industries Federation of Automotive Product Manufacturers Truck Industry Council
Consumer Representatives Australian Automobile Association Australian Automotive Aftermarket Association Australian Motorcycle Council Australian Trucking Association
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 Office of Regulatory Services, Justice and Community Safety, Australian Capital Territory Department of Infrastructure, Energy and Resources, Tasmania Department of Lands & Planning, Northern Territory New Zealand Transport Agency
Inter Governmental Agency
National Transport Commission

APPENDIX 12 - ACRONYMS

4WD	Four-Wheel Drive
AAA	Australian Automobile Association
ABS	Anti-lock Braking System
ADR	Australian Design Rule
AFMA	Australasian Fleet Managers Association
ANCAP	Australasian New Car Assessment Program
ATC	Australian Transport Council
BAS	Brake Assist Systems
BAU	Business as Usual
BCR	Benefit-Cost Ratio
BTE	Bureau of Transport Economics
COAG	Council of Australian Governments
DOIT	Department of Infrastructure and Transport
ESC	Electronic Stability Control
EU	European Union
EuroNCAP	European New Car Assessment Programme
FAPM	Federation of Automotive Product Manufacturers
FCAI	Federal Chamber of Automotive Industries
GVM	Gross Vehicle Mass
LCV	Light Commercial Vehicle
MVSA	Motor Vehicle Standards Act 1989
NRMA	National Roads and Motorists' Association
NRSS	National Road Safety Strategy 2011-2020
NTC	National Transport Commission
RIS	Regulation Impact Statement
SUV	Sports Utility Vehicle
SVSEG	Strategic Vehicle Safety and Environment Group
TISOC	Transport and Infrastructure Senior Officials' Committee
TLG	Technical Liaison Group
TRL	Transport Research Laboratory
UN	United Nations
UNECE	United Nations Economic Commission for Europe
WTO	World Trade Organisation

APPENDIX 13 - PUBLIC COMMENT

A summary of the public comment received is provided in Table 62 along with departmental responses. Where comments are discussed further within the RIS, page references are also included.

Table 62 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 BAS on all light vehicles and supports the proposed implementation timing of 2015 for new models and 2016 for all models.	-	1. 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.	35, 45	1. The benefit-cost analysis shows that mandating BAS for light vehicles would generate net benefits of $30m (for a 15-year regulation period) over and above the BAU case. The recommended requirements for BAS are those contained in the international standard UN R 13-H.
	2. The implementation dates of any ADR should be (not before): • 1 November 2015 for new models. • 1 November 2017 for all models.	35, 45	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 a well-established one. However, the final implementation dates may be subject to further negotiations 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 fitting rates of BAS in LCVs are only at 45 per cent. A more recent FCAI survey indicates the fitting rate is currently above 70 per cent, is expected to be over 90 per cent by the end of this year, and will reach 100 per cent fitting rate between 2016 and 2018.	35, 45	3. The benefit-cost analysis was based on current and expected future fitment rates as advised by the FCAI at the time of writing. Further sensitivity testing has shown 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 proposal to introduce a mandatory standard under the MVSA for BAS (Option 6).	-	1. Noted.
	2. Wishes to discuss the introduction of Global Technical Regulation 9 – Pedestrian Safety at SVSEG or other forums and suggests that the in-service impacts of mandating BAS 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.