Australian Government

Department of Transport and Regional Services

Regulation Impact Statement

ADR 59/00
Standards for Omnibus Rollover Strength

FINAL January 2007

This Regulation Impact Statement deals with the standards for omnibus rollover strength for MD and ME vehicle categories. The design rules have been reviewed proposing alignment with the requirements of the United Nations Economic Commission for Europe (UNECE) regulations.

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SUMMARY

In Australia, there are a number of legislated Australian Design Rules (ADRs) that have been introduced in order to reduce the cost to the community from road crashes. These ADRs set out requirements for road vehicle safety, anti-theft and emissions. They apply to new vehicles when supplied to the Australian market and are enforced through the Motor Vehicle Standards Act 1989 (MVSA). They are subject to review every ten years to ensure they remain relevant, cost effective, and do not become a barrier to importation of safer vehicles and vehicle components.

This particular Regulation Impact Statement (RIS) examines present Australian Government regulations for cost-effective regulation of the requirements for omnibuses of MD and ME vehicle category. An omnibus is defined as a passenger vehicle having more than 9 seating positions, including that of the driver. This review was carried out in August and October 2006.

ADR 59/00 – Standards for Omnibus Rollover Strength applies to the following new bus categories with more than 16 passengers in addition to the driver and crew, (excluding low floor height route service buses);

- MD2 ≤ 3.5t GVM
- MD3 > 3.5t, ≤ 4.5t GVM
- MD4 > 4.5t, ≤ 5.0t GVM
- ME > 5.0t GVM

ADR 59/00 came into force in July 1992 for the above bus categories to be constructed to a standard of superstructure strength for the preservation of a zone of protection for the bus occupants in the event of a rollover incident.

The Australian registered bus fleet was 71,314 units as at 2004; - source Australian Bureau of Statistics (ABS). Within the national fleet there are approximately 39,000 units that are ADR 59/00 compliant with approximately 26,000 units that do not comply due to the bus being built before July 1992 and buses that meet the exemption provisions.

Currently, this ADR is conditionally harmonised with UNECE Regulation 66/00 Large Passenger Vehicles with Regards to the Strength of their Superstructure.

Bus travel in Australia is known to be a safe form of transporting passengers when compared with other types of road transport. However, when a bus accident does occur the number of people injured could be high due to the comparatively large number of passengers carried on a bus. This tends to focus media attention and raise the public's expectations about improving occupant protection standards.

Bus occupants accounted for only a very small proportion (0.6 per cent) of all road fatalities between 1990 and 1998 (17,840) and hospitalisations between 1990 and 1997 (178,567). During stated periods there were 103 fatalities and 988 hospitalisations amongst bus occupants.

The problem of occupant protection in buses was identified after a number of fatal accidents between 1987 and 1989 where a total of 71 fatalities and 108 hospitalisations occurred from a

combination of inadequate bus superstructure strength and seat strength together with the lack of seat belts in tour and coach type buses.

The Australian government acted to regulate in 1992 after it was recognised that a system failure in bus design was the cause of significant trauma to the occupants of tour and coach buses as the result of those accidents. The Vehicle Safety Standards branch acted after consultation with the Australian Motor vehicle Certification Board and the Vehicle Safety Advisory Council to create an ADR which harmonised with the existing international regulation UNECE R 66 – Large Passenger Vehicles with Regards to the Strength of their Superstructure. The UNECE regulation is currently applied by 25 European Union members for their large buses used in route service and coach/tour operation.

Negative externalities can be expected because the consumer who makes the decision to purchase a product does not bear all of the costs. When a vehicle is involved in a road crash, the highest portion of the road trauma cost is borne by the community, rather than by the vehicle owner or the vehicle manufacturer. In the absence of regulation, some consumers may wish to maximise their private benefits by trading off vehicle price against safety features. The social costs would likely result in a net cost rather than a net benefit to the community.

It is assumed that the existing regulations contribute to reducing the cost to the community from road crashes, which has been estimated as $15 billion per year. Directly attributing the proportion of this cost to these regulations is not possible because pre-implementation economic data is generally not available. The only practical means of determining the contribution would be to remove the regulations and observe the result. This is considered an unacceptable risk.

The objective of the government review is to determine if there is a cost effective approach to ensure the provision of safe occupant zones in buses either by regulatory intervention (in this case by retaining ADR 59) or non-regulatory measures.

The aim of the ADR review is four-fold:

- to identify whether existing standards are relevant in the light of on-going developments in automotive safety technology, given the fact that some of the standards are in a mature stage,
- if existing standards are relevant to identify any refinements required to ensure their progression and positive contribution in the standards life cycle,
- to ensure standards do not impose excessive requirements on business, that they are cost effective and take account of community, social, economic, environmental, health and safety concerns, and
- to pursue where appropriate harmonisation with international standards, rather than with regional or national standards.

The Options reviewed were:

Option 1 Retain the present conditionally harmonised rule that incorporates UNECE R66/00 and retain the low floor height exemption and include UNECE R66/01 in the alternative standard provisions.

Option 2 Fully harmonise with the later edition UNECE R66/01 with no exclusions for low floor height buses.

Option 3 Conditionally harmonise with UNECE R66/01 and retain the low floor height exemption.

Option 4 Delete the regulation for omnibus rollover strength and the industry to adopt a code of practice.

The groups affected were identified as including consumers (vehicle users, other road users, accident victim families/carers), business (vehicle manufacturers/importers, component manufacturers/importers and test facilities, the private health and health insurance system, the private legal system, the employment market) and the Government (emergency services, public health and legal systems, Commonwealth transport agencies performing vehicle compliance functions and state and territory transport agencies performing a review or oversight function).

The regulatory options are similar in respect of the provision of occupant protection however, the magnitude and distribution of the expected costs and benefits are not. It was found that the cost to vehicle manufacturers and operators to comply with later edition of UNECE R 66/01 - Options 2 and 3, would impose new development, compliance and operational cost without any measurable improvement in benefits to the community from reduced costs in road trauma. The removal of ADR 59/00 (Option 4) has unknown factors as the effect will depend upon what changes and if the vehicle manufacturers maintain the standard as a code of practice and if the state and territory jurisdictions introduce separate regulations to fill the gap created by the removal of ADR 59/00.

The table below is a comparison between relative costs of options based on 2005 new vehicle registration volume for ADR 59 applicable bus categories.

	Option 1	Option 2	Option 3	Option 4
Total Cost	$1.434 million	$2.698 million	$2.058 million	unknown
Option 1 Cost	$1.434 million	$1.434 million	$1.434 million	$1.434 million
Difference		$1.264 million increase	$0.624 million increase	unknown

The Department undertakes public consultation on behalf of the Minister for Transport and Regional Services. Under Part 2, section 8 of the Motor Vehicle Standards Act 1989 the Minister may consult with state and territory agencies responsible for road safety, organizations and persons involved in the road vehicle industry and organizations representing road vehicle users before determining the design rule.

The Department has consulted with the Bus Single Issue Working Group (See Attachment 1), regarding the review of ADR 59. The members agreed with the options as outlined in this RIS.

The call for public comment was advertised on 23 August 2006 in The Australian and the Government Gazette with the comment period running for 60 days and ending in October 2006. Four responses were received with the adoption of Option 1 supported by three of the four respondents. See Appendix 1.

The one respondent who supported Option 2 – full harmonisation with UNECE R66/01 and to include low floor height buses gave reasons that all Australian cities have built high speed (80 to 100 kph) roads within their urban road environment and low floor height route service buses could operate on the these roads and they consider that there is a risk of rollover, even though a low risk. The ADR should take the changed road environment into consideration and attempt to set standards that will be proactive in terms of improving safety.

The points raised by the respondent had been considered in the original RIS at clause 7.3 – Option 2 and as route service bus operation is regulated by the state and territory governments, the respective jurisdiction can assess the risks of low floor height buses operating on the high speed routes and specify ADR 59 as required.

In conclusion, as the cost of Option 1 is the least amongst the four options, the adoption of Option 1 is therefore recommended. Option 1 has the least impact on the vehicle manufactures and helps to reduce road trauma by correcting for market failure. The acceptance of UNECE R66/01 as an alternative standard allows for overseas manufactures to access the market with lower compliance costs and promotes competition by increasing the number of players in the market.

The proposed regulation will be endorsed as an ADR. It will be given force in law in Australia by making them National Standards (ADRs) under the *Motor Vehicle Standards Act 1989*. It will be implemented under the type approval arrangements for new vehicles administered by the Vehicle Safety Standards Branch of the Department of Transport and Regional Services.

The ADRs are national standards under the *Motor Vehicle Standards Act 1989* and are therefore subject to complete review on a 10 year cycle.

1.0 STATEMENT OF THE PROBLEM

1.1 Introduction

This Regulation Impact Statement (RIS) examines a present Australian government regulation as required by and to the principles and guidelines as set by the Council of Australian Governments (COAG).

The Australian Government regulates vehicle standards through the application of the Australian Design Rules (ADRs) under the provisions of the Motor Vehicle Standards Act 1989. The objective of the regulations is to achieve uniform national vehicle standards that apply to new vehicles when they begin to be used in transport in Australia. The ADRs cover vehicle safety, emissions and anti-theft.

The Australian Government has undertaken to review ADR 59/00 to ensure that the regulation is relevant, cost effective and does not provide a barrier to the importation of safe vehicles and components. Furthermore, the intention is to assess the harmonisation with internationally recognised UNECE regulations as required under the agreements with the General Agreement on Tariffs and Trade/World Trade Organisation Agreement on Technical Barriers to Trade.

ADR 59/00 - Standards for Omnibus Rollover Strength requires all applicable new buses are constructed to a standard of superstructure strength for the preservation of a zone of protection for the bus occupants in the event of a rollover incident.

Currently, this ADR is conditionally harmonised with UNECE Regulation 66/00 Large Passenger Vehicles with Regards to the Strength of their Superstructure.

The general objective of Australian government action is:

"To establish the most cost effective design measures to reduce trauma for omnibus passengers"

The objective of the government review is to determine if there is a cost effective approach to ensure the provision of safe occupant zones in buses either by regulatory intervention (in this case by retaining ADR 59) or non-regulatory measures.

An omnibus as defined by the Australian Design Rules is *"a passenger vehicle having more that 9 seating positions, including that of the driver"*.

The most efficient form of transporting large numbers of passengers by road is the vehicle classified as an omnibus.

Omnibuses are categorised primarily by vehicle mass and seating capacity under the provisions of the ADRs. Certain functional characteristics may also be used to selectively apply particular regulatory requirements which are generally applied by the States and Territories by their vehicle use regulations**.**

- Route or scheduled buses (suburban buses), are generally medium to large vehicles with seating for more than 45 passengers and provision for standing passengers with an approximate passenger capacity of around 77.
- Coaches or tourist buses (interstate & regional charter) are generally large vehicles with around 47 seating positions. Long distance coaches are conveniently identified by seating arrangements which typically provide for adequate leg room and the high seatbacks incorporating headrests. These features if present in a bus would trigger the need for higher occupant protection standards requiring lap/sash seatbelts in all seating positions.

From time-to-time there have been calls for special treatment for school buses, particularly in relation to the provision of seatbelts. However, it should be recognised that the term school bus is a vehicle use term and is not a recognised category in the ADRs. The state and territory governments regulate school buses under their vehicle use regulations and the management of school bus routes in each jurisdiction. The school bus is typically a route bus for urban routes or a coach hired for regular regional routes or occasional excursions. The exception to this is the vehicles of unitary construction with 9 to 25 seating positions which are generally owned and operated by schools.

Bus travel in Australia is known to be a safe form of transporting passengers when compared with other types of road transport. However, when a bus accident does occur the number of people injured could be high due to the comparatively large number of passengers carried on a bus. This tends to focus media attention and raise the public's expectations increasing occupant protection standards.

The following is an extract from the Australian Transport Safety Bureau (ATSB) transport statistics report. The data in this report is specific to fatalities and injuries from within the bus and does not include other vehicle statistics;

ATSB report - Australian Bus Safety Nov 2001;

Bus occupants accounted for only a very small proportion (0.6 per cent) of all road fatalities between 1990 and 1998 (17,840) and hospitalisations between 1990 and 1997 (178,567). During stated periods there were 103 fatalities and 988 hospitalisations amongst bus occupants.

Bus travel in 1997 was clearly the safest mode of road transport with the least number of fatalities at 0.06 per 100 million passenger kilometres travelled. This compared with 0.49 fatalities per 100 million passenger kilometres travelled for passenger cars and 10.38 fatalities per 100 million passenger kilometres travelled for motorcycles. Similar trends were observed with hospitalisation rates.

The highest proportion of fatal and non-fatal bus crashes involved at least one other vehicle (55.6 per cent and 61.4 per cent respectively), followed by pedestrian crashes (34.3 per cent and 22.7 per cent respectively). The remaining were single vehicle crashes, only involving the bus (10.1 per cent and 15.9 per cent).

Please refer to Appendix A for further details.

1.2 The Problem

The problem of occupant protection in buses was identified after a number of fatal accidents between 1987 and 1989 where a total of 71 fatalities and 108 hospitalisations occurred from a combination of inadequate bus superstructure strength and seat strength together with the lack of seat belts in tour and coach type buses.

The Australian government acted to regulate after it was recognised that a system failure in bus design was the cause of significant trauma to the occupants of tour and coach buses as the result of those accidents. The Vehicle Safety Standards branch acted after consultation with the Australian Motor vehicle Certification Board and the Vehicle Safety Advisory Council to create an ADR which harmonised with the existing international regulation UNECE R 66 – Large Passenger Vehicles with Regards to the Strength of their Superstructure. The UNECE regulation is currently applied by 25 European Union members for their large buses used in route service and coach/tour operation.

In summary, it can be concluded that the problem is three-fold. Firstly is the current regulation relevant and effective in providing the protection to the bus occupant when an accident occurs.

Secondly is there another form of delivery of protection provisions that is of a net social benefit to the community and that reduces the cost of compliance for the vehicle manufacturers. Thirdly would full harmonisation with the current UNECE R 66 provide a more complete set of passive safety provisions and provide a net benefit to the community with a reduction in bus occupant injuries as a result from bus accidents.

2.0 IMPACTS OF UNSAFE BUSES

The impacts of unsafe buses can be seen in the externalities resulting from vehicle manufacturers producing bus bodies with inadequate structural strength which cause injuries and fatalities that has an impact on many areas;

- Grief and loss experienced by relatives from the death of bus passenger;
- Pain and suffering experienced by the injured;
- Medical, ambulance and rehabilitation cost;
- Long term care costs;
- Loss of labour in the work place;
- Loss of labour in the household;
- Reduced quality of life;
- Legal disputation costs;
- Workplace disruption;
- Funeral cost;
- Coroners court costs.

All of the above has an impact on the community, individuals, employers and hospitals from a financial and resource standpoint.

The human cost of injuries and fatalities using the Bureau of Transport and Regional Economics (BTRE) – Road Crash Cost in Australia; Report 102 May 2000.

The average cost per; (at 2005 dollars)

- Fatality $2.13 million
- Serious injury $0.462 million
- Minor injury $0.020 million

As a guide to the cost of fatalities and hospitalisations from bus rollover incidents for the period 1990 to 1998 the table below is indicative of the cost to the community for this period.

Fatalities		Hospitalisations*	
Number	Cost @ 1998 dollars	Number	Cost @ 1998 dollars
6	$9.87 million	156	$55.58 million

The hospitalisations* are estimated due to this data not being available for rollover incidents. The tabled estimate is based on the available data from the Road Transport Authority NSW 99 actual hospitalisations and the report - Australian Bus Safety Nov 2001 where; for each fatality over the period 1990 to 1998 there were 9.6 hospitalisations, so the assumption is that from the available data of 6 fatalities resulting from rollover incidents there would have been 99 plus (6 x 9.6) = 156 hospitalisations of bus occupants resulting from a rollover incident for the similar period.

3.0 WHY GOVERNMENT ACTION IS NEEDED

The options for government in reviewing the question to intervene with regulations applying standards of vehicle design which has an effect on the commercial activities of business and act in the general interest of the Australian community can be drawn from the following.

3.1 Self Regulation

In the absence of a mandatory standard or self regulated standard for occupant protection, problems that arise with consumer goods such as vehicles and vehicle parts may be dealt with through part V, section 65F or Part VA of the Trade Practices Act as well as through various state and territory Consumer and Fair Trading Legislation.

There are two compensatory mechanisms available for the consumer under the TPA.

1. Section 65F – Compulsory product recall and Part VA – Liability of manufacturers and importers for defective goods. These have a compensatory effect for consumer protection as opposed to the ADR or mandatory or voluntary code prescribed under the TPA which has a preventative effect as it prevents a supplier from placing unsafe vehicles on the market. Given the nature of bus travel and the community costs when fatalities or injuries occur, it may not be appropriate to rely solely on a compensatory measure but rather to have a preventative measure such as an ADR or code prescribed under the TPA.
2. Part VA provides a well-defined right for consumers to sue for damages, which places pressure on vehicle manufacturers to avoid large compensation payouts by making their vehicles safer.

Full reliance on the consumer protection provisions of the TPA and non government information programs without the use of legally binding preventative provisions of the MVSA or TPA are likely to result in the following effects:

- Lack of a definitive regulation could still result in costs to manufacturers as responsible sections of the industry would still incur the overall cost of design, development, styling and testing whether or not there was a regulation. In the absence of regulation in such a technically complex area market pressures may cause a shift in focus away from safety,
- In the absence of regulation, states may introduce their own standards, potentially leading to lack of uniformity and undue jurisdictional requirements for consumer standards. This could result in additional testing and assurance procedures and hence additional costs to industry that flow on to the consumer.

While allocation of safer vehicles could be achieved by the compensatory provisions of the TPA, of paramount importance is the need to prevent unsafe vehicles from entering the market and this can only be achieved by the use of regulatory options such as the use of an ADR or prescribed codes under the TPA

3.2 Code of Practice

At the very outset, it should be recognised that even a code of practice needs to be underpinned by an acceptable standard. Codes of Practice merely affect the method of enforcing compliance, whether by direct Government supervision and scrutiny or by industry self-regulation. Therefore adopting a code of practice is not a relevant option as this proposal is for determining the standard and not how it is to be enforced. Enforcement is provided for in the Motor Vehicle Standards Act 1989 and that piece of legislation has been subjected to a separate

review where the matter of enforcement was addressed. However, the following discussion explores the possibilities for codes of practice.

The motor vehicle industry delivers new vehicles and used vehicles to automotive consumers. Under existing regulatory arrangements, ADR compliant buses are delivered to operators. Operators as such do not need to comply with additional requirements.

However, additional requirements in case of specialised or specific purpose vehicles will need to comply with State and Territory vehicle use regulations, but such situations are an exception and not representative of the uniform administrative arrangement in place.

There are industry associations, which represent a large collection of economic agents in the new vehicle manufacturing industry; these include the Australian Trucking Association (ATA), Bus Industry Confederation (BIC) and the Federal Chamber of Automotive Industries (FCAI). ATA represents truck operators with a membership base of 50 per cent to 60 per cent of the operator industry. BIC is a confederation of operators and vehicle manufacturers and covers over 50 per cent of the agents in the industry. Membership coverage by FCAI would be around 90 per cent, which also includes importers and ancillary suppliers.

The bus operation industry has adopted a number of codes of practice such as those relating to maintenance procedures, customer service and business conduct. Codes of practice are less prevalent in the vehicle manufacturing industry. A few examples of the vehicle industry's code of practice include the FCAIs' voluntary code of practice for Electromagnetic Compatibility (EMC) requirements and product recalls. These codes of practice apply exclusively to FCAI members. In case of the EMC code the underpinning standard adopted is the UNECE Regulation and the code as such is a response to meeting the mandatory requirements of the Australian Communications Authority for electromagnetic emissions from electronic devices. The FCAI does not operate any monitoring system for the EMC code of practice, which would be a time consuming and costly exercise but relies on reports for non-compliance from its members.

Can Codes of Practice or other grey-letter law[1] instruments achieve an effective outcome for the new vehicle manufacturing industry instead of explicit government regulation?

We consider codes of practice and in particular the voluntary code for our analysis from the available quasi regulation. For a voluntary code of practice to succeed, the relationship between bus/truck manufacturer, bus/truck operator, government and passenger representatives should be collaborative so that all parties have ownership of, and commitment to, the arrangements (Grey Letter Law, 1997). In considering a code of practice, it is useful to note the following conditions, which exist in the truck or bus industry. These include:

- Universal application of standards is relatively difficult as numerous sectors exist and which in turn are represented by their own industry associations,
- It is not clear whether the industry associations can apply effective sanctions,
- Effective operation of a voluntary code of practice would require an enforcement system identical or similar to the one currently operated by the government regulator. This requires the members of the associations to provide evidence to their associations as currently required for obtaining an approval. It is quite difficult to envisage an environment where profit maximising economic agents would share leading or even

[1] Grey Letter Law, Report to the Commonwealth Interdepartmental Committee on Quasi Regulation, 1997

trailing edge information with their industry associations to enable the system to deliver certainty to consumers and governments.

Despite the inherent disadvantages in the application of grey letter law or quasi regulation for the automotive industry, there are some significant advantages, which need to be highlighted. These include:

- Codes of practice can deliver urgent interim response to problems in the short term while a long term regulatory solution is being developed,
- There are cost advantages from flexible, tailor made solutions and less formal mechanisms such as access to a speedy, low cost complaints handling and redress mechanism.

In summarising, it is quite evident that the critical factors for operating a code of practice as a regulatory option to deliver safer vehicles to the market do not really exist. Delivering safer vehicles to operators is a high-risk problem with a high impact on community safety and welfare and the uncertainty resulting from a code of practice does not warrant the adoption of a code of practice.

3.3 Government Action

Governments act to regulate when there is a recognised need to address a system failure that is the cause of significant trauma to the occupants of motor vehicles as the result of an accident. The system failure in vehicle design is generally recognised after the accident has occurred and the costs of occupant trauma is realised. To overcome the failure in the system of vehicle design, governments act to correct the failure through the enforcement of standards in regulation.

A regulatory approach has a number of positive outcomes with a recognised cost to vehicle manufacturers through the required activities to comply with the regulation. Two of the positive outcomes are; the community have safer vehicles to travel in and the cost of road trauma on the community is reduced.

The costs incurred by the vehicle manufacturer and bus operator are transferred on to the travelling public through the purchase price or fare rates. This is generally low in cost and is offset by the benefits to the vehicle occupant and the community through lower road trauma costs.

The regulatory approach applies a set of standards ensuring that all vehicles will provide a similar level of occupant protection as identified from vehicle failure analysis.

4.0 GOVERNMENTS OBJECTIVE FOR REVIEW OF ADR 59/00

The ADRs have been developed and issued since 1986 under the Second Edition ADRs and subsequently made national standards applicable to omnibuses under the Third Edition by Determinations No. 1 & 2 of 1989 under of section 7 of the Motor Vehicle Standards Act 1989. The releases of additional ADRs and revisions to existing ADRs have taken effect in the manufacture of omnibuses in Australia since 1989.

The Australian government has undertaken to review the ADRs to ensure that they are relevant, cost effective and do not provide a barrier to importation of safe vehicles and components. These objectives are shared by the New Zealand Government which has been reviewing its vehicle safety standards. The review is being conducted by the Vehicle Safety Standards Branch in consultation with NTC and the Land Transport New Zealand. Licensees

The aim of the ADR review is four-fold:

1. to identify whether existing standards are relevant in the light of on-going developments in automotive safety technology, given the fact that some of the standards are in a mature stage,
2. if existing standards are relevant to identify any refinements required to ensure their progression and positive contribution in the standards life cycle,
3. to ensure standards do not impose excessive requirements on business, that they are cost effective and take account of community, social, economic, environmental, health and safety concerns, and
4. to pursue where appropriate harmonisation with international standards, rather than with regional or national standards.

The review takes account of the provisions of the TTMRA Annex 4 – Road Vehicles. This Annex concerns the harmonisation of Australian and New Zealand standards with the internationally recognised UNECE Regulations, or those national or regional standards that are agreed by the Parties. The UNECE is regarded as the international standards setting body, meeting the provisions of the WTO Agreement on Technical Barriers to Trade, as standards development in the UNECE is open to participation by the international community.

The approach proposed in this RIS is consistent with the acknowledged future direction for TTMRA since the aim is to harmonise with the UNECE regulation to the extent of allowing the UNECE regulation as an alternative standard. A desirable outcome would be that a vehicle complying with the UNECE regulation would be allowed access to the Australian market without the need for any modifications and that objective would be achieved by the recommended option.

5.0 PRESENT AUSTRALIAN GOVERNMENT REGULATION

The present regulation for omnibus rollover strength is ADR 59/00 which is conditionally harmonised with UNECE R66/00.

Harmonisation of the international and ADR standards takes the form of either accepting the complete international technical criteria as the body of the ADR or selectively taking elements of the international technical criteria and inserting into the adapted text of the ADR. The conditional harmonisation of ADRs is generally used where the regional limits (vehicle dimensions, permitted axle limits) are recognised to be of limited technical criteria below the proven Australian standard and the limitations are recognised to be of high safety risk by the Australian transport authorities.

ADR 59/00 first came into force in July 1992 and it applies to single deck buses from 3.5 tonne Gross Vehicle Mass (GVM) constructed to carry more than 16 passengers whether seated or standing in addition to the driver and crew. However, low floor height route service omnibuses are exempt. Low floor height buses are those where, depending on the wheelbase, at least 50 per cent of the upper surface of the floor between the axles is no more than 550 mm from the ground.

The exemption of the low floor height buses (route service bus) is based on the height of the centre of gravity of the bus when fully laden with passengers. It was considered at the time of drafting ADR 59 that this type of bus used in suburban route service is less likely to be involved in a rollover incident and therefore did not require the additional body frame strength. The low floor height bus has 10.7 per cent greater lateral stability than the standard floor height

bus and is 9.6 per cent more stable under static tilt conditions. Furthermore, the available accident statistics over the period since 1993 have not recorded any low floor suburban route service buses being involved in a rollover.

ADR 59 is applicable to the following bus categories;

- MD2 ≤ 3.5t GVM > 16 passengers
- MD3 > 3.5t, ≤ 4.5t GVM
- MD4 > 4.5t, ≤ 5.0t GVM
- ME > 5.0t GVM

This ADR requires that a zone within the bus superstructure is preserved to protect the occupant space at every seating position in the bus when the unladen bus is subjected to a test where the bus is tipped over from a platform height of 800mm.

Compliance can be demonstrated by;

- a roll-over test of the complete vehicle;
- roll-over tests of one or more representative body modules;
- pendulum tests on one or more representative body modules; or
- calculation.

5.1 Bus Occupant Protection

The success of any one safety standard for buses equally depends on a supporting number of other standards. The following ADRs have been developed as part of a bus occupant protection package.

- ADR 58 - *Requirements for Omnibus Designed for Hire or Reward*
- ADR 59 – *Omnibus Rollover Strength*
- ADR 66 – *Seat Strength, Seat Anchorage Strength and Padding in Omnibuses*
- ADR 68 – *Occupant Protection in Buses*

The omnibus occupant protection package of ADRs sets the requirements for the safe transportation of passengers and each form part of an integral system of protection.

5.2 Impact of ADR 59

The need for improved bus superstructure strength (along with seat strength, seat anchorage strength and the fitting of seatbelts) in coach type buses were identified from the analysis of a number of fatal bus accidents during the period leading up to 1989 where multiple fatalities and serious injuries resulted from bus body design failing to protect the bus occupants during crash incidents.

As a result from this analysis ADR 59 was drafted (along with ADR 66 and following on with ADR 68) to prevent trauma to bus occupants from bus rollover accidents.

ADR 59 was first approved as a national standard on 2 August 1989 and became applicable for ME omnibus over 5.0 tonne Gross Vehicle Mass (GVM) manufactured on 1 July 1992 and for MD2 to MD4 omnibus 3.5 tonne GVM with over 16 occupant capacity whether seated or standing including driver and crew, and included ME route service buses on 1 July 1993.

The known types of mechanisms of injury causation from a bus rollover incident are described in the study by *Botto (1994).* The study outlined four main injury mechanisms in severe coach crashes.

1. **Projection:** occupant interaction with other occupants and the interior of the coach. Projection was the most frequent injury mechanism, but on average the lowest injury severity.
2. **Total ejection:** the occupant being ejected or thrown out of the vehicle.
3. **Partial ejection:** part of the occupant's body was thrown out of the compartment.
4. **Intrusion:** the occupant being injured inside the vehicle, due to structural deformation or intrusion of an object.

Intrusion is the mechanism of injury causation which ADR 59 is the standard developed to prevent this type of mechanism. Whereas **Projection, Total and Partial Ejection** are the mechanisms of injury causation which ADR 66 and ADR 68 addresses.

The measure of the effectiveness of ADR 59 in reducing fatalities or injuries to bus occupants cannot be isolated without a defined study of occupant injuries resulting from bus accidents in Australia. Such a study has not been undertaken.

Furthermore, the available statistical data held by the ATSB, State and Territory jurisdictions does not discriminate between the types of injury mechanisms that results from bus related accidents in particular rollover incidents.

With the application of ADR 59 and ADR 66 from 1992 and ADR 68 in 1994, all ADRs have combined to reduce the trauma to bus occupants from bus accidents. However, the result of this combination has created the condition that makes it difficult to readily isolate the performance indicators of an isolated ADR and therefore assessing the individual success of any one ADR applicable to buses.

There is another factor that needs to be acknowledged when measuring the success of the occupant protection measures. The reduction of bus occupant fatalities and injuries as indicated in the ATSB data particularly those from interstate bus transport could be showing a shift of passengers from long distance bus transport into airline transportation. The accident data could be indicating a reduction in coach bus patronage as a result of the introduction of low fares by the airlines within Australia which has taken a percentage of bus passengers into the air transport area.

Furthermore, the bus fleet age is another factor which will have an effect on the data when assessing the success of the ADRs for buses. The States and Territories regulate bus use and further to this some jurisdictions permit bus age to extend up to 25 years. According to the Australian Bureau of Statistics (ABS) as at 2004 the Australian registered bus fleet was 71,314 with the average age of 10.4 years. Within the national fleet there are approximately 39,000 units that are ADR 59/00 compliant with approximately 26,000 units that do not comply due to the bus being built before July 1992 and buses that meet the exemption provisions.

The issue of bus fleet age is supported by the Bus Industry Confederation which stated in a submission to the House of Representatives Standing Committee on Transport and Regional Services into road safety in October 2003;

> *"Based upon current turnover rates and the allowable age of buses in different States, it will take up to 20 years before all buses and coaches operating in Australia to meet the current design requirements."*

In consideration of the above statement, the effectiveness of the current bus ADRs and the full effect of the occupant protection measures may not become fully apparent until the year 2015.

In summary, it is not possible to state that since the introduction of ADR 59 we can see the total success because of the above conditions. All that can be stated is that there has been a reduction in fatalities and hospitalisations resulting from bus accidents (ATSB 2001). The combination of occupant protection ADRs - 59, 66 & 68 have all contributed to the reduction in bus occupant trauma. Furthermore, it can be assumed that there is to be further improvements in reduced bus occupant trauma in the future as new compliant buses replace the older buses.

5.3 Effects of Strengthened and Standard Bus Frames

In the absence of an Australian based study on the effectiveness of ADR 59 the following is presented as an example of the performance of the safety provisions from UNECE R66 afforded to the bus occupant.

The following is an extract from a paper *"Unusual Statistics about Rollover Accidents of Buses – V"* presented by Dr Matolcsy at the UNECE forum WP 29 - 85th meeting of the Working Party on General Safety Provisions in October 2003. The study was based on evidence that came out of media reports on rollover events in Europe and analysed by Dr Matolcsy.

> *"It is difficult to control the standard approval test used in UNECE R66, whether it is adequate to separate the strong superstructure from the weak one, to meet the demand of the public, to assure the required safety for the passengers at least in the protected rollover accidents. A slow feedback can be found from the accident statistics, from the analysis of rollover accidents.*
>
> *This new rollover statistics does not give direct information about the approval of the buses regarding UNECE R66. But indirectly Table 8. gives an interesting comparison. As it was defined above, "protected rollover accident" covers those accidents in which the passengers should be protected, the survival space shall be maintained. Among the 157 rollover accidents there are 62 in which we have information about the behaviour of the superstructure: 32 accidents did not cause damage in the survival space and in 30 accidents the survival space was harmed, including the total collapse, too. The casualties belonging to these two groups are significantly different. The fatality rate is 13 times, the serious injury rate 4 times higher when the survival space was damaged. From this recognition it becomes the clear goal of the international regulation: in the protected accidents the survival space shall be maintained. It is interesting to mention that the numbers of the light injuries are not closely related to the type or category of the accident. It may be assumed that this type of injuries are caused mainly by the inside collision of the passengers when they are leaving their seats, seating position during the rollover process. The main tool to reduce this kind of injuries could be the use of seat belts. (It has to be emphasized that the seat belt can reduce the number of fatalities and serious injuries, too.)"*

Table 8

Considered accidents	Number of events	Casualty per accident			
		Fatality	Serious injury	Light injury	Injury without classification
All rollover accidents	157	11,0	3,1	3,7	6,5
Protected rollover accidents	86	5,8	3,2	4,4	5,8
Survival space unharmed	32	1,0	1,6	4,2	5,2
Survival space damaged	30	12,8	6,1	4,9	9,2

6.0 OPTIONS FOR FUTURE GOVERNMENT LEGISLATION

ADR 59 adopts the technical requirements of UNECE R66/00 - Superstructure Strength of Large Passenger Vehicles, but with exemptions for low floor height buses. These exemptions do not apply in the UNECE regulation.

The regulation UNECE R66/00 has been revised and the version UNECE R66/01 was released in November 2005. As a result of the release of this new version there are a number of options to select from.

Option 1 would maintain the status quo and retain the present conditionally harmonised rule that incorporates UNECE R66/00 and retain the low floor height exemption and include UNECE R66/01 in the alternative standard provisions.

Option 2 would fully harmonise with the later edition UNECE R66/01 with no exclusions for low floor height buses.

Option 3 would conditionally harmonise with UNECE R66/01 and retain the low floor height exemption.

Option 4 would delete the regulation for omnibus rollover strength and the industry to adopt a code of practice.

7.0 IMPACT ANALYSIS

7.1 Affected Parties

The parties directly affected by ADR 59 are:

- Vehicle manufacturers of framed body construction of which there are currently 5 chassis manufacturers and over 10 vehicle manufacturers of the framed bus construction.
- Vehicle manufacturers and importers of unitary constructed buses of which there are 3;
- Economic agents designing and supplying materials, services and components used in the manufacture of framed body and unitary bus construction;
- Economic agents providing certification and compliance services to framed body and unitary construction manufacturers;
- State and Territory transport agencies performing a regulatory, review or oversight function;
- Australian Government through DOTARS Vehicle Safety Standards branch performing regulatory functions;
- Bus company owners;
- Insurance providers to vehicle manufacturers and bus operators; and
- Bus users.

7.2 General Impacts

Option 1

The present regulation ADR 59/00 imposes costs on vehicle manufacturers both locally and overseas. These costs include testing and submission of evidence, additional materials and labour. Presently these costs are included in the vehicle purchase price that the bus operators pay for the bus. The protection method add approximately 200kg to the mass of larger buses

and coaches, this will be variable between bus and coach body builders, there is likely to be operational cost penalties for bus operators which are passed onto the passengers through fare prices. The Australian government has a cost in checking of submitted evidence of compliance from the manufacturers and in the audit of production facilities.

With Option 1, the affected categories of buses are supplied with a passive safety feature that would provide a net social benefit with a reduction in road trauma and realise a reduced cost to the community.

Option 2

The impacts for Option 2 are similar to Option 1 however, the revisions in UNECE R66/01 will require all bus manufacturers to re-certify their current models that are built after the ADR application date (the application date would be 24 months after publication of the revised ADR) to show compliance to the revised ADR. All new bus models will have to comply with the new ADR 59/01 within 18 months after publication.

The revised regulation UNECE R66/01 over the current UNECE R66/00 has the following effect:

- The scope or applicability has been reduced from vehicles with more than 16 passengers whether seated or standing, in addition to the driver or crew to more than 22 passengers whether seated or standing, in addition to the driver and crew. This has the effect of removing vehicle categories MD2 and MD4 which will have a benefit cost impact. However, the UNECE working party on general safety provisions are currently working on an amendment to the scope and the extent of bus categories that are to apply UNECE R66/01 and the smaller category buses will most probably be included.
- The definition of "*Residual Space"* has changed from "means the space to be preserved in the passenger compartment during and after the structure has been subjected to one of the tests prescribed in Paragraph 6 of this regulation" to "means a space to be preserved in the passengers, driver and crew in case of a rollover".

  This will affect a small number of buses that are constructed on a chassis/cab truck with a separate passenger module behind the cabin of the chassis/cab truck. This will have an affect in requiring the truck cabin having to comply with UNECE R66/01. This could have a cost implication for the vehicle manufacturer.
- The revised regulation UNECE R66/01 has testing criterion that is different to the current regulation UNECE R66/00. This will impact on the extent of the testing the bus superstructure strength and may increase the testing and construction costs above the current costs.
- The revised regulation UNECE R66/01 in Annex 7 has replaced the pendulum test from UNECE R66/00 with a combination of static testing and calculation. This is seen as an improvement and a cost reduction in rollover certification of variations to bus models.
- The revised regulation UNECE R66/01 in Annex 8 provides an alternative method of justifying bus superstructure design by calculation, based on quantified energy ratings for each individual plastic hinge location derived from physical moment-angular deflection test results of each hinge construction. This will provide for a reduction in ongoing certification costs for bus model and variant changes.

The inclusion of low floor buses will add to the costs of manufacturing and the compliance of this variant. The costs would be similar to the standard floor height bus that is used in suburban route service.

Option 3

This option will have the same impacts as in Option 2 however, the low floor height buses are excluded from the regulation requirements.

Option 4

With Option 4, the impacts will depend upon what changes, if any, are made to present designs. The ongoing compliance costs for validation and auditing costs would no longer be an impost on either the vehicle manufacturer or DOTARS. Market forces driven by vehicle pricing may have an effect on the level of safety features that might remain in buses. Depending upon the extent of future change and the number and severity of future rollover crashes, passenger safety could decrease and increase the cost of road trauma.

7.3 Quantification of impacts

In 2005 there were 1195 buses of MD2 to ME category with greater than 16 seats that were required to comply with ADR 59. To supply these buses to the Australian market place each manufacturer will have invested in the design, testing and development of the bus's superstructure so that each model or variant of bus produced complies with ADR 59/00. The cost of compliance is detailed at 7.7 of this RIS. The bus manufacturer will be affected by the requirement to comply with ADR 59/00 when a change is made to the superstructure of the already compliant bus or when a new bus model is introduced.

The vehicle manufacturer will have minor ongoing administrative costs that relate to the control and the preparation of design documentation under the company's Quality Management System. These controls ensure that if the changes to the bus superstructure are made, the elements that have previous approval continue to comply with ADR 59. The vehicle manufacturer will generally not change the superstructure that is compliant with ADR 59. If the superstructure is changed however, then compliance costs will be incurred by the vehicle manufacturer.

Option 1

The retention of ADR 59/00 in its current form being conditionally harmonised with previous version of UNECE R66/00, will have the least effect on the cost of construction of the bus superstructures. Since 1992 there has been a known cost to the vehicle manufacturer and bus operator and the Australian government with regards to compliance with ADR 59/00.

There has been an additional cost to the operator as a result of added mass of around 200kg to some vehicles by the provision of a strengthened superstructure. The added mass affects the bus carrying capacity with respect to the axle load limits as set by the States and Territories. The added mass has the result of lowering the available occupant capacity of the bus. The bus operator may experience a reduction of around 3 occupants. The loss of revenue to the operator depends on the bus operation and occupant use ratio and whether the bus has only seated or seated and standing occupants.

The inclusion of the alternative standard UNECE R66/01 follows the policy of harmonising the ADR with those of the international regulations adopted by the UNECE under the 1958 agreement. The policy of harmonisation is also an important part of the commitments to the WTO and APEC agreements. The inclusion of the latest version of the UNECE standard

enables the imported bus to minimise the cost of certification with having to comply with one standard for both the international and Australian markets.

Option 2

The adoption of the current version of UNECE R66/01 will have an impact on the vehicle manufacturers cost of compliance as each manufacturer will be required to re-certify their current bus models and variants with the new regulation. The timing for application of the new standard will be 24 months for current bus models and 18 months for new bus models from the date of publication of the new ADR 59/01.

The revised test criterion in UNECE R66/01 will initially impose a higher cost of compliance however, the alternative methods for demonstration of compliance of bus superstructure design when changes are made to current bus models or when a new variant is produced from an existing bus design will realise a lower costs for compliance than the current cost of compliance with ADR 59/00.

This option would include the low floor buses which represent around 533 units (2005 registered buses) of the ME bus production and has a manufacturing and compliance cost estimated at $0.640 million. The inclusion of this bus configuration in the ADR scope would increase the bus superstructure strength however, as the available New South Wales Roads Traffic Authority accident data indicates the frequency of rollover of suburban route service buses is low. Therefore, the likelihood of this requirement being cost effective in this bus configuration is unlikely. Furthermore, it has been shown by calculation the low floor height bus has 10.7 per cent greater lateral stability and it is 9.6 per cent more stable under simulated static rollover conditions compared with the standard floor height bus.

However, it should be accepted that there is a potential for a rollover event of low floor buses if the buses are operating on hazardous routes and where the traffic and climate conditions are likely to be an influencing factor. In this case a risk assessment of the individual bus routes would be required by the controlling jurisdiction, if it is found to be a risk then the buses that are to operate on the route could be required to comply with ADR59/00. An example of the use of risk assessment can be shown in the approach to school bus routes taken by the Queensland Government and in the voluntary National Guidelines for Risk Assessment of School Bus Routes as endorsed by the Australian Transport Council (ATC) Ministers in November 2005. These guidelines enable all state and territory jurisdictions to classify their school bus routes according to the conditions which are experienced. The jurisdictions can then adopt a policy approach for school bus routes and the application of vehicle standards to match the identified environments and conditions.

Option 3

This option will have the same impacts as in option 2. However, low floor height buses would be excluded from the regulation requirements resulting in a $0.640 million cost differential between options 2 and 3 with a similar safety outcome.

Option 4

Delete the current regulation, in this case the manufacturing and compliance costs of $12,000 would be avoided and operating costs over time would be reduced as a result of completive pricing and market forces taking over. However, if the de-regulated industry prevailed with market forces driving the cost of the final product, the prospects of a lighter frame construction could influence an increase in trauma to bus occupants as a result from bus rollover event. Given the above ATSB statistics over the period from 1990 to 1998 a recorded 6 fatalities resulted from rollover events. The effect of road trauma costs on the community from the

adoption of option 4 has the highest impact if the bus industry were to revert to lighter framed body construction.

7.4 Affected Bus Categories

The 2005 registered vehicle volumes that are required to comply with ADR 59/00 are as follows:

- **MD2 > 16 seats** **0 units.**
- **MD3 and MD4** **411 units**
- **ME** *(Small Omnibus)* **427 units**
- **ME** *(Large Omnibus)* **357 units**

Total number of buses affected in 2005 **1195 units**

7.5 Trade Impacts

There are no trade impacts for buses that are either manufactured in Australia or overseas as the current harmonised ADR 59/00 does not preclude the importation of UNECE R66/00 compliant buses as UNECE R66/00 is an accepted Alternative Standard. Furthermore, the addition of UNECE R66/01 to the accepted Alternative Standard provisions would ensure that there would be no restriction to the importation of UNECE R66/01 compliant vehicles.

Currently for 2005 there were 838 imported buses of the MD3 to MD4 and ME *(Small Omnibus)* category buses imported into Australia that are ADR 59/00 compliant.

The local vehicle manufacturer is not precluded from exporting buses to other countries providing that the bus complies with that country's vehicle safety standards.

7.6 Summary of Costs

Option 1

The following summaries of relative costs shown in Table 1 are estimates. The total cost of compliance will depend upon the number of bus model variants that need to comply. In consideration of the fact that option 1 represents the status quo and the compliance of the current models and variants have been assumed to be done. The costs of materials are the ongoing costs for comparison purposes. The compliance costs will only become apparent when a change is made to the bus or when a new bus is introduced.

Table 1: Summary of Relative Costs of ADR 59 - Option 1

	Estimated cost to Industry	**Estimated cost for 2005 vehicle volume.**
Materials	$1,200 x 1195 units	$1.434 million
Total cost of ADR 59 for 2005 vehicle volumes		**$1.434 million**

Option 2

The adoption of Option 2 will include an additional 533 low floor height ME buses to comply with ADR 59. The following summary of relative costs is shown in Table 2. Again, the total cost of compliance testing to the vehicle manufacturers will depend upon the number of bus

model variants that require testing. The table represents an estimate of 4 variants across 13 vehicle manufacturers at a cost of $12,000 per compliance test. For the purpose of the costing exercise, the recovery of this cost is amortised over the 2005 vehicle volume of 1728 units.

Table 2: Summary of Relative Costs of ADR 59 - Option 2

	Estimated cost to Industry	**Estimated cost for 2005 vehicle volume.**
Testing	$12,000 x 52 variants	$0.624 million
Materials	$1,200 x 1728 units	$2.074million
Total cost of ADR 59 for 2005 vehicle volumes		**$2.698 million**

Option 3

The adoption of Option 3 will exclude the 533 low floor height ME buses. The following summary of relative costs is shown in Table 3. Again, the total cost of compliance testing to the vehicle manufacturers will depend upon the number of bus model variants that require testing. The table represents an estimate of 4 variants across 13 vehicle manufacturers at a cost of $12,000 per compliance test. For the purpose of the costing exercise, the recovery of this cost is amortised over the 2005 vehicle volume of 1195 units.

Table 3: Summary of Relative Costs of ADR 59 - Option 3

	Estimated cost to Industry	**Estimated cost for 2005 vehicle volume.**
Testing	$12,000 x 52 variants	$0.624 million
Materials	$1,200 x 1195 units	$1.434 million
Total cost of ADR 59 for 2005 vehicle volumes		**$2.058 million**

Option 4

Delete the current regulation, in this case the manufacturing and compliance costs of $12,000 would be avoided and all other cost will depend on what changes under any code of practice that may be adopted.

7.7 Impacts on Affected Groups

The consequences for affected parties are shown in Table 4.

Table 4: Impacts on Affected Groups

Affected group	**Option 1 – retain ADR 59/00**	**Option 2 – align with ECE R 66**	**Option 3 – align with ECE R 66**	**Option 4 – delete ADR 59/00**
Manufacturers and importers	• See Table 1	• See Table 2	• See Table 3	• unknown
Bus passengers	• safer vehicles	• safer vehicles	• safer vehicles	• unknown
Bus operators	• no change	• no change	• no change	• unknown
Insurance	• no change	• no change	• no change	• unknown

companies				
Government	• no change	• no change	• no change	• reduced administration

The available data on the number of fatalities and injuries and subsequent cost of road trauma to the community caused by inadequate bus frame strength is unavailable. The available data from the ATSB report - Australian Bus Safety Nov 2001 notes that reported rollovers caused 6 fatalities for the period 1990 to 1997. The information does not indicate that the fatalities were caused by inadequate frame strength, only that the 6 fatalities were as a result of a bus rollover. To show that the costs to the vehicle manufacturing industry and the costs that have now formed part of the vehicle price compared with a reduction in road trauma cost from strengthened bus frames can not be presented.

However, the contribution of ADR 59/00 together with the package of bus occupant measures has shown a reduction in road trauma fatalities and injuries over the period 1990 to 1998. Furthermore, the reduction of the cost of bus accident road trauma for three year period 1987 to 1989 of $76.06 million as compared with to the cost of road trauma for the 9 year period 1990 to 1998 of $46.06 million supports the statement that the total package of bus occupant ADRs have worked together to reduce the impact of road trauma from bus related accidents.

The investment in the bus occupant ADRs into the compliant buses that are currently in service on Australian roads provides for passive safety features that when relied upon during an accident involving a bus and the cost of compliance will produce a net benefit to the community through lower injury costs.

7.8 Data Sources

Assumptions are presented in the relevant section above.

Primary data sources were:

- Information on costs supplied by industry sources.
- Australian Bureau of Statistics (ABS)
- Australian Transport Safety Bureau (ATSB)
- Bureau of Transport and Regional Economics (BTRE)

8.0 CONSULTATION

The Department undertakes public consultation on behalf of the Minister for Transport and Regional Services. Under Part 2, section 8 of the Motor Vehicle Standards Act 1989 the Minister may consult with state and territory agencies responsible for road safety, organizations and persons involved in the road vehicle industry and organizations representing road vehicle users before determining the design rule.

The Department has consulted with the Bus Single Issue Working Group (See Attachment 1), regarding the review of ADR 59 and the seeking of public comment. The members agreed with the options as outlined in this RIS.

8.1 Public Consultation

The issue of an Exposure Draft for public consultation is an integral part of the Department's due process for developing and reviewing vehicle design rules as it initiates the most extensive and interactive phase of making national standards. Publication of the proposal 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 regulation impact statement, assists all stakeholders to identify more precisely the impacts of the proposals and enables more informed debate on the issues.

The call for public comment was advertised on 23 August 2006 in The Australian and the Government Gazette with the comment period running for 60 days and ending in October 2006. Four responses were received with the adoption of Option 1 supported by three of the four respondents. See Appendix 1.

The one respondent who supported Option 2 – full harmonisation with UNECE R66/01 and to include low floor height buses gave reasons that all Australian cities have built high speed (80 to 100 kph) roads within their urban road environment and low floor height route service buses could operate on the these roads and they consider that there is a risk of rollover, even though a low risk. The ADR should take the changed road environment into consideration and attempt to set standards that will be proactive in terms of improving safety.

The points raised by the respondent had been considered in the original RIS at clause 7.3 – Option 2 and as route service bus operation is regulated by the state and territory governments, the respective jurisdiction can assess the risks of low floor height buses operating on the high speed routes and specify ADR 59 as required.

9.0 CONCLUSION AND RECOMMENDATION

The need to protect bus occupants from intrusion of the bus superstructure as the result of a rollover accident has been shown to be required by the accident analysis of Australian crashes and supported by the accident studies from Europe.

The identified cost to the community from road trauma to bus occupants involved in a rollover incident was estimated to be $65.45 million for the period 1990 to 1998 this is a significant cost to the community and requires government action.

Self Regulation

In the absence of ADR 59, ‘Self Regulation’ could result in loss of assurance for consumers that occupant protection measures fitted in new buses and supplied to the market provides an appropriate and adequate level of safety. Reliance on Section 65F and part VA of the Act for maintaining consumer rights introduces an impediment to consumer certainty. The legal redress is only available after an occupant has been injured. In the absence of regulation, states may introduce their own standards, potentially leading to lack of uniformity, undue jurisdictional requirements for consumer standards. This could result in additional testing and assurance procedures and hence additional costs to industry and eventually the consumer.

Code of Practice

A ‘Code of Practice’ when used in place of a regulatory option to deliver safer vehicles to the market does not really exist. Delivering safer vehicles to operators is a high-risk problem with a high impact on community safety and welfare and the uncertainty resulting from a code of practice does not warrant the adoption of a code of practice. The issue of delivering safer vehicles to the market is a high risk-high impact nature, quasi regulation as a regulatory form does not appear to be appropriate in delivering a safer vehicle to the public.

Option 1

The retention of ADR 59/00 would maintain the status quo. The vehicle manufacturers would maintain the current level of cost of compliance of their bus models. The bus operators will be unaffected by this option. The total investment for one year of new buses is $1.434 million for this option.

Option 2

The harmonisation with UNECE R66/01 is estimated to initially cost industry $0.624 million in compliance costs over the current number of vehicle manufacturers. After this initial investment it is expected that the cost of compliance and manufacture for this option will level out to a comparable cost with the current ADR 59/00. There will be a potential reduced cost of compliance with the revised UNECE R66/01 regulation as it provides an alternative method of justifying the bus superstructure design by calculation rather than destructive testing.

The additional investment of $0.833 million for the 533 low floor height buses that operate in suburban route service would most probably not realise a net benefit as the current statistics show that the likelihood of this type of bus rolling over in a suburban zone is low.

It is unknown if a net social benefit will be realised by the community by the investment of $0.833 million by industry, as the frequency of rollover incidences in suburban areas is not seen in the available accident data and this is supported by calculation that the low floor height bus has 10.7 per cent greater lateral stability and it is 9.6 per cent more stable under static loading conditions compared with the standard floor height bus.

Option 3

The harmonisation with UNECE R66/01 is estimated to be a cost to industry of $0.624 million in compliance costs over the current number of vehicle manufacturers. After this initial investment it is expected that the cost of compliance and manufacture for this option will level out to a comparable cost with the current ADR 59/00. There will be a potential reduced cost of compliance with the revised UNECE R66/01 regulation as it provides an alternative method of justifying the bus superstructure design by calculation rather than destructive testing.

However, it is unknown if a net social benefit will be realised by the community with the investment of $0.624 million by industry as the accident data from the UNECE is not yet available to analyse the difference in occupant protection between UNECE R66/00 and UNECE R66/01.

The low floor height bus will be exempted from complying with this option.

Option 4

The adoption of the removal of ADR 59 has unknown factors as the effect will depend upon what changes and if the vehicle manufacturers maintain the standard as a code of practise and if the state and territory jurisdictions introduce separate regulations to fill the gap created by the removal of ADR 59.

Recommendation

The cost of Option 1 is the least amongst the four options, the adoption of Option 1 is therefore recommended. Option 1 has the least impact on the vehicle manufactures and helps to reduce road trauma by correcting for market failure. The acceptance of UNECE R66/01 as an alternative standard allows for overseas manufactures to access the market with lower compliance costs and promotes competition by increasing the number of players in the market.

10.0 IMPLEMENTATION AND REVIEW

The proposed regulation will be endorsed as an ADR. It will be given force in law in Australia by making them National Standards (ADRs) under the *Motor Vehicle Standards Act 1989*. It will be implemented under the type approval arrangements for new vehicles administered by the Vehicle Safety Standards Branch of the Department of Transport and Regional Services.

There are arrangements for on-going development of the ADRs. Development of the ADRs is the responsibility of the Vehicle Safety Standards Branch of the Department of Transport and Regional Services and the National Transport Commission and is carried out in consultation with representatives of Australian, state and territory governments, representatives of the manufacturing and operating industries, road user groups and experts in the field of road safety.

A manufacturer will be required to ensure that vehicles supplied to the market comply with the requirements of any package of regulations. Penalties for non-compliance with the Motor Vehicle Standards Act are 120 penalty points for each offence.

The ADRs are national standards under the *Motor Vehicle Standards Act 1989* and are therefore subject to complete review on a 10 year cycle.

Attachment1

Bus Single Issue Working Group

The membership is on a voluntary by invitation basis, the members represent various areas of the automotive industry including state government regulators.

Bus Industry Confederation

Commercial Vehicle Design Services

Curretechnic

Custom Coaches

Daimler Chrysler

Department for Planning and Infrastructure - WA

Department of Transport and Regional Services

Ford Motor Company

Federal Chamber of Automotive Industries

McConnell Seats Australia

Mitsubishi Motors Australia – FUSO

Roads and Traffic Authority - NSW

Toyota Australia

Truck Industry Council

Appendix A

1.0 OVERVIEW OF BUSES

An omnibus as defined by the Australian Design Rules is *"a passenger vehicle having more that 9 seating positions, including that of the driver"*.

The most efficient form of transporting large numbers of passengers by road is the vehicle classified as an omnibus.

1.1 Omnibuses

Omnibuses are categorised primarily by vehicle mass and seating capacity under the provisions of the ADRs. Certain functional characteristics may also be used to selectively apply particular regulatory requirements which are generally applied by the States and Territories by their vehicle use regulations**.**

1.2 Australian Bus Manufacture

The manufacture of buses in Australia is supported by a number of companies that import bus chassis along with the local manufacturers who construct bus bodies on the imported bus chassis.

There are two principal elements in the construction of medium to heavy buses:

a) Vehicle chassis;

- The vehicle chassis for buses is generally purpose built by a number of heavy vehicle manufacturers of trucks. The chassis is generally a "ladder" frame structure which is made from two steel channel sections with a number of crossmembers positioned so that the assembled frame resembles a horizontal ladder. The chassis supports the engine/transmission and locates the front axle(s) and rear axle(s) and is a platform for the framed bus body structure to be attached.
- The other form of vehicle chassis for buses is a pair of separate sub-frames, one sub frame supports the steer axle(s), and the other sub frame supports the rear axle(s), engine and transmission.

b) Bus body;

The medium to heavy bus body structure is predominantly manufactured in Australia and consists of a fabricated steel frame structure made with square and rectangular hollow sections which forms the bus floor, walls and roof.

The bus body is constructed using one of the following methods;

- The "ladder frame" vehicle chassis and bus body floor frame are attached with the walls and roof being fixed to the floor frame. This method produces a standard floor height bus with a number of steps at the bus entry.
- The bus which utilises the chassis "sub-frame" assembly, the fabricated framed body of the bus is used as a connecting structure between the two sub-frames which forms an integrated vehicle design or monocoque bus construction. This type of construction produces one of the following bus types;

i) Low floor height bus which has only one step into the bus which is commonly used in the Route or Scheduled bus area. Commonly used for an improved form of access for people with mobility disabilities and wheelchair access.

ii) Coach type bus with luggage storage space under a raised floor with the bus occupant space accessed via a set of steps.

The Australian bus industry has seen an evolution of bus body manufacture through changes in the manufacturing processes, developments in material technology, material availability, the implementation of quality systems and performance standards set by governments.

1.3 Importation of complete buses

The imported bus is generally a unitary design of the categories MD2 to MD4 including the ME 25 seat bus where the body is generally pressed metal panels on a variant of a commercial vehicle of a light to medium size truck from the manufactures vehicle range.

1.4 Bus Accident Statistics

Bus travel in Australia is known to be a safe form of transporting passengers when compared with other types of road transport. However, when a bus accident does occur and due to the number of occupants on a bus, the percentage of occupant injuries and fatalities are greater than other passenger vehicle accidents.

The following is an extract from the Australian Transport Safety Bureau (ATSB) transport statistics report. The data in this report is specific to fatalities and injuries from within the bus and does not include other vehicle statistics;

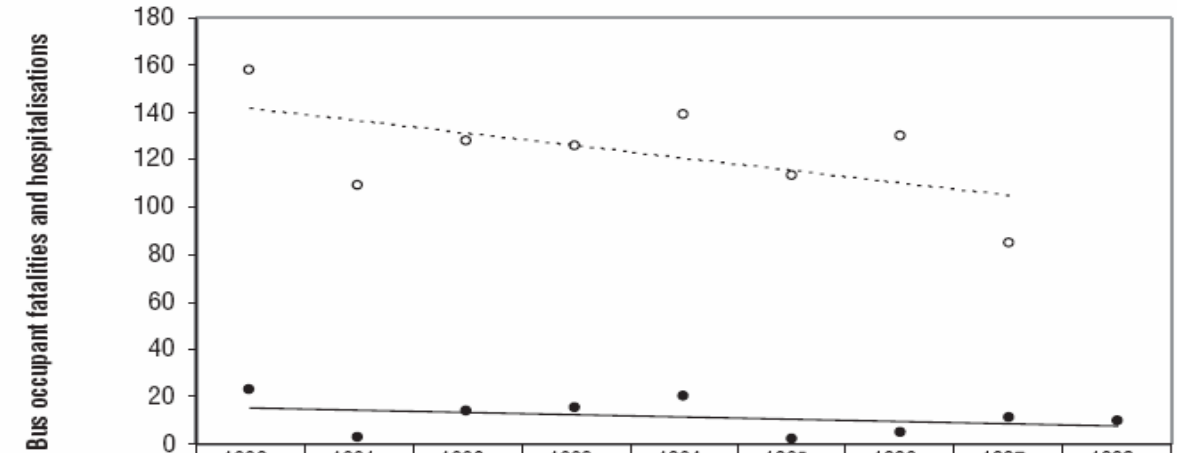
ATSB report - Australian Bus Safety Nov 2001 et al;

Bus occupants accounted for only a very small proportion (0.6 per cent) of all road fatalities between 1990 and 1998 (17,840) and hospitalisations between 1990 and 1997 (178,567). During stated periods there were 103 fatalities and 988 hospitalisations amongst bus occupants.

Bus travel in 1997 was clearly the safest mode of road transport with the least number of fatalities at 0.6 per 100 million passenger kilometres travelled. This compared with 0.49 fatalities per 100 million passenger kilometres travelled for passenger cars and 10.38 fatalities per 100 million passenger kilometres travelled for motorcycles. Similar trends were observed with hospitalisation rates.

The highest proportion of fatal and hospitalisation bus crashes involved at least one other vehicle (55.6 per cent and 61.4 per cent respectively), followed by pedestrian crashes (34.3 per cent and 22.7 per cent respectively). The remaining were single vehicle crashes, only involving the bus (10.1 per cent and 15.9 per cent).

Bus occupant fatalities and hospitalisations, Australia, 1990 to 1998



	1990	1991	1992	1993	1994	1995	1996	1997	1998
○ Hospitalisations	158	109	128	126	139	113	130	85	
● Fatalities	23	3	14	15	20	2	5	11	10

Note: National hospitalisation figures were not available for 1998 at the time of publication.

The above chart indicates a reduction in hospitalisations and fatalities over the period of introduction and application of ADR 59 along with ADRs 66 and 68.

	DRIVER INTENT				
Point of impact	**Straight /ahead**	**Stopped /parked**	**Turning**	**Other**	**Total**
Front	78, 50.3% a	2, 1.3%	11, 7.1%	1, 0.6%	92, 59.4%
Driver's side	6, 3.9%	0, 0.0%	0, 0.0%	0, 0.0%	6, 3.9%
Left side	6, 3.9%	0, 0.0%	6, 3.9%	0, 0.0%	12, 7.7%
Front right corner	2, 1.3%	0, 0.0%	0, 0.0%	0, 0.0%	2, 1.3%
Front left corner	0, 0.0%	0, 0.0%	0, 0.0%	1, 0.6%	1, 0.6%
Rear	1, 0.6%	3, 1.9%	2, 1.3%	1, 0.6%	7, 4.5%
Rollover (overturn)	4, 2.6%	0, 0.0%	2, 1.3%	0, 0.0%	6, 3.9%
Other/none	18 11.6%	0, 0.0%	5, 3.2%	3, 1.9%	26, 16.8%
Unknown	2 1.3%	0, 0.0%	1, 0.6%	0, 0.0%	3, 1.9%
Total	117, 75.5%	5, 3.2%	27, 17.4%	6, 3.9%	155, 100%

a. Percentage of total buses involved in fatal bus crashes

The above chart at Rollover (overturn) indicates the number of fatalities and the percentage of the total fatalities for the period 1990, 1992, 1994, 1996, 1997 and 1998. The data also indicates the drivers intent compared with other fatal accidents. The data does not identify the injury mechanism, it can only identify that the fatalities resulted from a bus rollover accident.

Bus occupant injury and fatality data as below is for the period 1999 to 2003 from the ATSB report *"Serious Injury Due to Road Crashes"* November 2004.

Persons Seriously Injured in Road Crashes, Australia, July 1999 to June 2003

Year	***Bus***
Jul-Dec 1999	*94*
Jan-Dec 2000	*215*
Jan-Dec 2001	*233*
Jan-Dec 2002	*220*
Jan-Jun 2003	*108*
Total Hospitalisations	***870***

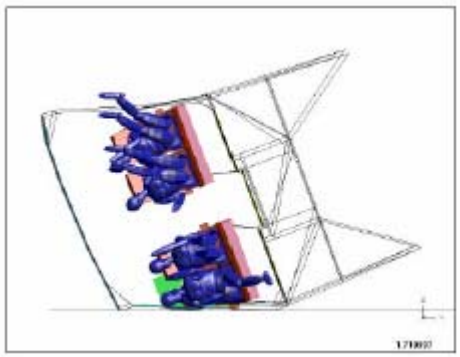
Casualties** (Fatalities) **due to Road Crashes, Australia, July 1999 to June 2003

Year	***Bus***
Jul-Dec 1999	-
Jan-Dec 2000	*4*
Jan-Dec 2001	*8*
Jan-Dec 2002	*6*
Jan-Jun 2003	- .
Total Casualties	***18***

The combined ATSB data indicates that there has been a reduction in fatalities and hospitalisations from 1996 to 2003 which could be attributed to the introduction of the package of occupant protection measures of which ADR 59 is one part of the total package.

2.0 ROLLOVER AND THE EFFECTS OF UNSAFE BUSES

The bus occupant is vulnerable to significant injury in the event of a rollover. If the bus body does not have sufficient strength the body will collapse when the vehicle mass is born by the bus body cant rail (the intersection of the roof and wall). The effect of the weaker bus body is that the space where the occupant is seated is reduced and the occupant is either crushed or forced across into the space occupied by the adjacent occupant and therefore impacts with the other occupant.



(ECBOS 2001)

The occupant can also impact with the side wall/window and the luggage rack or roof above the seating position which can cause significant injury.

Furthermore, a rollover event can cause the occupant to be partially or totally ejected through window openings.

2.1 Studies into Omnibus Occupant Protection

There has been a number of international studies/investigation into bus design and injury causation; however, there has not been an Australian study into bus design since 1973 when Joubert reviewed safety in motor vehicle design in Australia. There was an Australian investigation into a number of fatal bus accidents during the period leading up to 1989 where multiple fatalities and serious injuries resulted from the bus body design failing to protect the bus occupants during crash incidents. However, there has not been a longitudinal study of bus accidents which can be useful in the assessment of the design measures required to improve bus occupant protection in Australia.

In the absence of Australian data on mechanisms of injury causation from real world accidents, the following information is presented as an indicator of the injury types and distribution amongst bus occupants from accidents involving buses in Australia.

2.1 Swedish Study

"Is there a pattern in European bus and coach incidents? A literature analysis with special focus on injury causation and injury mechanisms" by P Albertsson - Division of Surgery, Department of Surgical and Perioperative Sciences Umeå University, Umeå, Sweden and T Falkmer - Swedish National Road and Transport Research Institute Linköping, Sweden;

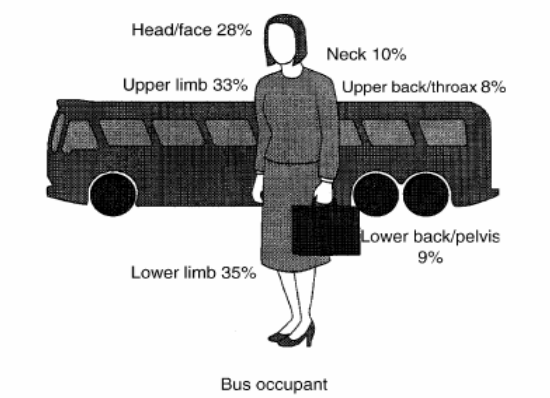


Fig. 3. The most frequent injury regions on all bus and coach occupants from bus incidents. Due to multiple injuries, a total of more than 100% is presented in the figure (Simpson, 1997).

Injury distribution from bus and coach incidents in Great Britain based on national hospital data during a 3-year period (Simpson 1997) are described in the above fig 3.

The Swedish study found that most frequently injured body regions were to the limbs, followed by the head/face. The referenced Simpson study also described the distribution of injury severity through the Maximum Abbreviated Injury Scale (MAIS) the distribution was:

up to 32 per cent for MAIS 1 (Minor – bruising),

65 per cent for MAIS 2 (Moderate – simple limb fracture)

3 per cent for MAIS 3 (Serious – basilar skull fracture) or more.

The injury severity for different injury types showed that among slight injuries were "tenderness" the most common in 35 per cent of most cases, followed by "whiplash" 8 per cent. Bone fractures were the most common among serious injuries in 8 per cent of cases.

Sever accident study based on 47 real-world coach crashes with at least one "severe injury or passenger fatality", Botto et al. (1994) found that rollovers and tip-overs occurred in 42 per cent of the cases. The study outlined four main injury mechanisms in severe coach crashes.

1. Projection: occupant interaction with other occupants and the interior of the coach. Projection was the most frequent injury mechanism, but on average the lowest injury severity.
2. Total ejection: the occupant being ejected or thrown out of the vehicle.
3. Partial ejection: part of the occupant's body was thrown out of the compartment.

4. Intrusion: the occupant being injured inside the vehicle, due to structural deformation or intrusion of an object.

Injury mechanisms in rollover coach crashes were further analysed (Botto and Got, 1996). Two separate sources were used, 16 real-world crashes and 3 experimental crash tests using road ready vehicles. In the real-world crashes, 19 per cent of the occupants were killed. The highest proportions were found in rollovers over a fixed barrier, yielding a 30 per cent rate of Killed or Seriously Injured (KSI). In rollovers without a fixed barrier, the KSI rate decreased to 14 per cent.

From Great Britain's part of the "*Enhanced Coach and Bus Occupant Safety"* ECBOS project, it was reported that rollovers were the cause for 1 per cent of all casualties, but representing only 0.2 per cent of all vehicles involved in crashes (ECBOS, 2001).

Spanish data from 1995–1999 showed a rollover frequency of 4 per cent of all coach "accidents" on roads and highways, and the risk for fatalities in a rollover was five times higher than in any other coach "accident" type (Mart´ınez et al., 2003)

Rasenack et al. (1996) analysed 48 touring coach crashes in Germany of which eight were rollover/overturn crashes. These eight crashes accounted for 50 per cent of all severe injuries and 90 per cent of all fatalities.

References

- Australian Transport Safety Bureau - Australian Bus Safety; Report Nov 2001
- Bureau of Transport and Regional Economics – Road Crash Cost in Australia; Report 102 May 2000
- Trade Practices Act 1974
- *Evaluation of restraint system for coach passengers.* Botto, P., Caillieret, M., Tarrier, C., Got, C., & Patel, A. (1994). Paper presented at the Fourteenth international technical Conference on enhanced safety of vehicles, Munich, Germany.
- Australian Design Rule 59/00
- United Nations Economic Commission for Europe Regulation 66 Large Passenger Vehicles with Regards to the Strength of their Superstructure
- Bus Industry Confederation Submission to the House of Representatives Standing Committee on Transport and Regional Services into road safety in October 2003
- Motor Vehicle Standards Act 1989
- *"Is there a pattern in European bus and coach incidents? A literature analysis with special focus on injury causation and injury mechanisms"* by P Albertsson - Division of Surgery, Department of Surgical and Perioperative Sciences Umeå University, Umeå, Sweden and T Falkmer - Swedish National Road and Transport Research Institute Linköping, Sweden;
- Enhanced Coach and Bus Occupant Safety 2001
- Australian Transport Safety Bureau - Serious Injury Due to Road Crashes; Report November 2004

Appendix 1 - Summary of Public Comment Feedback

Note that manufacturer's names have been removed to protect commercial interests.

Organisation	Keep existing 59 requirements	Harmonise ADR 59 with UNECE R 66/01	Comments
Bus Manufacturer	Yes		
Bus Manufacturer	Yes		
Compliance Agent	Yes		
Australian Automobile Association		Yes	Harmonise with UNEC R 66/01