

**SEAT AND BELT
CONFIGURATIONS FOR HEAVY
VEHICLES**

**Discussion paper on options for
improved design requirements**

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National Transport Commission

Prepared by Burgewood Pty Ltd

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Purpose: To seek public comment on options for improved seat belt wearing compliance.

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FOREWORD

The National Transport Commission (NTC) is a statutory body established by an inter-governmental agreement to progress regulatory and operational reform for road, rail and intermodal transport to deliver and sustain nationally consistent outcomes. The NTC is responsible for developing and maintaining the National Heavy Vehicle Safety Strategy (NHVSS). This is done with input by the Heavy Vehicle Safety Strategy Taskforce (HVSS Taskforce), which comprises representatives from jurisdictions and key industry stakeholders. The NHVSS is approved by Ministers of the Australian Transport Council.

Increasing seatbelt wearing compliance is a key strategic objective for the NHVSS. With around 40 unbelted drivers killed each year, the strategy has identified a project to look at introducing compulsory seat and belt configurations, which may lead to greater wearing compliance. Anecdotally, evidence would suggest that some seat and belt configurations are uncomfortable for heavy vehicle drivers, which contributes to the low wearing rate compliance.

This report seeks to investigate whether any seatbelt design issues need to be resolved in order to contribute to better wearing rates. The purpose of this report is to assist the HVSS Taskforce to determine whether further work needs to be undertaken in this area. Therefore, public comment is sought on the accuracy of the information in the report, the feasibility of the proposed options, including supporting evidence and information, and also suggestions for alternative options to be considered. The results will help the NTC in the development of a future safety work programme.

Submissions can be received in writing by **14 October 2005**, either by post or electronically.

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SUMMARY

Seatbelt wearing compliance for drivers of heavy vehicles is estimated to be around 50% which, in comparison to that of passenger car drivers (around 95%), is very low. Increasing wearing compliance is one of the key strategic objectives of the National Heavy Vehicle Safety Strategy.

Anecdotally, evidence suggests that some seat and belt configurations are uncomfortable for heavy vehicle drivers, which contributes to the low wearing compliance rate. Therefore, it is possible that introducing a compulsory standard for more favourable configurations could increase wearing compliance, however, there is little evidence to support this at present.

The purpose of this report is to investigate any realistic links between seat comfort and belt wearing. This is tested by canvassing the heavy vehicle market to establish what seat and belt configurations are contained in vehicles delivered (i.e. new vehicles) in the last year. It is assumed that these delivery statistics are typical and therefore provide a benchmark for determining what proportion of seat and belt configurations are available in the existing fleet. Conclusions could then be drawn that if there is a prevalence of a certain seat and belt configuration, and if this configuration could be demonstrated to be uncomfortable, then there may be benefit in introducing a regulatory standard in favour of other sorts of belts.

During the development of this research, key stakeholders, including government enforcement agencies, the truck operating industry and truck manufacturers have been consulted. The results of a literature review demonstrate that there is not a lot of reliable information available on this issue. The report concludes that there are some commonly held assumptions relating to the comfort of certain seat and belt configurations which, when tested, do not measure up. These, linked with other misconceptions (including an apparently common perception that wearing seatbelts is dangerous) contribute to the low wearing compliance rate.

The report concludes that there are a range of options to address better seatbelt design, which could be explored to remove one of the perceived barriers to seatbelt use, including amending existing Australian Design Rules relating to seatbelts to specify belt and seat configurations, making seatbelt reminder systems for heavy vehicles compulsory, making certain seat and belt configurations compulsory when retro-fitting or re-fitting seats in heavy vehicles and enhancing enforcement techniques.

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1. INTRODUCTION

Anecdotal evidence, supported by observational surveys, suggests that seatbelt wearing compliance with heavy vehicle drivers is perhaps as low as 50%. This is in comparison with a 95% wearing rate with private passenger vehicles. This presents a significant safety problem in terms exacerbating the effects of serious injury crashes had by truck drivers, and increasing fatalities. The National Heavy Vehicle Safety Strategy (NHVSS) identifies key strategic areas for improving heavy vehicle safety. One area is raising the level of seatbelt wearing for heavy vehicle drivers to match that of car drivers. This would reduce the costs of accidents in which heavy vehicle drivers are injured by about 45%.

The reasons behind low wearing rate compliance include a number of factors. It would appear that there is a common perception amongst drivers that seatbelts are often uncomfortable, making it significantly less desirable to wear a seatbelt. There also appears to be a prevalence of the misconception that there is no safety benefit to be gained from wearing a seatbelt in a heavy vehicle. Other reasons for wearing non-compliance stem from inconvenience issues.

1.1 Background

Seatbelts were introduced into passenger vehicles in Australia, as a mandatory fitment, in the early 1970s. At the time of introduction, there was significant resistance from motorists to the use of seatbelts. This resistance was borne from the feeling that seatbelts were not comfortable, restricted the driver from operating the vehicle properly and were generally unnecessary.

Since then, the impact of this mandatory fitment in passenger vehicles has been well researched and documented. Today, surveys have measured the wear rates in passenger vehicles to be greater than 95% and the drop in the road toll remarkable. The impact has been a significant decrease in passenger vehicle fatalities, serious injury and road trauma.

The mandatory use of seatbelts in heavy vehicles was implemented nationally when the Australian Road Rules came into force in December 1999, although in some jurisdictions it was compulsory prior to this date. As happened with passenger vehicles, there has been resistance to the use of seatbelts in heavy vehicles. An observational survey completed in New South Wales (NSW) in 2002 (Preece, R (2002)) indicates about half of truck drivers use seat belts.

The Roads and Traffic Authority, NSW (RTA) undertook a crashed vehicle study between 1995 and 1998 (Preece, R (2002)). In the study, 225 drivers of prime movers with trailers involved in crashes were studied. Of these, more than two hundred (n=205) were not wearing a seatbelt, while only 20 were wearing a seat belt. Of those wearing a seat belt none were killed or seriously injured, and 30% had minor injuries. For those who were not wearing a seat belt, 45% were killed or injured. This demonstrates the link between seatbelt wearing and death or injury prevention, and the road safety benefit of improving seatbelt wearing rates in heavy vehicles.

This report aims to review the current situation with heavy transport and seatbelt use and review potential measures to increase the use of seatbelts in heavy transport.

1.2 Purpose

The purpose of this report is to provide a current overview of seatbelt availability and use in heavy vehicles in Australia, to test the theory that seatbelt wearing non-compliance is a result of certain seatbelts not being comfortable. This is with a view to ascertaining whether introducing a compulsory standard for certain seat and belt configurations may achieve a greater safety benefit.

In doing so, this report will seek to ascertain whether market forces may drive the trend toward more comfortable belt configurations and in what areas of the fleet (heavy, light commercial, etc.) the safety risk exist. This is done by exploring the correlation between different seat and belt configurations and the perceived and the comfort of these. This report does not investigate whether improved comfort levels will, on their own, lead to significant increase in wearing rates.

The NTC also wishes to seek feedback from stakeholders on the accuracy of the information in the report, the feasibility of the proposed options, including supporting evidence and information, and also suggestions for alternative options to be considered.

1.3 Literature Review

Many countries, including several European countries, USA, Canada and Australia have researched and reported on the benefits of seatbelt use. This research has proven that the use of seatbelts significantly reduces driver and passenger fatalities and serious injuries. To access the benefits of a lower road toll, these countries have used legislative processes to make the use of seat belts mandatory. However, in each of these countries the driver resistance to use seatbelts has been high.

In Australia, Australian Design Rule 4 (ADR 4) is the national standard for the fitment of seatbelts in heavy vehicles. Since the introduction of ADR 4, and the mandatory use of seatbelts, there has been some research into the effectiveness of the requirement. These have shown that drivers resist the use of seatbelts. Reports and studies undertaken overseas have produced similar results.

In the USA, Regulation 392.16 'Use of seat belts' reads "A commercial motor vehicle which has a seat belt assembly installed at the driver's seat shall not be driven unless the driver has properly restrained himself / herself with the seat belt assembly". In a recent US report, the Transport Research Board special report 278 has shown their heavy vehicle drivers are resisting seatbelt use.

The Department of Transport, UK, has published a report on Road Safety (July 2003) which states (point 7.13) "We also plan to make the fitting of seat belts compulsory in new buses, coaches and minibuses which may not carry standing passengers, and in new goods vehicles over 3.5 tonnes, subject to consultation." This indicates that the UK Heavy Goods Vehicle legislation is well behind that of other countries.

1.3.1 Resistance to Use of Seatbelts

Resistance to heavy vehicle driver seatbelt use has been studied and detailed in the RTA report (Preece, R (2002)) (based on the interviews of Gibson, Benatos and Corbett 2001 RTA) and drivers have stated their reasons as including:

- restriction in the use of side mirrors;
- discomfort during normal driving;

- inconvenience when performing deliveries;
- impeding the driver's ability to move within or escape from the cabin in order to avoid injury during or after a collision;
- difficulty in accessing and unlocking the seatbelt; and
- getting entangled in the seatbelt when exiting the cab.

This report also asserts that these reasons do not justify the drivers not wearing seat belts, given the finding that an estimated 40% to 50% of fatalities could be prevented by seat belt use at similar levels to light vehicles in NSW.

Driver resistance was experienced in Australia at the introduction of seatbelts in passenger vehicles for reasons similar to the resistance by heavy truck drivers today. To overcome the resistance in passenger vehicles, a massive education campaign was conducted and there were high levels of enforcement. Today wear rates in passenger vehicles in Australia is amongst the highest in the world (at around 95%).

The report concludes that a number of strategies, based on the experience of light vehicles (passenger vehicles), could be used to increase seatbelt wear rates. These strategies include:

- informing occupants and operators of the safety value of using seatbelts in trucks and addressing the false belief that it is better to be unrestrained in a crash; and
- encouraging truck owners to provide vehicles with appropriate restraints fitted so that drivers can use them easily and comfortably;
- informing drivers about the legal requirement to wear an available seatbelt; and
- enforcing the seatbelt regulations.

A campaign by the RTA called "Do or Die – Seat Belts Save Truckies Too" recognised the problem of low seatbelt usage and that 40% to 50% of the truck drivers lives lost in heavy vehicle accidents could be saved. The campaign aimed to educate fleet operators and drivers about the safety value of seat belts and the legal requirement to sue them, including the operators' requirements under Occupational Health and Safety laws to provide a safe work place.

The main thrust of the campaign was education and the RTA used devices to inform and then reinforce the message of seatbelt use. These devices included direct mail packs, roadside billboards, posters displayed at truck stops, and road stencils. A survey taken to determine the results of the campaign indicated there was a high awareness of the campaign and improved attitudes and self reported use of seatbelts.

The Head of Safety and Research of Scania Sweden, Mr Nils-Gunnar Vagstedt, in 'Safety Shows – Scania introduces red seat belts' is quoted as saying "Every step we can take that increases the use of seatbelts by drivers and passengers in trucks is welcome. Still, although compulsory since several years in most countries, seat belts are only worn by between 5 and 20% of drivers". This suggests that belt wearing rate compliance is an issue overseas also.

Lismore City Council, in an internet report, *Seatbelt Survey Encouraging* (May 2003) conducted observational surveys to determine seatbelt usage. Based on the findings, the Council is now constructing and conducting surveys and using advertising, education, and enforcement to encourage heavy vehicle seatbelt wearing compliance.

1.3.2 Seatbelt Reminder Systems

A seatbelt reminder system is a prompt of some kind that alerts or reminds the driver if seatbelts are not put on when the engine is started. The ADR 69 requires seatbelt reminders in passenger vehicles, which must operate a dash light for five seconds and then extinguish. The Australian Transport Statistics Bureau Consultant Report 215 comments it is arguable that while the vehicle is starting, this seatbelt reminder is lost within the other warning systems activated at the start up.

Under the Canadian standard 208 (section 6), all vehicles over 4536kg are fitted with a seatbelt. This fitment also requires an added feature of a five-to-eight second dash light, designed to remind the driver to use the seatbelt. It is not an aggressive reminder and reports have indicated the reminder light is lost amongst the other warning lights when the vehicle is started and therefore not as effective as intended.

The European Transport Safety Council reported in 'Priorities for EU Motor Vehicle Safety Design' 2001 that top priority is to be given to seatbelt reminder systems and seatbelt fitment legislation. This report indicates heavy vehicle drivers have also resisted the use of seatbelts.

1.3.3 Enforcement and Penalties

The penalties for not wearing a seatbelt are significant. In Queensland, NSW and Victoria, a driver not wearing a seatbelt will be fined over \$200 per offence and receive three demerit points. NSW also considers the driver responsible for passengers to wear seatbelts and if there is an offence, then additional fines and demerit points are awarded to the driver.

While the penalties are significant, the level of actual enforcement is unknown and anecdotally in some jurisdictions may be very low. This could be attributed to an operational policy decision enacted by Police, however, is more likely to be a result of the physical difficulty for Police in observing whether a belt is worn (in terms of proximity of police car in relation to truck cab and depending on whether or not a lap only belt is installed). This will necessarily lead to lower wearing rates, as evidenced by research in Australia and the United States of America for light vehicles which indicates that when mandatory seat belt use is not rigorously enforced when it is introduced, low wearing rates ensue.

1.3.4 Summary

The above information sourced from reports globally has common elements:

- each country has recognised that heavy vehicle drivers are not using seatbelts at the rate of light vehicles in Australia;
- each country has recognised the current substantial cost of heavy vehicle driver fatalities and serious injuries; and
- each country has recognised that these costs are significantly reduced by the correct fitment and use of seatbelts.

The low levels of heavy vehicle drivers' seat belt use are therefore resulting in unnecessary loss of life amongst heavy vehicle drivers. Increasing seat belt use by removing real or perceived barriers will result in lives saved.

From the information researched above, the problem of drivers not wearing seatbelts is well understood. Experience from the RTA strategy of education and driver awareness is that seatbelt use can be improved. NSW would argue that improvements to the ADR requirements for heavy vehicle seat belts would supplement and enhance this approach.

2. SEATBELTS, SEATS, COMFORT IN TRUCKS

2.1 Australian Design Rules

Australian Design Rules specify technical standards for vehicles in various areas, at point of manufacture or entry into the country. There are currently three ADRs that relate to seats and seatbelts. They are:

- ADR 3-Seats and Seat Anchorages. The function of this national standard is to specify requirements for 'Seats', their attachment assemblies, and their installation to minimise the possibility of occupant injury due to forces acting on the 'Seat' as a result of vehicle impact.
- ADR 4-Seatbelts. The function of this national standard is to specify requirements for seatbelts to: restrain vehicle occupants under impact conditions, facilitate fastening and correct adjustment, assist the driver to remain in his 'Seat' in an emergency situation and thus maintain control of the vehicle, and protect against ejection in an accident situation.
- ADR 5-Anchorage for Seatbelts and Child Restraints. The function of this national standard is to specify requirements for 'Anchorages' for both 'Seatbelt Assemblies' and 'Child Restraints' so that they may be adequately secured to the vehicle structure or 'Seat' and will meet comfort requirements in use.

2.2 Seatbelts in Trucks

Heavy vehicles can be fitted with either lap only seat belts, or lap sash seat belts. A random survey of heavy vehicles in NSW undertaken by the RTA in 2003 found that 33% of articulated vehicles surveyed had lap only belts.

These belts can either be anchored to the seat itself (known as integrated seat belts), or anchored to the cabin (i.e. B-Pillar—which is the column next to the shoulder of the seat, and directly to the floor). A B-Pillar anchored seatbelt is completely separate from the seat.

Although under the ADR lap only belts can be installed in vehicles, lap sash belts provide greater protection. This is because they restrain the torso and can prevent contact with the interior of the cabin. A lap sash seat belt with air bags generally provides the highest level of occupant protection currently available.

2.3 Seats in Trucks

There are two basic seat designs in truck cabs; fixed seats and suspension seats. These types refer to how the seat is fixed to the vehicle.

A fixed seat is mounted to the cab floor and has adjustments similar to those adjustments found in a passenger vehicle. A suspension seat is also mounted to the cab floor, but the

seat cushion and back (squab) is connected to the chassis by a suspension system such as air suspension. Suspension seats have greater adjustment capabilities than the fixed seat.

With an integrated seatbelt and suspension seat, all the forces are transmitted through the seatbelt/seat configuration to the floor and, therefore, requires a stronger cabin mounting system. In the case of a B-Pillar anchored seatbelt the forces are transmitted through the B-Pillar, the floor mounting points for the seatbelt and the seat.

2.4 Seats and Seatbelts in Trucks

Seatbelts and seats can be in four configurations:

1. B-Pillar anchored seatbelt with a fixed seat;
2. B-Pillar anchored seatbelt with a suspension seat;
3. integrated seatbelt with a suspension seat; and
4. integrated seatbelt with a fixed seat.

The following data is based on statistics provided by the Truck Industry Council, from the *Truck Tracker Report* as compiled by the Equipment Research Group (EGR), and analysis by OEM manufacturers and seat suppliers.

The truck market in Australia has twenty two manufacturers who supply vehicles from a Gross Vehicle Mass (GVM) of less than 3,500kg to over 28,000kg.

Market statistics show vehicles with B-Pillar anchored seatbelts and fixed seats are available from eleven manufacturers and have a GVM range from 3,500kg to 16,000kg. This vehicle configuration makes up approximately 46% of the total market (delivered vehicles in calendar year 2004).

Vehicles with B-Pillar anchored seatbelts and suspension seats are available from ten manufacturers and a GVM range from around 3,500kg to over 28,300kg. This vehicle configuration makes up approximately 31% of the total market.

Vehicles with integrated seatbelts and suspension seats are available from ten manufacturers and a GVM range from around 3,500kg to over 26,000kg. This vehicle configuration makes up approximately 23% of the total market.

Integrated seatbelts with a fixed seat, while available in Australia, are not used for the driver's seat.

In summary therefore, 46% of heavy vehicles sold have fixed seats and B-Pillar anchored seat belts, 31% have suspension seats and B-Pillar anchored seat belts, and 23% have suspension seats and integrated seat belts.

2.5 Seatbelts, Seats and Comfort

As noted earlier, one of the reasons given by drivers for not wearing their seatbelts is discomfort.

On all Australian trucks seatbelts have an automatic retracting mechanism. If we consider a passenger vehicle seatbelt configuration as the benchmark of comfort, then it could be argued that a heavy vehicle with a fixed seat and B-Pillar anchored seatbelt will have similar levels of comfort to a light vehicle because the heavy vehicle driver's position

relative to the cab floor, and to the relative position of the seatbelt anchorage, remains constant during the travel of the vehicle.

Consider the integrated seatbelt with a suspension seat. As a result of being mounted to the seat the seat belt moves up and down with the driver. From a comfort perspective, the driver experiences free movement as would a driver in a passenger vehicle. The driver also experiences less vibration and less 'jarring' from bumps and other road conditions, because of the effect of the suspension seat. It could be reasonably argued then, that the driver experiences comfort levels equal to or better than a passenger vehicle driver.

The discomfort probably arises, however, when there is a seatbelt anchored to the B-Pillar that is used with a suspension seat, because as the seat goes up and down the seatbelt may slowly tighten. That is, a suspension seat is designed to ride the bumps and dampen vibration. If the driver has a B-Pillar anchored seatbelt, when a bump is experienced and the first reaction is for the seat to reduce height relative to the cab floor, the seatbelt becomes loose. The next reaction is for the seatbelt to 'adjust' by reducing the length of strap around the driver. The third reaction is for the driver's seat to re-adjust to normal height (or above, depending on the severity of roughness and the seat dampening adjustment). The seatbelt locks as it is designed to do and driver experiences the force of the seatbelt across the neck, throat, chest and abdomen.

The seatbelt may or may not unlock as the vehicle continues on its trip. This means that the driver may continue to experience the discomfort of tightened belts during normal driving on smoother roads.

A rough road may be considered to include roads such as the shoulders of roads, the traversing of driveways, and crossing high camber intersections.

It was because of this issue that from 1 June 1993 changes were made to the ADR to make retractor mechanisms for the driver's seat better suited to heavy vehicle suspension seats so that they did not lock up so easily. It is not clear, however, that these changes have in fact led to an improvement in this issue.

If vehicles are fitted with B-Pillar anchored seatbelts and fixed seats or integrated seatbelts and suspension seats, then the comfort levels should be considered equivalent to passenger vehicles. In relation to vehicles fitted with B-Pillar anchored seatbelts and suspension seats it could be argued that driver comfort is compromised. As indicated above, this configuration makes up 31% of trucks delivered into the Australian market in the 2004 calendar year.

2.6 Seatbelt Anchorage, Seats and Cab Design

The installation of seatbelt anchorages and the type of seat in a truck cab is determined by the cab strength and customer demand. The installation of a B-Pillar anchored seatbelt requires less cab floor strength to install the seat, whether it is a fixed or suspension seat. An integrated seatbelt on a suspension seat requires a strong cab floor. If a vehicle is in an accident, the forces generated must not allow the seat or seatbelt anchorages to fail. Thus, for an integrated seatbelt and suspension seat, all accident forces will act upon the floor mounting structure. In comparison to the B-Pillar anchored seatbelt, the generated accident forces are dispersed through the floor and the B-Pillar.

Using data from the truck deliveries of 2004 calendar year, approximately 12% of the total deliveries were of vehicles where cab strength or cab design may be insufficient to support

a suspension seat. Although these cabs require a seat and belt configuration that may provide a lower level of comfort, they still provide the necessary protection.

The manufacturers supplying vehicles with potentially insufficient cab floor strength to support the installation of an integrated seatbelt and suspension seat configuration have indicated they are working towards a strengthened cab to permit integrated seatbelts and suspension seat installations.

As indicated above, 31% of the total market delivered in the 2004 calendar year had B-Pillar anchored seatbelts and suspension seats. Of this, 20% of the total deliveries can have integrated seatbelts and suspension seats retro fitted. The manufacturers of the other 11% have indicated their vehicles are capable of integrated seatbelt and suspension seats but this configuration has not yet been engineered for these vehicles, but will be in the near future.

2.7 Manufacturers

Australian heavy vehicles are sourced from three areas, America, Europe and Japan. The proportions are reflected in the table below, which also indicates the seatbelt/seat configurations installed, by country. The information has been sourced from all deliveries made in calendar year 2004.

Table 1. Seat and Seatbelt Type, by Country, for Deliveries for 2004 Calendar Year

	Integrated Suspension	B-Pillar Fixed	B-Pillar Suspension
American	3458	3976	1882
European	3647	3121	139
Japanese	52	7182	7853
TOTAL	7157	14279	9874

SOURCE: TIC Truck Tracker Calendar Year 2004 Report supplied by ERG

Table 2. Percent of Country of Design Origin / Percent of Seatbelt-Seat Type

	Integrated Suspension		B-Pillar Fixed		B-Pillar Suspension	
	% of total from country	% of total seat and belt configuration	% of total from country	% of total seat and belt configuration	% of total from country	% of total seat and belt configuration
American	37.1	48.3	42.7	27.8	20.2	19.1
European	52.8	50.1	45.2	21.9	2.0	1.4
Japanese	0.3	0.7	47.6	50.3	52.1	79.5
TOTAL*	22.9		45.6		31.5	

SOURCE: TIC Truck Tracker Calendar Year 2004 Report supplied by ERG

* Total indicated the % of the total deliveries for the calendar year 2004

European and American manufacturers currently deliver over 99% of all vehicles delivered with integrated seatbelts and suspension seats. The remaining 1% integrated seatbelt with an air suspension seat is on a new Japanese model.

European manufacturers also deliver into the market 98.9% of their product with either B-Pillar anchored seatbelt and fixed seat or an integrated seatbelt and suspension seat. In other words, nearly all the product supplied by the European manufacturers is equal to or better than the comfort for drivers of passenger vehicles.

The American style vehicle delivered nearly 20% of their total deliveries with a B-Pillar and suspension seat configuration. This is in alignment with the Federal Motor Vehicle Safety regulations. Discussions with the major manufacturers of American product indicate their customer demand is increasing for integrated seatbelts and suspension seats and this configuration is replacing the B-Pillar anchored seatbelts and suspension seats.

Japanese producers predominately supply B-Pillar seatbelt configurations. For all Japanese manufacturers to provide integrated seatbelts and suspension seats, like the American product, considerable time will be required to engineer the configuration into their respective vehicles. Discussions with most of the Japanese vehicle manufacturers has indicated their customer demand is increasing for integrated seatbelts and suspension seats in lieu of B-Pillar anchored seatbelts and suspension seats.

General discussions with many of the manufacturers have indicated their customers are trending toward vehicles capable of having integrated seatbelts and suspension seat installations. It was also noted that trucks of less than 12 tonne, that is the NB1¹ and NB2² class of vehicles are price sensitive in the market. This means that there may be an impact on the 'sale-ability' of a vehicle with a integrated belt and seat combination installed.

2.8 Market Trends

Current ADR 4/03 and ADR 5/04 stipulate seatbelts and seatbelt anchorages are required in heavy vehicles. The ADRs do not, however, stipulate requirements for the type of seatbelt and seat configuration, apart from that they meet a minimum safety standard.

From calendar year 2000 to 2004, the trend to incorporate integrated seatbelts and suspension seats has been driven by consumer demand, although it would appear that these demands are not overly significant. The 2004 calendar year statistics showed 16% of vehicles delivered have integrated seatbelts and suspension seats. This penetration into the market could be considered low and may reflect the context of driver comfort and seatbelt wearing compliance.

Using the passenger vehicle B-Pillar seatbelt anchorage and fixed seat as a benchmark of comfort, then B-Pillar seatbelts with a fixed seat and integrated seatbelts with suspension seats could be considered as the equivalent or better than the passenger vehicle 'comfort' benchmark. This being the case, then the combined market penetration for B-Pillar seatbelt and fixed seats plus integrated seats with suspension seats is 69%. The corollary is 31% of vehicles have seatbelt and seat configurations that may create an uncomfortable driver environment.

¹ NB1 means medium goods vehicle over 3.5 tonnes, up to 4.5 tonnes

² NB2 means medium goods vehicle over 4.5 tonnes, up to 12 tonnes.

Discussions with seat manufacturers have indicated they have not seen any significant trend for the increase in installation of integrated seatbelts and suspension seats from calendar year 2000 and 2004. However, there is anecdotal evidence that transport companies are becoming more demanding for integrated seatbelts and suspension seats for their drivers. This increased demand, however, has not translated into a significant increase in integrated seatbelt and suspension seat installations.

3. ISSUES TO TAKE INTO CONSIDERATION

3.1 Safety

All seats that meet current ADR requirements are safe. While there is a suggestion that some seatbelt and seat configurations may be more or less comfortable than others, this does not imply that any combinations are less safe than others. The purpose of seatbelts, and the endorsement of wearing compliance, is aimed at saving lives and reducing serious injuries in the case of an accident. Wearing a seatbelt in any configuration is better than not wearing one at all.

3.2 Comfort

What determines 'driver comfort' is largely a matter of opinion. As it is currently understood, driver resistance to wearing seatbelts in heavy vehicles is in part a result of discomfort caused by wearing a seatbelt. This discomfort can arise in two ways; actual discomfort, and the belief that wearing a seatbelt might be uncomfortable (which is reinforced by a commonly held, ingrained, view across industry).

If using driver seatbelt/seat configuration in passenger vehicles is the benchmark for seatbelt comfort, then over 30% of trucks delivered in 2004 may not reach that benchmark. However, this also suggests that nearly 70% do reach a comfort benchmark. Non seat belt use in these vehicles, therefore, is likely due to perceived discomfort, lack of a seat belt use habit, incorrect safety beliefs and lack of enforcement.

3.3 Engineering

Each manufacturer, whether from America, Europe, Australia or Japan, conforms to the current regulations. Vehicles not conforming are not available for sale in this country. To make changes to regulations that require significant engineering resources, which might be the case for some companies if the regulation change impacted cab design and cab strength, means manufacturers should be given reasonable notice to achieve such a change.

3.4 Cost Sensitivity

The cost difference of a B-Pillar seatbelt with a fixed seat, B-Pillar anchored seatbelt and mechanical suspension seat and an integrated seatbelt and air suspension seat may be seen as sensitive to the size of the vehicle. Smaller vehicles are in a very price sensitive market. Using less expensive seats could reduce the retail price of a vehicle by around \$1000. This equates to over 2% of the total price for some vehicles.

3.5 Reminder Systems

ADR 69/0 requires seatbelt reminder systems to be incorporated into passenger vehicles but not heavy vehicles. The purpose of reminder systems is to increase driver awareness, change driver habits and improve driver seatbelt wear rates.

Many truck manufacturers currently have reminder systems such as a dash light that extinguishes after a few seconds. The inclusion of reminders comes from the standard fitment by the manufacturers of other countries.

3.6 Observational Surveys

An observational survey aims to identify if a driver is or is not wearing a seatbelt while driving. This is done by positioning an observer to have visibility access to the driver's position and seatbelt anchorage. For heavy vehicles, seat belt observations are made difficult because of the configuration of the vehicle (i.e. it can be very difficult to see into the dark cabin of a prime mover), and the prevalence of lap only seat belts.

Observational surveys conducted have ascertained whether or not a driver is wearing a lap sash seatbelt, by either observing the seatbelt across the driver's neck and chest or observing the seatbelt on the B-Pillar (and therefore, not in use).

An observational survey cannot accurately determine what type of seat is installed in the truck or what type of seatbelt maybe in use (i.e. B-pillar mounted or integrated, lap belt). These limitations mean that the surveys are unable to assist in determining if the seat belt is not being used because of the seat/seat belt configuration.

Future observational surveys should consider:

- determining the make and model of the vehicle;
- determining whether the vehicle is an NC Class (i.e. over 12t) or an NB1 or NB2 Class (i.e. less than 12t); and
- seeking a method of determining type of seat belt and seat type.

4. OPTIONS

It is useful to speculate as to how seatbelt wearing rates can be improved. Depending on whether compliance rates are low due to unintentional or intentional reasons, there are some options to consider.

4.1 Status Quo

There are currently no requirements stipulating specific seat and belt configurations. To leave requirements as they are means B-Pillar seatbelts and suspension seats would remain as an option for the Australian market. Market trends have indicated an increase toward integrated seatbelts but this is anecdotally small. Without greater market or regulatory influence, the B-Pillar anchored seatbelt and suspension seat would remain in the Australian market for sometime (currently, they make up 31% of the market). Without regulatory intervention, this seatbelt/seat configuration is likely to remain for some time, contributing to the perception that seatbelts are uncomfortable, therefore, exacerbating resistance to wearing seatbelts overall.

4.2 Amend ADRs or Develop a New ADR

Some sort of legislative requirement could be introduced, by either amending existing seat and seatbelt ADRs, or by developing a new ADR relating specifically to this issue. There are several different approaches that this could take.

4.2.1 Amend ADR 4 and ADR 5 to Define Seatbelt/Seat Configurations

ADR 4 and ADR 5 could be amended to define that vehicles fitted with suspension seats may only be fitted with integrated lap/sash seat belts. This would still allow vehicles the option of having fixed seats to be installed with B-Pillar seatbelts. Integrated seatbelts with suspension seats or fixed seats with B-Pillar seatbelts maintain a relative position of the driver with the seatbelt, and should be considered by drivers as being as comfortable as, or more comfortable than, the comfort benchmark.

In effect, this would remove B-Pillar anchored seatbelts and suspension seats from future heavy transport and, therefore, the potential for driver discomfort.

If the ADR is changed, then the wording should be such as to allow innovation and technology advancements to be incorporated into future designs of seats. (Under Performance-Based Standards, this may be approached by saying the benchmark for driver seat comfort must be equal to or better than passenger vehicle seat comfort). This is anticipated to conform to Performance-Based Standards.

An argument may be made to include the B-Pillar anchored seat with a suspension seat due to the cost sensitivity of NB1 and NB2 class vehicles. This argument would only be valid if the seatbelt/seat configuration was permitted. Removing this seatbelt/seat configuration means no manufacturer would be disadvantaged nor would any manufacturer be given an advantage.

It is suggested that the Truck Industry Council (TIC) be requested to contact their member companies and ask what a reasonable timeframe would be, should they move to either a B-Pillar anchored seatbelt and fixed seat or an integrated seatbelt and suspension seat for their full production. This is with the understanding that TIC's member companies will see this as a strategic effort and will require some confidential treatment of their information.

It should also be noted that this conclusion is not about the enforced use of just B-Pillar anchored seatbelts and fixed seats or integrated seatbelts and suspension seats. It is about the removal of seatbelt/seat configurations that could compromise driver comfort and safety.

4.2.2 Amend ADR to Change ADR4 and ADR5 to Stipulate Integrated Seatbelts and Suspension Seats for Vehicles over 12500kg GVM

The option to change ADR4 and ADR5 to mandate integrated seatbelts and suspension seats for vehicles of 12,500kg GVM and above has merit. It is more narrow than the previous option, as it specifies a certain weight of vehicle and precludes the option of a fixed seat with a B-Pillar seatbelt, which is arguably as comfortable as an integrated seatbelt with a suspension seat.

This option would require sufficient lead time for the manufacturers to engineer the integrated seatbelts and suspension systems, although of the manufacturers who do not

supply integrated seatbelt and suspension seat configurations, it would appear that they are already moving toward production.

However, central to the success of any argument to amend ADRs to mandate certain belt and seat configurations is lack of evidence that shows there is higher wearing rate compliance with integrated seat and seatbelts than with other belt combinations.

4.3 Retro-fitting or Re-fitting Integrated Seatbelts and Suspension Seats in Vehicles with B-Pillar and Suspension Seat Configuration

Information from seat manufacturers indicate heavy transport vehicles commonly have up to three seat replacements in the life of the vehicle. A mandatory requirement to re-fit a vehicle with an integrated seatbelt and suspension seat in place of a B-Pillar anchored seatbelt and suspension seat at the time of replacement requires careful consideration. A replacement seat may require engineering and cab modifications which, despite cost alterations, would not be expected to impact on the commercial value of the vehicle. Mandatory retro-fitting B-Pillar anchored seatbelts and suspension seats with integrated seatbelt and suspension seats could also be considered.

4.4 Seatbelt Reminder Systems

Currently the ADR 69, which relates to the mandatory installing of seatbelt reminder systems in passenger cars, does not relate to heavy vehicles.

The draft Regulation Impact Statement (RIS) “Seatbelt Reminders” from the Department of Transport and Regional Services, July 2004, deals with passenger vehicles. Part of the RIS recommendations is for “the voluntary installation of reminders by manufacturers ... as there is strong evidence that manufacturers are responding not only to Australian but global demand for these devices”.

4.4.1 Change ADR 69 to Incorporate a Reminder System for Heavy Trucks

The option to adjust ADR69 should be considered to mandate a reminder system for heavy vehicles. A reminder system increases the likelihood that drivers will make a conscious decision to put their seatbelts on, or deliberately create a bypass of the reminder. Those that create the bypass may be considered drivers who would not use seatbelts under most circumstances.

However, a simple reminder system, such as that of the current passenger vehicle, risks the actual warning getting ‘lost’ amongst all the other start up warning lights and buzzers.

4.4.2 Modify ADR 69 to Include a More Aggressive Reminder System. Effective with the Introduction of the ADR 4 Change

The addition of a mandatory aggressive seatbelt reminder system is aimed at forcing an action by the truck driver. An aggressive reminder system will last beyond the start up systems and requires an action by the driver to extinguish the reminder lamp and/or buzzer.

As with the first option, those that deliberately bypass the reminder are probably drivers who would not use seatbelts anyway. An argument against installing aggressive reminder systems is that passenger vehicles do not have to have an aggressive reminder system and, therefore, nor should heavy vehicles. The flaw in this argument is that passenger vehicles currently experience 95+% of driver seatbelt wearing compliance, and it is part of the mind

set of passenger vehicle drivers. Heavy vehicle drivers do not have this mind set and an aggressive reminder system would force the recognition that a seatbelt must be worn.

It is suggested TIC be requested to source information on implementation implications of this option, while maintaining manufacturer confidentiality.

4.5 Make Drivers Wearing Seat Belts Part of the Chain of Responsibility: Effective with the Introduction of the ADR 4 Change

Responsible truck driving is not solely the responsibility of the truck driver. The current Chain of Responsibility objectives assign duties to all participants in the transport chain to help ensure vehicles are well maintained, and drivers are adequately rested, to provide a safer operating vehicle on Australian roads. Consideration could be given to have driver's seatbelt usage as part of driver training and company standing orders, so those in the chain of responsibility could also take responsibility for the driver to wear their seatbelt.

If this is to be considered seriously, then broad industry commitment would be required.

4.6 Increase Enforcement and Review Penalties: Effective with the Introduction of the ADR 4 Change

As mentioned earlier there is anecdotal evidence to suggest that the Police do not enforce heavy vehicle seat belt use, particularly as there are difficulties with enforcement of lap belt wearing due to the lack of visibility of the belt. Consideration needs to be given to how to make Police enforcement more effective, and it can be assumed that integrated lap sash seatbelt options would aid this. Combined with ensuring that penalties for non-compliance act as an effective deterrent (this could include consideration of an increase in demerit points), this should lead to an increase in wear rates.

When a vehicle with a B-Pillar anchored seatbelt and suspension seat requires a replacement seat, encouragement could be provided by industry, for instance in the form of an industry guideline, for an integrated seatbelt and suspension seat to be fitted. Understandably, the cost of the latter seat is greater than the original and, therefore, some inducement may be needed, such as an operator meeting their obligations under occupational health and safety requirements, to have a safe work place.

5. CONCLUSIONS

The Heavy Vehicle Safety Strategy targets seatbelt wearing compliance as one of its eight strategic objectives because of the significant gains which can be made through reducing death and serious injury for heavy vehicle users through the increased use of seatbelts. Fundamental to achieving this is accurately understanding the reasons why seatbelt wearing compliance is currently low, in particular in comparison to passenger vehicles.

One reason that drivers are resistant to wearing seatbelts and the reason often stated is because they are uncomfortable.

A contributor to this discomfort may be the availability of B-Pillar mounted seatbelt and suspension seat contributing to drivers resistance to wearing seatbelts.

The literature review has indicated many countries have similar issues. Each country that has analysed heavy transport driver fatalities and road trauma acknowledges the high cost,

and that these costs are significantly reduced when the correct seatbelt fitment is used. Each country has also recognised that drivers of heavy vehicles resist wearing seatbelts.

5.1 Analyses of the Current Australian Market Highlight Three Basic Outcomes

- B-Pillar seatbelt and suspensions seats may create driver discomfort.
- Roughly 50% of drivers do not wear seatbelts.
- To save lives, heavy truck drivers need to wear seatbelts.

It should be noted that reports from other countries have not indicated what the seatbelt/seat configurations are. It would be interesting for that analysis to be done to determine if those other countries have seen similar market share of B-Pillar anchored seatbelts with suspension seats.

Future actions, whether regulatory or by consumer demand, need to address the top two outcomes. The third outcome will result from actions of the first two.

5.2 Observational Surveys

The current observational process, while providing important usage data, should be examined to see if it can be improved to provide more information to assist in understanding seatbelt usage in Australia.

5.3 Consultation

The purpose of this discussion document is to provide information sought by the NTC on seats with integrated seatbelts, including availability, market penetration and to cover some views put forward that seat belt wearing compliance is hampered by discomfort caused by some seat and belt configurations.

The NTC seeks feedback on the information provided and the options suggested. The NTC would also like to receive comments on the accuracy of the information provided. Any option would require substantial investigation before any action would proceed.

To aid in this, NTC would like comments on the feasibility of the proposed options, including supporting evidence and information, and also suggestions for alternative options to be considered.

6. DISCLAIMER

Much of the material within this report has been sourced anecdotally. Much of the discussion is based on this material and as such should be taken in that context. In writing this report, the author has aimed to draw conclusions using logical reason. For example, there is no direct study that determines if a passenger vehicle driver's comfort is equivalent to a heavy truck driver's comfort given the truck drivers seatbelt and seat configuration are the same.

It should also be noted that for the purpose of this report, while input has been widely sought across industry, including seat manufacturers, vehicle manufacturers and other interested parties, consultation was not exhaustive. Some manufacturers and other

interested parties were contacted, but were unable to provide input within the project timeframe.

7. ACKNOWLEDGEMENTS

This report has been written with the intention of providing an understanding of the current situation of seatbelt/seat configurations, usage patterns and reasons for those patterns and a discussion on market trends. The following companies are acknowledged and thanked for their support, time, information and thoughtful consideration.

Daimler Chrysler Australia

Hino Australia

Isuzu Australia

Kenworth Trucks Australia

Mack Trucks Australia

Volvo Trucks Australia

Scania Australia

UD Trucks Australia

ISRI Seats Australia

Truck Industry Council owners of Truck Tracker as supplied by ERG

The many truck drivers and fleet operators

National Transport Commission

8. REFERENCE MATERIAL

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Appendix A – Statistics Review

The following analysis is based on the statistics from the Truck Industry Council's (TIC) Truck Tracker program as operated by the Equipment Research Group (ERG). Added to these are seatbelt and seat configurations as supplied by seat manufacturers and original equipment manufacturers.

The statistics are the total deliveries heavy vehicles in Australia (classes very light duty vehicles, light duty, medium duty and heavy duty) for the calendar year 2004 and includes make, model, and GVM.

Is There a Correlation Between GVM and Integrated Seat Belts?

Figure 1. Seat Belt vs GVM

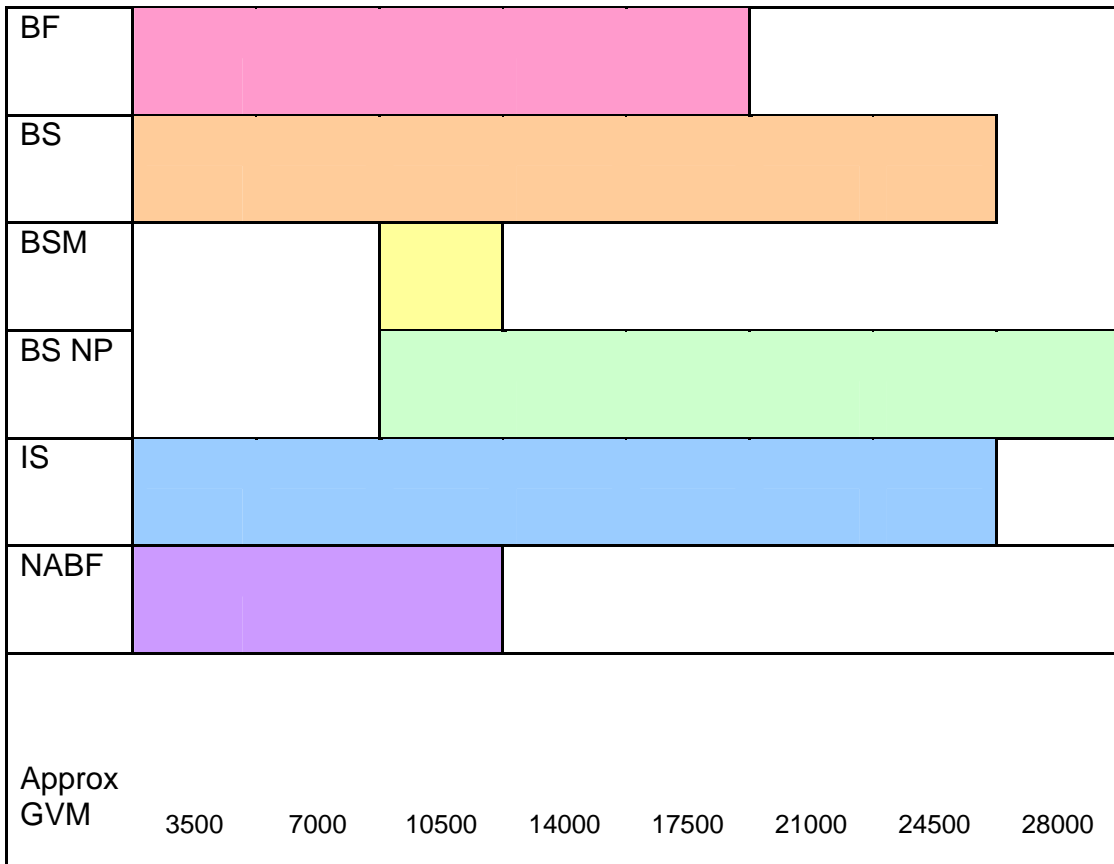
	GVM			Total Units	% of Total
	Min	Max	Median		
BF	3500	16500	3550	5625	18.2
BS	3550	24600	16000	5305	16.9
BSM	10400	10400	10400	902	2.8
BS NP	10000	28300	15000	3672	11.7
IS	3500	26000	19700	7157	22.8
NABF	3500	8500	4490	8654	27.6
				31313	100

Legend

- BF Seatbelt B-Pillar anchored, fixed seat (ie no suspension)
- BS Seatbelt B-Pillar Anchored, air suspension seat
- BSM As for BS but mechanical suspension
- BS NP As for BS but has engineering limits ie Cab Strength
- IS Integrated seatbelt, air suspension seat
- NABF Base Vehicle less then 4.5 GVM – BF configuration

The chart below plots the maximum and minimum of each seatbelt/seat configuration for the GVM of the make and model. The plot indicates there is a significant overlap of the seatbelt and seat configurations throughout the GVM range. This would then seem to indicate that GVM is not the single determinant for seatbelt and seat configuration selection by truck drivers, truck owners or fleet managers.

Figure 2. GVM by Seatbelt Configuration Overlap



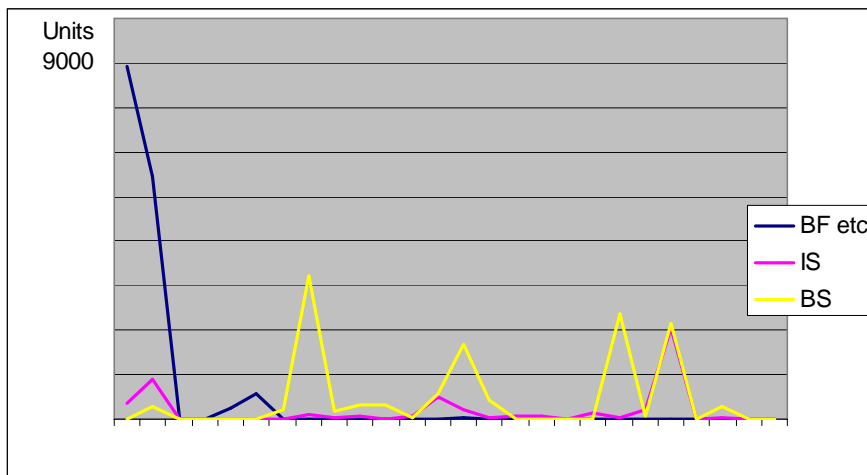
If it was deemed appropriate, a study to determine the impacting factors should consider:

- make;
- model;
- origin of design;
- vehicle vocation; and
- ownership of the vehicle (as distinct from the driver).

Is There a GVM Point of Difference When Selecting a Seatbelt/Seat Configuration?

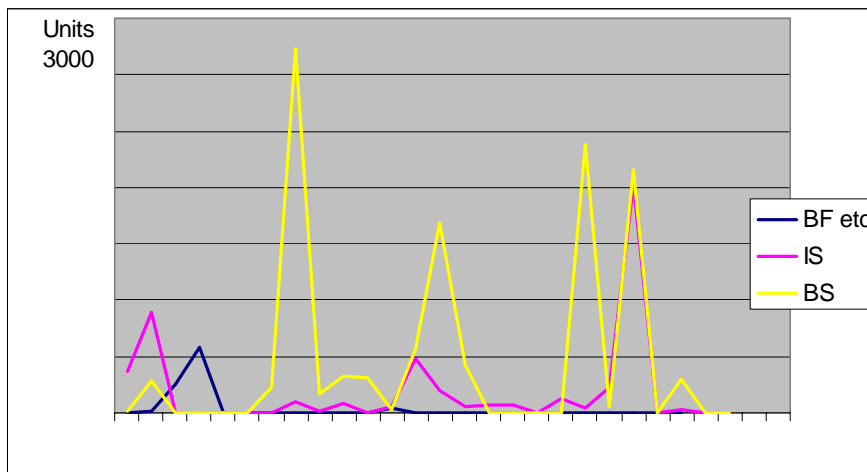
The chart below indicates the Volume (LHS scale) vs GVM (3500kg LHS to 28000kg RHS). This would indicate that the B-Pillar Anchored seatbelt and fixed seat configuration dominates the lower GVM ranges and the other two configurations are of equal significance across the remaining GVM range.

Figure 3. Volume of Seat Types by GVM (LHS 3500kg, RHS 28000kgs)



Removing the GVM range of 4500kg and below from the above chart, the results clearly show that from 4500kg and up, all seatbelt and seat configurations are used. And while spikes do appear across the chart, it would also indicate that the reason for these spikes might not be directly associated with the GVM of those vehicles.

Figure 4. Volume of Seat Types by GVM (LHS 4500kg, RHS 28000kgs)



The overall conclusion is that the GVM is not the deciding factor and it would lead to the thinking that if any change in the ADR were to be explored than it should be a broader change rather than a change selected on GVM.