Work Related Road Safety

January 2014

RACV Research Report 14/01

Royal Automobile Club of Victoria (RACV) Ltd

Report No.	Date	ISBN	Pages
14/01	2014	978-0-9804913-4-0	35

Title

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Abstract

Work-related road safety is increasingly regarded as a vital issue for a wide range of private companies. Vehicles used in the course of employment are a part of the workplace and it has been estimated that work related road crashes in Australia account for about half of all occupational fatalities and 15% of national road deaths. Further, fleet vehicles are generally sold to private buyers within a few years. This suggests that the safety of a company's fleet vehicles and the road safety behaviour of its employees is paramount when considering the road safety of the general population.

RACV commissioned this report to gain a better understanding of work related road safety. The project includes a review of vehicle technology and driver based safety initiatives; a review of currently available resources that address work related road safety and consultations with a range of organisations. The report concludes by outlining best practice principles and priority actions for managers to improve a company's road safety profile.

Key Words

road safety; fleet safety; fleet management; fleet safety programs; driver training; fleet vehicles; company vehicles; vehicle safety technology; road trauma; policy; work related road safety.

Executive Summary

Work related road safety is a fundamental issue for many companies. Many occupations require trips by road which presents risks for employees and other users of the road system. Vehicles used for work purposes are considered part of the workplace, and it has been estimated that work related road crashes in Australia account for about half of all occupational fatalities and 15% of national road deaths. However, the safety of a company's fleet vehicles and of its employees goes beyond driving while on duty for work. Fleet vehicles are also used by employees while they are commuting to and from work and even while engaged in personal leisure activity. In addition, fleet vehicles are generally sold to private buyers within a few years meaning the purchasing decisions made by fleet operators help to determine the safety profile of the general vehicle fleet.

RACV commissioned this report to gain a better understanding of road safety and more particularly work related road safety. The project reviews vehicle and driver based initiatives that have the potential to reduce road trauma in fleet settings. Publically available resources that address work related road safety have been reviewed and consultations with a range of organisations provide an insight into current work related road safety policies and practices. The report outlines best practice principles and priority actions to assist managers to improve a company's road safety profile.

The investigation revealed that a reduction in road and work place trauma can be achieved through improved fleet management procedures. Fleet purchasing policies should only allow for the purchase of 5-star rated vehicles and greater use of vehicle safety technologies. There is also evidence that some driver based interventions, such as monitoring, media campaigns, and the development of a good safety culture have the potential to improve fleet safety.

The evidence around post licence driver training programs as an intervention to reduce road and work place trauma is poor. Driver training may be suitable in some settings such as for those that drive in demanding off road conditions or use vehicles that have distinct handling characteristics. Managers need to carefully consider the organisations specific context and assess whether there are any benefits of having employees participate in this type of training.

It is important to note that there are many ways of describing good practice in work related road safety management, and there have been a number of resources designed to assist managers improve a company's road safety risk. In particular, ISO 39001 Road Traffic Safety Management Systems is likely to be regarded as the gold standard of work-related road safety management and of corporate support for road safety within the community. It combines quality management disciplines with the most recent understanding of best practice road safety management.

Many organisations are already beginning to put road safety at the forefront and are making positive advances in workplace road safety policies and practices. This is evident from organisations gradually integrating road safety into their wider Occupational Health and Safety (OH&S) management system. Effective journey planning is also becoming more important to many organisations as it addresses critical aspects of workplace safety by questioning the need for employees to travel at all.

Introducing stronger policies and practices not only improves the safety of employees who drive for work purposes but also improves the safety of other users of the road system. Furthermore, the general vehicle fleet will also progressively become safer once ex-fleet vehicles are sold to private buyers.

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1 Introduction

1.1 Outline

In order to support improved road safety and more particularly work-related road safety, the Centre for Automotive Safety Research (CASR) was commissioned to:

- Identify the key vehicle safety technologies that could improve safety if introduced into a fleet.
- Identify best practice driver training programs and techniques for implementation in a fleet.
- Identify best practice fleet management and workplace road safety policies and procedures.
- Recommend priority actions to improve fleet safety and workplace road safety.

The project was undertaken in four stages, and this report follows that broad structure:

- A literature review concentrating on vehicle technology and driver based interventions.
- A review of publicly available fleet management programs and policies.
- Discussions with chosen companies about safe fleet management.
- Identification of best practice and recommendations for priority actions.

This report begins by first addressing the overall scale of the work-related road safety problem, and discussing the interaction between road safety and workplace safety management. In relation to vehicle safety the focus of this report is on light vehicles not heavy trucks.

1.2 Scale of the work-related road safety problem

Vehicles used in the course of employment are a part of the workplace and many occupations require trips by road, which presents risks for employees and other users of the road system. The safety of a company's fleet vehicles and of its employees who drive can affect road safety in a variety of ways including while the company's employees are on duty at work, while they are commuting to and from work, and even while engaged in personal leisure activity.

Road crashes have been previously reported as the most common cause of work place deaths, accounting for between 30 and 35% of work place deaths in Australia and considerably more if crashes while commuting are considered (Haworth, 2002; Murray, 2010). A more alarming picture appeared in the National Road Safety Strategy 2011-2020 (ATC, 2011), which noted that work-related (working, commuting and bystanding) road crashes in Australia account for about half of all occupational fatalities and 15% of national road deaths.

The greater proportion of road travel in Australia is work-related or involves commuting to and from work. The Australian Bureau of Statistics (ABS) conducted a survey of vehicle use over the 12-month period of November 2009 to October 2010 (ABS, 2011). The average number of passenger and light commercial vehicles on register in Australia during that period was nearly 15 million. These vehicles were estimated to have travelled a total 206,075 million km over that time of which 29.6% were classified as business trips, 25.6% as travelling to and from work, and the remaining 44.8% were classified as personal and other travel. The pattern in Victoria is similar to the national scene – 27.8% of travel in passenger and light commercial vehicles comprises business trips, 24.4% is commuting and 47.7% is for personal or other travel (ABS, 2011).

While it notes that exact numbers are difficult to determine, Safe Work Australia has been estimating work-related injury fatalities for several years based on an examination of a number of datasets, and categorises injuries resulting from work activity or exposure in three ways:

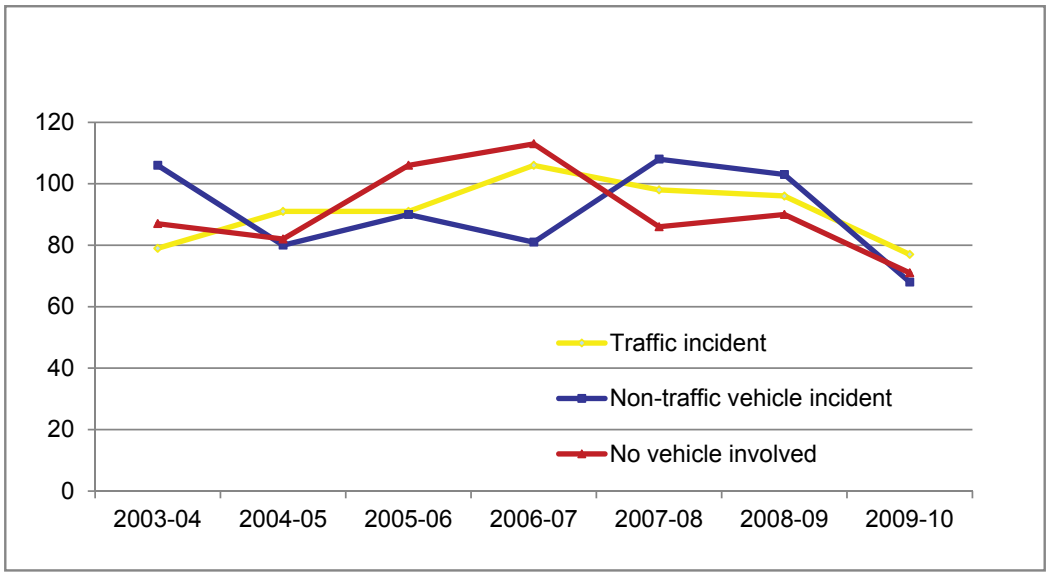
- While working or travelling for work (worker fatalities).
- Travelling to or from work (commuting fatalities).
- As a result of someone else's work activity (bystander fatalities).

Perhaps due to the absence of a single national database, Safe Work Australia does not report consistently on the involvement of road crashes, but the significance of the safety risks that working Australians face on the road is unmistakable:

- For the year ending June 2007, there were 453 work-related traumatic injuries and fatalities in Australia, of which over half (237 or 52.3%) occurred on the road. This comprised 103 out of 295 worker fatalities, 91 out of 93 commuter fatalities, and 43 out of 65 bystander fatalities (Safe Work Australia, 2009a).
- For the year ending June 2010, (fatalities only reported), there were 337 work-related deaths. Of these, 216 (64%) were worker fatalities, and of those 216, about one third (77) occurred on the road. There were 79 (23%) commuter fatalities and 42 (12%) bystander fatalities. Of the 42 bystanders killed, 66% were traffic incidents (exact number not published) (Safe Work Australia, 2012a).
- Trucks were the vehicle type most often involved in the 216 worker fatalities in 2009/10, and cars were the vehicle type most often involved in the additional 79 commuter fatalities.

Figure 1

Worker fatalities in Australia 2003/04 to 2009/10: number by traffic incident status



- In the seven years up to and including June 2010, one-third of worker fatalities occurred in a vehicle incident on a public road and another one-third occurred in a vehicle incident at a workplace. As shown in Figure 1, just one-third did not involve a vehicle.

All injuries come at a cost and road vehicle injuries tend to cost more. In the 2008/09 financial year (the latest data available), the median working time lost from a vehicle incident was 5.8 weeks at a cost of $10,000, compared to 4.0 weeks and a cost of $7,700 - the average for all injury/disease mechanisms (Safe Work Australia, 2012b).

1.3 The interaction between road safety & workplace safety management

Work-related road safety is increasingly regarded as a vital issue for a wide range of private companies. Indeed, while public agencies and governments still at times struggle to communicate a vision of zero fatalities and serious injuries, leaders in private corporations have been drawing upon well established occupational safety and health principles and their own values to articulate a zero harm philosophy for their companies on the road. In this regard, there are road safety management lessons to be drawn from workplace safety management.

Considerably greater attention has been given to road safety management over the last ten to fifteen years, particularly in response to the challenge put forward by the Vision Zero principles articulated first in Sweden, and increasingly adopted elsewhere. Road safety was seen for many years through a prism of road user and particularly driver responsibility. Vision Zero challenged the ethical foundation for this, drawing inspiration not only from other

transport modes such as rail and aviation where a non-injury incident is regarded as a matter of significant safety concern and a fatality as a disaster that must never be repeated, but also from workplace safety principles.

Many of the well-known road safety treatments fit within the notion of a hierarchy of control in workplace safety, which can be described in a variety of ways (Safe Work Australia, 2009b; New York Committee for Occupational Safety & Health, n.d), but perhaps most simply in relation to work-related road safety management as:

- Can we eliminate exposure of the user to the hazard (through reducing the need for travel)?
- Can we substitute the hazard to the user for one with a lower risk (through shifting to a safer mode of travel)?
- Can we use technology to safeguard the user from the hazard (through safer road design or vehicle technology)?
- Can we put in place training or procedures for the user to mitigate the presence of the hazard (through setting greater expectations on behaviour)?
- Can we provide the user with personal protective equipment against the hazard (such as cycle helmets or motorcycle safety clothing)?

In workplace safety, this hierarchy of control is a descending list of effectiveness – the first being most effective, and the last being least effective. The preponderance of traditional road safety treatments is in the last two controls, and the relatively recent boost in profile over the last ten to twenty years in the middle control is notable. A focus on individual and behavioural responses can be more easily seen as inconsistent with modern road safety and workplace safety management.

The road safety management discipline has its origins in the Haddon matrix developed in 1970 as a framework for analysing the causes of injuries and ways to prevent them. The framework is based on the host (the person at risk of injury), the agent (the energy causing the injury) and the environment (the physical and social context in which the injury occurs). These aspects of the injury event are then considered over three time periods: the time leading up to the event, the event itself and the time immediately after the event. The aspects of the event provide the column headings for the matrix and the time periods the row headings, the cells in the matrix contain the potential measures to prevent or reduce the injury. In the road safety context the host is the road user, the agent the vehicle and the environment the road and social environment in which the crash occurs (Haddon, 1972).

A typical version of the matrix is shown in Table 1 below.

Table 1

The Haddon Matrix

	Human Factors	**Vehicle Factors**	**Physical Environment Factors**	**Social Environment Factors**
Event	Driver behaviour Driver attentiveness Sobriety	Maintenance Crash avoidance technology	Roadway condition Darkness or glare	Cultural attitude to drink driving and speeding Speed limits Seatbelt legislation
Post-event	Human tolerances to crash froces Wearing of sealtbelts	Vehicle crashworthiness Energy absorbing design Airbags	Presence of fixed objects near roadway Unsecured objects witin the vehicle	Enforcement of restraint wearing legislation
Pre-event	Crash victim general health status	Ease of access Fire risk	Availability of effective emergency response Congestion	Public support for trauma care and rehabilitation

The Haddon matrix promoted the scientific and systematic analysis of road crashes and focused on how the crash could be prevented or injuries reduced rather than on apportioning blame. Williams (1999), when exploring the history of road safety, suggests that the matrix helped shift the focus of road safety countermeasures from being exclusively on human behaviour before the crash to countermeasures involving vehicles and the environment, both during and after the event.

Shinar (2007) points out that although the actions identified in the individual cells of the Haddon matrix have changed considerably over the years the general principles have remained the same. Although the Haddon matrix moved road safety towards a systematic response, the Vision Zero challenge demands even more, and it has become increasingly apparent that the key to sustained improvement is an overall road safety management system.

Thus, the systems put in place by companies to control employee exposure to enduring hazards within the road traffic system are assuming much greater importance with road safety, and are bringing positive workplace safety disciplines into the road setting. By applying workplace safety principles that remove user blame from the safety analysis, road safety programs within companies play an important role in influencing the safety of billions of daily individual actions undertaken each day by millions of individuals. Key tools in this are improving the quality of the vehicle fleet through safer vehicle purchasing decisions, and creating a supportive climate within society for improved safety.

2 Vehicle and driver based initiatives

This section reviews literature on vehicle and driver based initiatives in the context of work-related road safety, focusing primarily on light vehicle fleets. The primary purpose of this is to provide an analytical base to subsequent discussion on best practice interventions in work-related road safety management.

2.1 Vehicle-based initiatives

Vehicle-based technologies are classified in the literature in two ways. They are divided into those that aim to prevent a vehicle being involved in a crash and those that provide greater protection in the event of a crash. The technologies are further classified into those that require driver intervention to achieve their aims and those that improve safety with no intervention from the driver. The terminology used to describe the different technology types is not consistent across all publications. To avoid confusion this report uses the term 'Active" to describe technologies that help prevent a crash and "Passive" to describe technologies that provide protection when a crash occurs. Those that require action from the driver are described as requiring driver intervention. Some technologies, for example intelligent speed adaptation can achieve both crash prevention and protection and can be installed to require or not require driver intervention.

New vehicle safety technology has been responsible for significant reductions in road trauma and is expected to be the major contributor to ongoing reductions in the next two decades. A key part of this contribution is likely to come from greater consumer understanding of vehicle safety, and this is addressed below, followed by an outline of the most significant new technologies.

2.1.1 Australasian New Car Assessment Program (ANCAP)

The Australasian New Car Assessment Program (ANCAP) allows vehicle buyers to make informed decisions, thus encouraging levels of vehicle safety that exceed those required by regulation. ANCAP assesses the crashworthiness and safety features of new vehicles and assigns stars based on safety performance. It has been estimated that occupants have twice the chance of being killed or seriously injured in an ANCAP 1-star rated vehicle compared to an ANCAP 5-star rated vehicle (ANCAP, 2012).

From 2011, ANCAP developed a roadmap which takes new safety assist technologies into greater consideration. In 2011 the requirements for a vehicle to achieve a 5-star rating included:

- Achieving a suitable standard in frontal offset, side impact and side pole impact tests.
- Electronic stability control (ESC).
- 3-point seatbelts for all forward facing seats.
- Head protecting technology (side airbags [1]) for the front seats.

The requirements for a vehicle to achieve a 5-star rating will change over time on the basis of the multi-year roadmap. In 2012, in order to gain a 5-star rating, a vehicle's performance on a number of crash tests must meet or exceed specified criteria and the vehicle must have been fitted with safety technologies as a standard for that vehicle, as well as a specified number of additional technologies dependent on whether the technology is fitted as standard or optional equipment. An example of the additional technologies is side (curtain) airbags, which have been estimated to prevent over 50% of deaths and serious injuries from side impact crashes (Fitzharris, 2012). The roadmap means that when an organisation makes a specific 5-star only fleet policy, the safety of the organisation's vehicle fleet will continue to improve over time, in line with changes in the ANCAP rating system.

[1] Front airbags for the driver and passenger of a vehicle are not required to achieve a 5-star rating. Although this is the case, in the March Quarter of 2012, approximately 98% of vehicles sold were fitted with driver's airbags as a standard feature and 98% were fitted with a front passenger airbag. (POLK, Quarterly Vehicle Safety Report, March 2012).

2.1.2 Electronic Stability Control (ESC)

A recent demonstration of the effectiveness of ANCAP in promoting vehicle safety through consumer advocacy came when in 2008 it first made electronic stability control (ESC) a requirement to achieve a 5-star rating, well ahead of government regulation. ESC is a system which gives a driver greater control over their vehicle during emergency situations. It compares the driver's steering intentions with where the vehicle is heading and intervenes by braking individual wheels to correct for any variance. ESC can also reduce engine torque if required. A vehicle equipped with ESC will endeavour to steer where the driver intends and be far less likely to skid. As a result, ESC allows a driver to maintain directional control and stability beyond their normal level of ability, up to a vehicle's physical limits.

ESC particularly has potential to prevent crashes on high speed rural roads (Mackenzie & Anderson, 2009). A number of studies have reported substantial crash reductions for vehicles fitted with ESC, for example Ferguson (2007), Erke (2008), Scully and Newstead (2008), and Papelis, Watson and Brown (2010). A summary paper on ESC from the Dutch Institute for Road Safety Research reported reductions in fatal single vehicle crashes ranging from 30% to 62% (SWOV, 2010). The Australian study, Scully and Newstead (2008), found reductions in single vehicle crashes involving driver injury of 68% for 4-wheel drives and 27% for passenger cars.

Mackenzie and Anderson (2009) developed 12 crash scenarios based on actual rural road crashes and made computer simulations for those crashes, both with and without ESC fitted to the vehicle, in each simulated crash scenario. For those 12 simulated crashes, it was found that ESC would have prevented a collision in ten cases and reduced the severity of a collision in the other two.

Anderson (2012) studied all passenger vehicles involved in crashes in South Australia in 2008-2009 compared with a random sample of passenger vehicles on register in April 2010. He found that ESC was present in fewer of the crashed vehicles than in the general registered fleet, thus indicating that ESC systems are active in preventing crashes in South Australia. A subsequent analysis of single and multiple vehicle crashes revealed that ESC equipped vehicles are substantially under-represented in single vehicle crashes.

The European Commission decreed that all new vehicle models (including heavy vehicles) must be fitted with ESC from November 2011 and that all newly sold vehicles, including current models, be fitted from November 2014. In Australia, similar legislation was implemented firstly in Victoria from January 2011, and then subsequently throughout Australia by the Commonwealth Government. Once ESC had become widely available within the market, but prior to legislation, organisational decisions to only purchase vehicles fitted with ESC played an important road safety role by accelerating the early penetration of this highly effective vehicle technology within the overall fleet.

2.1.3 Intelligent Speed Adaptation (ISA)

The uptake and acceleration of intelligent speed adaptation (ISA) is proving difficult. ISA refers to in-vehicle technology systems that assist a driver to travel within the prevailing speed limit. By using global positioning system (GPS) technology and on-board electronic maps that are linked to a speed zone database, the ISA system calculates where the vehicle is in relation to the speed limit for the road section travelled on and prevents the vehicle from exceeding the speed limit. ISA systems can range from advisory systems that simply warn a driver by sound and/or visual sign that the speed limit is reached, to limiting systems that slow a vehicle down (such as by restricting the flow of fuel) but which cannot be overridden by the driver. An intermediary option is an ISA application that is supportive, but which the driver can override.

A trial of advisory ISA systems fitted to 110 light vehicles from private and company fleets took place in New South Wales. The majority of participating drivers reported reductions in how often they exceeded the speed limit as well as by how much they exceeded the limit. While participants generally found the ISA device acceptable, most felt they should be able to choose whether to have one installed in their fleet vehicle (Cuenca et al., 2010).

In 2011, Doecke, Anderson and Woolley used Australian speed crash data to estimate crash reduction and benefit cost ratios (BCRs) for various vehicle fleets for vehicles fitted with advisory, supportive or limiting ISA. They found that, for organisational and company fleets, BCRs can vary depending on the type of ISA device used and how many ISA devices a company orders to be fitted to its vehicles. In the case of small orders for the device, advisory ISA systems produce the best BCR due to the likely reduction in price over time. However, over a 20-year period, limiting forms of ISA constitute the best investment as they have the potential to reduce fatal and injury crashes by almost 10%, with supportive ISA offering a benefit of 5.5% and advisory ISA providing a reduction of almost 3%.

The importance of choosing limiting forms of ISA has been demonstrated in field trials in the United Kingdom. Lai and Carsten (2011) found that where ISA allows the driver an overriding option, drivers tended to override where a slower speed was needed most, namely on high speed limit roads and in built up areas with complex road user configurations. Moreover, ISA systems tended to be overridden by drivers who would benefit most from it due to their propensity for taking greater risks when driving, such as not wearing a seatbelt.

It is worth noting, research that suggests drivers of fleet vehicles fitted with ISA systems should continue to drive ISA equipped vehicles as these drivers do not necessarily keep within the speed limits when they drive non ISA-equipped vehicles (Chorlton & Conner, 2012). This is perhaps indicative of the difficulty to date in generating industry uptake of this very effective technology. In an organisational context, however, effective speed management whether through ISA or other controls is likely to provide substantial crash, injury, fuel and operational savings.

2.1.4 Forward Collision Avoidance Technology (FCAT)

If ISA is very effective, but slow to spread, there appears to be significant market potential in other important technologies. Adaptive cruise control was originally developed to make the driving task easier by automatically maintaining a travelling speed range within traffic of varying speeds. It has now evolved to perform a critical safety function by autonomously braking a vehicle when an impending collision is detected. This technology, which is quite a recent development, uses arrays of sensors in vehicle systems to detect a vehicle's proximity to other vehicles, but also proximity to pedestrians, cyclists and fixed objects. The systems actively intervene to prevent a crash from occurring and are typically referred to as forward collision avoidance technology (FCAT) systems and research shows very promising findings.

Anderson et al. (2012) conducted a study that estimated the effectiveness of FCAT systems based on Australian crash data. One hundred and four crashes that had occurred within 100km of Adelaide were selected to represent crash configurations likely to be affected by FCAT systems. The crashes had previously been investigated at the scene and were re-analysed using simulation methods to estimate how collision speeds would have been modified with an FCAT system. Crash types considered were rear-end, pedestrian, head-on, intersection and a proportion of hit-fixed-object crashes.

Had FCAT systems been fitted to vehicles involved in the 104 crashes, substantial overall reductions in risk were predicted in the study. Up to 40% of fatal crashes and 50% of injury crashes might be prevented with a comprehensive and effective FCAT system. Importantly, Anderson et al. (2012) concluded that these estimates were consistent with previous studies in company fleet or general contexts suggesting reductions of up to and in excess of 40% for vehicles fitted with FCAT. These studies included Sugimoto and Sauer (2005) (38%); Farmer (2008) (38%); Schiittenhelm (2009) (52%); Kusano and Gabler (2010) (36%); Rosen et al. (2010) (44%).

In their recommendations, Anderson et al. (2012) called for greater uptake of FCAT in vehicle systems to occur as soon as possible. This is even though a slightly earlier study (Anderson, Hutchinson, Linke and Ponte, 2011) noted that while technologies such as FCAT are likely to produce the greatest road safety gains in future years, given their present stage of development and current relatively high cost, their benefit cost ratio for use in passenger vehicles appears marginal at this time.

2.1.5 Other proven vehicle safety features

FCAT may perhaps play a similar role within the market to ESC – that is, it is being promoted by manufacturers, accepted by consumers, and can now be increasingly promoted through incorporation into organisations' new vehicle purchasing decisions. There are other significant technology decisions that can be made. Leaving aside ESC and ISA, the most promising were analysed in a study for their potential to reduce fatal and non-fatal injury crashes in Australia, and are outlined in Table 2 (Anderson et al., 2011). The vehicle safety technology which appears to provide the greatest benefit is forward collision avoidance, which was analysed in the same manner as all other technologies using historical crash data from New South Wales, as opposed to the simulation analysis presented in section 2.1.4, which explains the difference in reduction figures for FCAT.

Table 2

Top crash reduction technologies in Australia

	Estimated annual reduction in fatal crashes	% of all fatal crashes	Estimated annual reduction in non-fatal injuruy
Forward Collision Avoidance	227	16%	54305
Alcohol interlocks	217	15%	9301
Fatigue management systems	150	10%	9233
Forward collision avoidance 80km/h speed zones & above	127	9%	8204
Motorcycle ABS	88	6%	8618
Dedicated Pedestrian Detection (Dayliight)	43	3%	6711
Lane Departure Warnings	100	7%	4177
Lane Change Warnings	14	1%	5031
Seatbelt Interlocks	88	6%	726
Dedicated Pedestrian Detection (Darkness)	54	4%	2007
Sealtbelt Reminder	71	5%	508

It is important to note in the context of work-related road safety management that vehicle technology is capable of significantly reducing behavioural risks, and the relative value of this in the context of vehicle technology as a whole. Drink driving, fatigue and seatbelt wearing are all persistent behavioural issues within the community, and applying technological safeguards is likely to be more effective than relying predominantly on safety education and enforcement programs.

By examining their risk profile and the vehicle technology opportunities to reduce that risk, organisations can play an important non-regulatory role in road safety. In Sweden, for example, alcohol interlocks, a proven technology which shuts down the motor vehicle unless the driver is able to provide a clean breath sample, are far more widespread through encouragement of workplace fleet managers, compared to the relatively limited regulatory application of interlock devices in Australia as a sanction against drink drivers. Alcohol interlocks are estimated to have the potential to reduce fatal crashes in Australia by 15% (Anderson et al., 2011).

Fatigue monitoring systems (FMS) detect driver impairment through steering wheel movements, vehicle movements, eye movements or a combination of the three. Based on their analysis of NSW crash data, Anderson et al. (2011) estimated a fatal crash reduction potential of 10%, had an FMS been fitted to a vehicle in relevant crashes. The authors also noted that while some views of the crash reduction potential have been published, they had not found any prior publication actually comparing crash numbers with and without a fatigue warning system.

In most modern vehicles, seatbelt usage is monitored via sensors in both the seatbelt buckle and the seat itself. Should an occupant be detected and the seatbelt remain unbuckled above a certain vehicle speed, the system will display visual and/or auditory warnings until the seatbelt is fastened. Additionally, an ignition system interlock can prevent vehicle operation until all detected occupants are wearing seatbelts. Seatbelt interlocks and reminders are estimated to have potential to reduce fatal crashes by 6% and 5% respectively (Anderson et al., 2011). The European Transport Safety Council (ETSC) (2009) has estimated the BCR of audible seatbelt reminders to be 6:1.

More generally, in-vehicle driver behaviour monitoring systems such as video cameras and ‘black boxes’ are attracting greater attention. Video cameras have been used to successfully improve driver behaviour among fleet drivers (Quayle & Forder, 2008). ‘Black boxes’ are of two types — event recorders that record travel characteristics such as speed just prior to and during a crash, and ongoing monitoring recorders that register episodes of sudden or harsh acceleration or braking (Haworth et al., 2008). Both device types can be used to identify driver-training needs, but are more generally used to monitor compliance with road law and other company work requirements. These devices are not yet highly prevalent in company light vehicle fleets in Australia, although they are becoming cheaper and thus more cost-effective to purchase and operate (Haworth et al., 2008). They have been very successful in improving fleet crash rates and driver behaviour, for example among light vehicle fleet drivers in Germany (ETSC, 2009) and in England (Quayle & Forder, 2008), and ambulance drivers in Arkansas and Pennsylvania (Levick, 2009).

2.1.6 Fleet purchasing policies

Purchasing safe vehicles is an excellent way for employers to provide a safe working environment for their employees (ETSC, 2009). Moreover, safety-based fleet vehicle purchasing decisions not only benefit fleet drivers and the fleet itself, but also the community at large. This is because the penetration of ex-fleet vehicles into the second-hand car market is often large, providing a penetration of new technologies into the vehicle market at a faster rate than there otherwise might be (ETSC, 2009). Consequently, the more safety features are requested by fleet buyers, the more quickly they help the general vehicle pool become safer.

Fleet purchasing policies that improve the safety of fleet vehicles (particularly 5-star ANCAP rated vehicles) have the potential to reduce work related road trauma and can also be an effective means of improving the standard of vehicles in Australia. Over 40% of all light vehicles are initially purchased as a fleet vehicle (private or government) and sold to private buyers after a relatively short period as a fleet vehicle (Anderson, 2012). These vehicles will remain in the general fleet for many years and will continue to contribute to reducing road trauma.

Leyson (2010) reviewed the effect of implementing a policy of mandatory safety features for all vehicles purchased for use by the then South Australia Department for Transport, Energy and Infrastructure. The percentage of crashes by new vehicles purchased one and two years after the policy was implemented was compared to the percentage of crashes by new vehicles purchased one-year prior. For both one and two years after the policy was implemented, there was a 20% reduction in the percentage of crashes by new vehicles. The total number of crashes in that time was small however, and as yearly fluctuations in crash numbers over a longer period can be expected, the initial 20% reduction may not reflect the average reduction over a longer term (regression to the mean effect). Nonetheless, the 20% reduction was a noteworthy one. Anderson's broader analysis of crashes in that state's general vehicle fleet (2012) led him to conclude that fleet purchasing as a method of increasing the uptake of new technologies by government and private fleets can be effective in increasing the prevalence of those technologies in the overall fleet.

BHP Billiton now requires all its new light vehicles to have ANCAP 5-star ratings and that all light vehicles in its fleet should be of this standard by 2016. The company indicates that this policy not only ensures its fleet comprises the safest vehicles possible, but that it allows its staff to focus more on core business (Gordon, 2012). Unfortunately, BHP are in the minority, and fully evaluated world-wide case studies of successful fleet management, including purchasing, are limited in number (Murray, Dubens & Rea, 2009).

Depending on the approach of fleet managers, vehicle safety is not always the first priority in fleet purchasing decisions. Australian fleet policies commonly focus on vehicle choice, the need to comply with financial constraints and minimising tax liabilities (Haworth, Grieg & Wishart, 2008). The ETSC (2009) notes research showing that factors such as price, running costs, reliability, size and fuel consumption sometimes outrank safety considerations. Traditionally, fleet risk management has tended to focus on controlling costs of managing the fleet rather than on employee and public safety (Darby et al., 2011). Research by Newnam and Tay (2005) found that not only were fleet coordinators more knowledgeable about fleet efficiency than safety and that they rated efficiency as more important. They were also required to report to the company directors in greater detail on fleet efficiency than the safety record.

When fleet managers accord safety a similar (or lower) priority to cost considerations, such differing priorities may be due to personal values held by managers or their board of directors, but they may also arise if managers believe that safety initiatives would be resisted by fleet drivers if it required them to change their driving behaviours. The ETSC (2009) suggests that an appropriate approach in this situation is for fleet managers to anticipate human failure by choosing vehicle safety features which do not require driver action. Technologies such as limiting ISA devices, ESC, high ANCAP ratings and side airbags do not involve the sometimes difficult behavioural changes required with features such as cruise control or advisory ISA (ETSC, 2009).

The ETSC (2009) concludes with some pertinent points for fleet managers on vehicle purchasing policies. In the first instance, these policies should be part of a broader company road safety action plan derived through a full risk assessment, and this plan should itself be part of the company's broader occupational and health and safety statements. Haworth et al. (2008) also note that best practice fleet safety is grounded in broader occupational safety imperatives, while the worst fleets tend to barely comply with the minimum legal requirements for fleet management.

Fleet purchasing policies should emphasise safety criteria, especially 5-star vehicles, and the range of in-vehicle technologies selected should include active and passive so as to prevent crashes occurring and provide protection in the event of a crash (Haworth et al., 2008).

Fleet managers who consistently select vehicles with high levels of built-in safety exert considerable consumer power on vehicle manufacturers to ensure they continue to make and market vehicles of the highest safety standards possible (ETSC, 2009).

2.2 Driver-based initiatives

Often in fleets, the management of drivers is secondary to the management of vehicles. Traditionally driver management has largely meant counting crashes and repair costs rather than counting injury costs and costs in lost time and productivity (Haworth et al., 2008). There is some evidence that driver based interventions have the potential to improve fleet safety. Although limited research has been undertaken in Australia, significantly more has been carried out in Europe, particularly Sweden and the United Kingdom. There is also some evidence that a strong company culture of safety is an effective driver-based approach.

2.2.1 Driver training programs

Post-licence driver training programs are common fleet management provisions, however research throws much doubt on their effectiveness as fleet crash reduction measures. This is mainly due to an overall limited effectiveness of driver training to produce crash reductions, as expertly discussed by Christie (2011).

A study of fleet driver interventions was conducted by Gregersen, Brehmer and Morén (1996). Four groups of approximately 900 professional drivers from a telephone company in Sweden were each assigned a different type of remedial measure. The measures were driver training, group discussion, safe driving campaigns, and bonuses for crash free driving. A fifth group was assigned no remedial measure to act as a control group. The effectiveness of each measure was calculated by comparing the crash frequency of the associated group before and after the measure was applied.

Gregersen et al. (1996) found that group discussions, driver training, and bonuses for crash-free driving reduced crash frequency, while all the measures reduced crash cost. It was noted however, that the results for these specific remedial measures applied to large groups of professional drivers and may not apply for remedial measures in general or for work drivers.

Downs, Keigan, Maycock and Grayson (1999) conducted a review of fleet car driver safety in the United Kingdom, including the interaction of remedial measures and crash frequency. It was concluded that there was no evidence to show that driver training was able to significantly reduce the crash frequency of fleet car drivers.

In 2003, under the prestigious Cochrane Collaboration, Ker et al. systematically re-examined 24 previous evaluations of driver training programs, 20 of which were remedial training programs for crash-prone drivers (the 24 studies represented 300,000 drivers in total). The researchers' overall conclusion was that there is no evidence that post-licence driver training is effective in preventing traffic injuries or crashes. A similar conclusion was reached by the ETSC (2010) in relation to its analysis of work-related road safety.

In North America, Peck (2011) also examined the evidence for the ability of driver training to reduce crashes and traffic violations. He estimated that conventional driver training programs as delivered to novice drivers, and comprising on average 30 hours of classroom instruction and 6 hours on-road driving, could reduce crash rates by as little as 5%, but added that the possibility of a zero effect cannot be dismissed.

Peck (2011) then turned to the question of whether the type of training program is a critical factor in such findings. He noted an important limitation of existing on-road training programs is their focus on practical driving skills, pointing out that skill, as measured in on-road tests, has never been shown to be correlated with driver crash rates.

Unfortunately, there is a trend for many post-licence training programs to focus on skill development and at an advanced level, such as practising handling skids or emergency swerve and brake techniques. There is strong evidence that these programs do not reduce crashes and in some cases may lead to worse crash rates if the drivers become overconfident of their skills through practice (SWOV, 2009; Christie, 2011).

There are further problems with providing skills training to already experienced drivers, such as may be found in fleet settings. Providing such training may undermine driver safety by offsetting the beneficial effects of vehicle safety features, for example training drivers in emergency braking techniques may increase their braking distance in vehicles fitted with anti-lock braking systems (Christie, 2011).

In contrast to skills-based training, some training programs focus on attitudinal or motivational aspects that influence driving, as well as higher order thinking skills, such as hazard perception, decision making and self-assessment. Christie (2011) points out that they remain unproven in changing attitude, behaviour or crash risk. However, such programs are at least often well grounded in contemporary theory in behaviour change psychology and adult educational practice.

In summary, there is strong evidence that for fleet road safety management systems to be effective, they should not offer driver-training programs as a general provision. If driver training or other driver-based initiatives are provided, they should focus on higher-order thinking skills rather than be driving skills-based and in any event they should not be isolated safety components but rather small parts of a much broader, multi-faceted but integrated fleet road safety provision.

Nonetheless, driver-training programs remain a popular option in fleet management (Christie, 2011). As opposed to the notion of a 'one-size fits all' fleet driver training approach, Banks, Davey and Biggs (2007) investigated how a staged change model can help assess fleet drivers' willingness to change their driving behaviour and identify appropriate educational intervention approaches for employers to implement. They studied their change model with the participation of two organisations, one a large fleet of 15,000 vehicles and a much smaller one with 200 vehicles. The stages they identified were:

Pre-contemplation — the driver is satisfied with their behaviour and sees no need for change.

Contemplation — the driver is aware of work driving risks and the need to be safer.

Preparation — the driver is willing to change behaviour in the short term.

Action — the driver is actively modifying their driving behaviour.

Maintenance — the driver engages in safe driving behaviours over the longer term.

Depending on the stage identified for each fleet driver, education intervention strategies can range from raising awareness of work driving risks to personal goal setting and ongoing monitoring of safe driving.

In view of the poor evidence supporting fleet driver training programs, Christie (2011) suggested that other driver-based initiatives might be more effective in crash reduction terms. An allied approach to driver training that appears successful is to provide one to one coaching or mentoring, where the focus is on changing drivers' mindsets rather than just driving skills. Research by Stanton, Walker, Young, Kazi and Salmon (2007) showed that 50 coached fleet drivers (compared to a control group) had improved situational awareness and as a result could carry out driving manoeuvres more skilfully. They also experienced positive attitudinal change, with drivers more able to anticipate hazards (crash outcomes were not measured and would have been problematic to attempt due to the small sample size.) While the authors confidently assert that individualised coaching coupled with associated driving "...appears to be central to the improvements seen in the three [measured] competencies, namely, driving knowledge, skills and attitude" (Stanton et al 2007, p.1231), research cited earlier reports that skill and attitude correlate poorly with crash rates.

Coaching is quite a different approach to traditional forms of driving instruction and this has led to the European Union project HERMES: High impact approach for Enhancing Road safety through More Effective communication Skills for driving instructors. The project involved developing an easy-to-use training package for driving teachers focusing on best practice communication skills, especially coaching. A multi-national team of experienced driving teachers, psychologists, educational and coaching experts contributed to the work. A comprehensive final report analysed the coaching approach in considerable detail and measured how a group of driving instructors successfully adopted coaching in their teaching of driving to students aged 18 to mid-20s (HERMES, 2010). Measurements were made before and after the instructors participated in a 3-day coaching seminar and in relation to their actual teaching/coaching of the students. For example, it was reported how often the instructors gave positive compared to negative feedback and how often they asked open as opposed to closed questions of the students. While the results were mixed, the authors were encouraged that some key aspects of a coaching style were clearly being adopted by some instructors.

In Australia, a coaching approach underpins the novice driver education curriculum developed by Christie, Harrison and Johnston (2004) for the former Australian Transport Safety Bureau (ATSB). The report is essentially a practical guide to the content and structure of sessions involving novice drivers and their coaches/mentors and in that context appends a guide to coaching novice drivers prepared by Harrison for the New Zealand Land Transport Safety Authority. Mindful of its prime purpose, though, the report does not explore the background justification for advocating a coaching approach to the extent of the HERMES report, other than to state that coaching is consistent with the principles and practices of contemporary adult education, as experienced by adults currently undertaking programs of study. This novice driver curriculum is being trialled in the current P Drivers Project, a major national project involving probationally-licensed drivers in NSW and Victoria.

It is important to note that although the uptake of coaching by driving instructors is increasingly becoming a favourable way to train novice drivers compared to traditional forms of driving instruction, the effect of coaching experienced drivers in fleet settings on crash reduction remains unclear.

2.2.2 Driver self-monitoring

An important tool that could assist in identifying what training/development stage a driver is at and hence identify appropriate interventions is the concept of individual driving diaries or logs (Rowland, Davey, Freeman & Wishart, 2008). It is likely the driver would be required by fleet management to allow a diary or logbook to be read by relevant personnel, so in this case they would not be private personal records.

Another assessment approach is a questionnaire, such as the Driver Profiler 20:20 developed by the Royal Society for the Prevention of Accidents (2012) in conjunction with Birmingham City University. The Driver Profiler 20:20 was trialled with over 2,000 fleet drivers and takes 10 minutes to complete online. The questionnaire has 45 questions covering areas ranging from personality, knowledge, attitudes, fatigue, driving under pressure, risk taking and distractions, and in relation to new technologies such as satellite navigation and mobile phone use. It provides tailored training feedback to individual drivers as well as reports to fleet managers to identify drivers at risk. Effective use of online assessment among 16,000 fleet drivers in a single UK company was reported by Darby, Murray and Raeside (2009). Driver knowledge, attitude, behaviour and hazard perception, along with mileage driven, driver age and personality, were found to be 'highly correlated with self-reported collisions'. Various driver questionnaire forms were reviewed by Freeman, Wishart, Davey and Rowland (2010). They concluded that, while such assessment tools usefully predict crash risk to some extent, much still needs to be done to refine and standardise such assessment forms and how they are used within companies. In particular, their use should be much more strategically planned and implemented as proactive practice, rather than used as a post-event approach that has historically been shown to be inefficient.

An important characteristic of diaries, questionnaires and online assessment tools is that they rely on the driver being willing to disclose aspects of their attitudes, provide ratings of their opinions and responses to hypothetical or real driving scenarios, and to self-report their driving behaviour. This is distinct from the technological in-vehicle monitoring systems discussed earlier, which provide an objective and ongoing record of what the driver actually does on the road. Ideally, fleet management systems should implement both types of assessment as they usefully complement one another. For example, a driver who reveals a pro (or anti) road safety attitude in a questionnaire or a diary may (or may not) behave on the road in ways that are consistent with this attitude. The diary of a driver whose in-vehicle monitoring system recorded an instance of emergency braking could reveal a contextual description and explanation for what had occurred. A third form of driver monitoring, and also complementary to the other two, is to make use of feedback from members of the public, such as through providing a contact phone number or website on the rear of fleet vehicles, accompanied by a 'This company values safe driving' style of message. However, none of the reviewed literature on fleet management specifically discussed to what extent, if any, companies make use of such feedback for planning driver-based initiatives.

2.2.3 General road safety education programs

Downs et al. (1999) found that measures such as incentives, rewards and safety pledges do not significantly reduce crash frequency. A more recent review (Banks, Davey, Biggs & King, 2010) found that at best the value of such measures was unclear, but that it was more likely such measures are ineffective.

Aside from designated driver training or improvement programs, a common educational approach relevant to fleet driver management is mass media campaigns aimed at providing information about safe driving, persuading drivers to drive more safely, or a combination of the two. However, reviewing how companies, including vehicle fleets, employ such approaches does not appear to be a topic of systematic research so far. Wundersitz (2011) reviewed best practice for campaigns as they might be applied in occupational settings. She found that campaigns aimed at increasing awareness of an issue are generally more successful than those aimed at changing behaviour. However, behaviour change campaigns are more likely to be successful if they are accompanied by other intervention activities such as enforcement and community engagement, and are aimed at achieving behaviour change in the longer rather than the shorter term.

Wundersitz (2011) also found that campaigns containing threat messages are not as effective (or as desired by industries) as campaigns based on positive emotional appeals. Behaviour change messages should focus on a specific target behaviour (e.g. wearing a seatbelt). The choice of media for campaigns should depend on the target audience, for example use of social media is often employed for younger workers.

Where threat messages are employed, they are more likely to be effective if the consequence implicit in the threat is a statistically more likely one for the driver (Williams & Haworth, 2008). For example, whereas crashes are relatively rare events for any driver, including fleet drivers, messages that allude instead to statistically more likely consequences such as accumulation of demerit points, loss of licence and maybe one's job, are likely to be more influential in eliciting safer driving behaviour.

Lewis, Rowland and Wishart (2012) concur with the best practice approaches identified by Wundersitz (2011), although they did not include Wundersitz as a reference. Among their points about using advertising campaigns in the workplace, Lewis et al. advocate embedding any campaign as one component within a much broader approach to achieve a desired safety behaviour. They also advocate using various media types or formats such as posters and DVDs to challenge assumptions about safe speeds and speeding, and safe driving messages that preface email signatures.

2.2.4 Safety culture

Safety culture has been defined as a psychological product of the behavioural and cultural ingredients of an organisation and has the potential to directly impact on the driving outcomes of employees (Davey, Freeman & Wishart, 2007). A number of companies and organisations have developed and nurtured successful safety cultures, recognisable by various macro aspects such as safety-oriented vision and goal statements; focusing on safety in recruitment, induction and in ongoing training and education programs; monitoring and assessing driver performance; minimising exposure to hazardous driving conditions; and selecting vehicles based on their safety features (Banks, Davey & King, 2010). A successful or positive safety culture can perhaps be defined as one where safety results are very good.

Micro-level aspects of a healthy safety culture collectively make valuable contributions to the whole culture. A case study of the evolution and nurturing of one company's safety culture showed that it valued such things as policy awareness audits, access to drug and alcohol programs, free eyesight checks for drivers, safest driver of the year competitions, embracing community road safety initiatives (e.g. a local Road Safety Week), fitting 'cyclist beware' decals to fleet vehicles, and tyre and windscreen checks of employee vehicles in the company car park (Murray, Ison, Gallemore & Nijjar, 2009).

As early as 1999, it was surmised by Downs et al. that a combination of factors within a strong culture of safety was most likely to produce an improvement in fleet driver safety. Research has shown this is often also the case in practice, for example as occurred in a UK telecom fleet of 40,000 vehicles (Darby et al., 2011). Moreover, Newnam, Griffin and Mason (2008) studied the safety attitudes of drivers, their supervisors, and fleet managers. They found that drivers who were motivated towards safety tended to have a lower crash frequency. These drivers' motivations were positively influenced by their own attitudes and beliefs about what they can achieve for safety (efficacy), as well as the safety values of their fleet managers. Moreover, the positive influence on drivers' safety motivation was found to be greater when both their supervisors and fleet managers were perceived to value safety.

Banks, Davey, Biggs and King (2010) noted that a majority of the effective occupational road safety initiatives they had reviewed were employee-initiated interventions rather than organisation-initiated ones. Clearly while employee-initiated interventions need employer support for them to be effective, it shows that safety culture is reliant on involvement and commitment at all levels of an organisation.

The importance of a healthy safety culture within a company should not be underestimated. Freeman et al. (2010) note that evidence is mounting that creating a positive safety culture has a positive effect on employees' driving performance, vehicle crash rates and injury severity. Research reported by Naevestad and Bjørnskau (2012) shows that there are often many sub-cultures or mini-cultures held by peer groups. Influencing safety sub-cultures through targeting particular worker peer-groups with safety interventions may be a promising way of improving an organisation's safety culture as a whole.

2.3 Summary of literature

Reduced road and work place trauma can be achieved through improved fleet management procedures in the areas of better vehicle purchasing policies, the use of new safety technologies, safety ratings, and interventions aimed at fleet drivers including monitoring, training and media campaigns, as well as the development of whole of company cultures of safety and better integration of fleet safety within company OH&S (Christie, 2011).

Among the new safety technologies, FCAT systems offer the greatest potential for crash reduction, of up to 40-50%. FCAT systems are followed closely by ESC and ISA technologies. Other worthwhile technologies to consider in fleet vehicle purchasing decisions include side airbags, alcohol interlocks, fatigue monitoring systems and seatbelt reminders or interlocks.

Safety should be the prime factor considered by fleet vehicle buyers, with 5-star ANCAP rated vehicles affording high levels of crashworthiness and vehicle safety features. The range of 5-star rated vehicles currently available allows purchasers to refine their choice based on other considerations such as cost, size and fuel efficiency. The more company fleet buyers choose 5-star rated vehicles and those that contain both passive and active vehicle technologies, the quicker the general vehicle fleet will become safer once ex-fleet vehicles are sold. Fleet purchasing policies that are embedded in broader company occupational safety policies are indicative of best practice in fleet management.

While the overall evidence favouring driver-training programs in fleet settings is poor, some companies have reported success with individualised forms of training, determined through various forms of monitoring tools such as driver diaries and online questionnaires. If fleet managers choose to implement driver training programs, they should not be relied on as the sole approach to fleet crash reduction but instead integrated within broader based programs that blend driver training with other driver-based initiatives including coaching, but also with a wide range of vehicle-based initiatives.

While media campaigns implemented by companies have not been systematically reviewed, the available literature advises workplaces to develop campaign approaches based on best practice principles for safety campaigns generally. For example, company campaigns to improve fleet driver safety should be integrated with other measures targeting the desired safety behaviour such as enforcement. They should also prefer positive emotional appeals to threat messages, target a specific desired behaviour and use a medium that suits the audience. If threat messages are used they should target statistically more likely consequences of unsafe driving such as demerit points or loss of job benefits.

Companies with good fleet safety records often have strong safety cultures that permeate all levels of the organisation. These safety cultures are characterised by such aspects as the companies' vision statements, their induction and ongoing training policies, driver monitoring and tailoring interventions, plus sound fleet purchasing decisions, but also micro level initiatives that collectively contribute to the evolving company safety culture. Targeting workplace peer groups associated with particular safety sub-cultures may produce positive outcomes for the collective safety culture.

It is important for all these areas not to be treated as disparate issues, as best practice fleet management requires a systems based approach (Mooren, Grzebieta & Williamson, 2009; Darby, Quddus, Murray, Raeside & Ison, 2011; National Institute for Occupational Safety and Health, 2012). Moreover, successful implementation of these measures in fleet settings is likely to be transferred to drivers' families and the broader community (Murray, Faulks & Watson, 2007; National Institute for Occupational Safety and Health, 2012).

3 Corporate road safety programs

Just as there are many different ways of describing good practice in organisational management and leadership, so there are many different ways of describing good practice in occupational safety and health management and more particularly good practice in work-related road safety management.

There are considerable resources available that address work-related road safety. The most notable early form of this appears to have been the Network of Employers for Traffic Safety in the United States of America which was established in 1989 (Network of Employers for Traffic Safety, 2012). Other examples are the Fleet Forum which is a grouping of international humanitarian agencies established in 2003 (Fleet Forum, 2012) and Driving for Better Business which was established in the United Kingdom (UK) in 2007 as an initiative of the Secretary for Transport (Driving for Better Business, 2012). The ETSC has also developed PRAISE (Preventing Road Accidents and Injuries for the Safety of Employees), a significant program of work co-funded by the European Commission to mobilise knowledge of work related road safety leadership (European Transport Safety Council, 2009). Finally, the International Standards Organisation (ISO) has also recently published ISO 39001 Road Traffic Safety Management Systems; a direct descendant of ISO 9001 Quality Management Systems which provides a certifiable mechanism for demonstrating road safety credentials (International Standards Organisation, 2012).

In Australia, the National Transport Commission (NTC) has recently undertaken significant effort towards developing a local network for businesses, governments and researchers to share information and good practice regarding road safety (National Transport Commission, 2012). This program can be seen as a successor to other programs within Australia, such as that set up by the Office of Road Safety in Western Australia (2012), and there are many other organisations which offer commercial or membership services in relation to work-related road safety who have a long standing interest in the area. A good example is the Australasian Fleet Managers' Association who provide direct safety guidance in the area, and also promotes best safety practice through its annual awards program.

This section focuses on the policy aspects of corporate road safety programs, particularly given the growing focus on work related road safety and the interaction between workplace safety and road safety management principles. There are many different templates and mechanisms for managing road safety that organisations have developed and successfully implemented, but this section focuses on management and policy related matters, drawing on recent guidance from the ISO, Driving for Better Business, and the NTC's National Road Safety Partnership Program which provide a sound summary of contemporary best practice.

This is a growing area of interest as illustrated by a recent report by the Transport Research Laboratory from the United Kingdom (Helman, Buttress & Hutchins, 2012). The report promotes further work in the area, as does a proposed Austroads project to promote early adoption of ISO 39001.

3.1 ISO 39001 Road Traffic Safety Management Systems

The most recent development in road safety management systems has been the publication of ISO 39001 Road Traffic Safety Management Systems. ISO 39001 is 'a tool to help organisations reduce, and ultimately eliminate, the incidence and risk of death and serious injury related to road traffic crashes' (International Standards Organisation, 2012). The standard was published in October 2012 and combines the quality management disciplines given effect through ISO 9001 Quality Management Systems with the most recent understanding of best practice road safety management.

The eventual uptake of the standard is likely to vary between and within markets, and some major corporations will simply adjust the management systems they have already implemented. It appears likely however that ISO 39001 will come to be regarded as the gold standard of work-related road safety management and of corporate support for road safety within the community.

An organisation accredited to ISO 39001 needs to:

- Understand its road safety context and influence – for example, a large suburban shopping mall, major manufacturing plant or national transport carrier face different safety risks on the road, but can each have a significant impact on the safety of all users.
- Establish top management leadership and commitment – out of seven critical success factors senior management commitment was nominated by 16 of 27 fleet safety managers in the NETS program as the number one factor [2] (Hanley, 2009).
- Determine its road safety policy and communicate it – clear and unambiguous statements about the value placed on road safety by the company backed up by documented policies and procedures which form the basis for engagement and communication with staff and stakeholders.
- Consider safety performance factors that positively impact on road safety in a known way – a defining feature of ISO 39001 is a set of ten evidence based factors which each company needs to consider within its own organisational context (these are addressed below).
- Establish objectives and plans – having established which factors have most meaning and value in their organisation, a series of metrics are established and plans developed to achieve improvements or reach particular targets.
- Resource plans appropriately, and support through a variety of management functions – the allocation of people and budget to deliver against the plans, and perform a range of coordinating, communicating and training activities and working to a series of documented procedures.
- Measure, review and continually improve performance – regularly receiving and analysing performance data, evaluating progress against stated objectives, engaging senior management in periodically reviewing the quality of the system and making necessary adjustments to improve performance.

The safety performance factors below are set out in the standard, and cover those aspects of road safety which are backed by evidence of their capacity to improve road safety:

- Road design and safe speed (especially separation, roadsides, and intersections).
- Use of appropriate roads depending on vehicle type, user, type of cargo and equipment.
- Use of safe driving speed considering vehicle type, traffic and weather conditions.
- Use of personal safety equipment (restraints, helmets, lights).
- Driver fitness (fatigue, distraction, alcohol & drugs).
- Safe journey planning (need/amount/mode of travel, choice of route).
- Safe vehicles (vulnerable/occupant protection, crash avoidance/mitigation, roadworthiness, load security).
- Appropriate authorisation for controlling different classes of vehicle.
- Removal of unfit vehicles and drivers/riders.
- Post crash preparedness, recovery and rehabilitation

The factors will not all necessarily be relevant for all organisations, and there may be other factors which are also relevant within an organisation, but they establish a full menu of road safety factors which an organisation can address. By going through the processes within the standard, including assessing its ability to influence these ten safety performance factors, the organisation is capable of both significantly reducing road traffic safety risk, and improving the safety on the road of the community within which the organisation exists.

[2] Single factors nominated as critical to success were senior management commitment (16), field management support (5), driver training (3), strong policies (1), high risk program (1), use of metrics to set goals (1), and incentives (0).

3.2 Driving for Better Business

The Driving for Better Business network (Driving for Better Business, 2012) involves many different public agencies and private companies to promote the business benefits of managing work-related road safety. One of the starting positions for the program is UK health and safety legislation which requires the employer 'to ensure, so far as is reasonably practicable, the health and safety of all employees while at work... (and) that others are not put at risk by work-related driving activities' (Department for Transport, 2003).

The network includes approximately 50 champions, who have logged a case study on the network's website which also houses some useful guidance and tools for companies to use. An example of this guidance is shown in Table 2, which lists ten essential elements for a road safety policy developed by a risk management and insurance corporation.

Table 2

Driving for Better Business – Essential Elements of a Road Safety Policy

Managent Policy	• Assign a senior manager with specific responsibility for managing driving at work. • Incorporate a driving for work policy within existing health and safety policy. • Routinely undertake, record and act on the findings of risk assessments dealing with all aspects of driving at work including driver safety, vehicle safety and journey planning. • Ensure that every incident involving any vehicle driven on behalf of the company is recorded and that collective information is regularly analysed to determine actions which may reduce recurrence.
Journey planning	• Check whether a road journey is really necessary, and encourage the use of alternative modes of communication/transport where this is practical. • Ensure that necessary journeys are scheduled to a realistic timetable and are planned to accommodate the essential need for adequate rest periods.
Driver safety	• Provide a driver's handbook that includes road safety guidance and sets out individual driver responsibilities, in support of the company's policies and procedures, for example what to do in the event of an incident. • Ensure that all employees driving on behalf of the company are initially vetted, inducted and regularly assessed, to establish that they are properly licensed, competent, suitably trained and medically fit to do so.
Vehicle safety	• Ensure when choosing vehicles to be used on behalf of the company, that they are entirely suitable for their intended purpose and that utmost importance is placed on safety features. • Ensure that all vehicles used on behalf of the company are regularly inspected and strictly maintained using the manufacturer's recommended service schedules.

While considerable guidance exists in workplace related road safety, this policy guidance is notable for two aspects which are not always found. The first is the prominence given to journey planning as a key aspect for controlling exposure to risk. Controlling exposure is at the top of the hierarchy of control for workplace safety, and in the road setting connects easily with other key cost drivers such as effective use of time and consumption of fuel, and relates directly to environmental imperatives to reduce greenhouse gas emissions. Travel by road is an essential aspect of company life, but placing greater controls on it can provide a range of benefits, and directly improves a company's risk profile.

The second notable aspect of the policy essentials published by Driving for Better Business is the choice of vehicles. With a substantial gap in safety performance between even 5 and 4 star rated vehicles, the purchasing and leasing decisions in this area provide immediate risk reduction benefits for a company and also provide a direct community benefit when the vehicle lease expires or the vehicle is on-sold. Again, it is relatively unusual for vehicle purchasing to be given such prominence, with vehicle safety advice often directed solely at the relatively less important maintenance aspects.

3.3 National Road Safety Partnership Program

In 2011 the National Transport Commission (NTC, 2011) released a public discussion paper to advise on the development of a draft national strategy for corporate road safety. The discussion paper sought to identify actions that companies can themselves identify and implement to improve occupational safety, without waiting for government intervention or regulation change. Key features of the new draft strategy include the potential for corporate partnerships to improve occupational road safety and the importance of corporate social responsibility or safety culture (Potter, 2012).

After considerable feedback in August 2012 the NTC released for discussion a draft strategy document to create a positive road safety culture within Australian businesses and organisations. The draft strategy was endorsed by a steering committee of 19 organisations, mostly private companies, and also included the Australian Automobile Association. [3]

The NTC National Road Safety Partnership Program is responding to actions identified within the National Road Safety Strategy 2011-2020. It also responds to Australia's new national health and safety legislation, which places a duty of care on employers 'to ensure, so far as is reasonably practicable, the health and safety of workers engaged, or caused to be engaged by the person, ... (and) to other people who may be at risk from work carried out by the business or undertaking,' and defines a workplace as including vehicles, ships and aircraft (Safe Work, 2012c).

All of the businesses involved in the NTC sponsored project have, to some degree, been engaged in developing a shift towards a road safety culture, and have described the following benefits from this shift:

- A reduction in fatalities and serious injuries.
- A reduction in fuel use (7–12 per cent), which correlates to a reduction in vehicle emissions.
- A significant reduction in WorkCover claims and insurance premiums.
- A reduction in fleet maintenance and overall operating costs.
- An increased fleet life expectancy.
- A reduction in vehicle accidents and rollovers.
- An inclusion of road safety parameters within the issuing of contractual requirements.
- A change in attitude, so that road safety becomes a standard component of Toolbox Talk (safety team discussions at the start of the shift) for general workers on site.
- An increased staff retention and a desire to work for the business.
- Provision of direct feedback to vehicle manufacturers to address safety concerns of a vehicle.

There are direct cost savings to the company associated with better and safer management of road traffic risk within a company. Less tangible, but still real, are the reputational and brand benefits in associating the company with the enduring value of safety both within the workforce and wider community.

The National Road Safety Partnership Program is a potentially significant road safety development within Australia, and has been established on collaboration and partnership principles which give the project the possibility of outliving its origins within NTC.

[3] The steering committee comprised of the National Road Safety Council (Chair), National Transport Commission (Secretariat), Australian Automobile Association, Australian Local Government Association, BHP Billiton, Blue Care, Coca Cola Amatil, GM Holden, Hanson Construction, Linfox, Origin Energy, Rio Tinto Iron Ore, Shell, Suncorp Vero, Telstra, Toll Group, Volkswagen, Wes Wesfarmers Insurance, and Zurich.

4 Fleet safety experiences

4.1 Introduction

In order to gain further insight into work-related road safety policies and practices in Australia interviews were conducted with representatives from a range of organisations. The aim was to discover how different organisations view work-related road safety and what policies and procedures have been implemented. Specific questions addressed were:

- Road safety context of the organisation.
- Leadership and safety culture.
- Key safety risks being managed.
- Fleet management and vehicle safety policy.
- Safe driving policy, training and education.
- Road safety policy.

4.2 Method

Discussions were held with the fleet manager or OH&S manager of six organisations and with a range of safety related managers from the RACV. The organisations included two state government road authorities, a major bank, a large energy company, a motoring organisation and a fleet management company. These companies were chosen as they were considered leaders in fleet safety and so the authors could gain an understanding of the factors that lead to the development of different policies.

The discussions were guided by a checklist of issues rather than a formal questionnaire and in most cases the discussions were constrained to less than 30 minutes. It should be noted that it was not possible to cover all issues with all organisations. In addition to the interviews, information from the presentations at the National Road Safety Forum held in Canberra in August 2012 was used to identify successful programs and policies (National Road Safety Forum, 2012).

4.3 Context, leadership and culture

The interviews highlighted that companies have made progress in accepting that the safety of their employees on the road is an important component of their OH&S response, and that road safety is gradually being integrated into the wider OH&S management system. All organisations reported a strong safety culture lead by senior management and in three cases with direct involvement from the Board of Directors. There was widespread understanding of the importance of a strong safety culture led from the top to both OH&S in general and road safety in particular.

Strong OH&S systems are in place in the larger organisations, particularly the government authorities and energy company, but all organisations are active in the development of their systems. All companies have policies about vehicle purchasing, vehicle use and road safety. In some case these are combined in a single document whilst others maintain multiple policies.

Representatives from three organisations considered road trauma to be the major safety risk for the company and all accepted that the vehicle is a workplace thus ensuring road safety for their employees is a part of an organisation's OHS responsibilities.

All presentations at the corporate responsibility session of the National Safety Forum stressed the importance of having a systematic response to managing road safety, which is led from the very top of the company.

4.4 Fleet Management

All organisations have a policy of purchasing 4 or 5-star vehicles for their light vehicle fleet with four reporting a strict policy of 5-star only. The remaining companies have chosen a 4-star policy because of the limited range of light commercial vehicles available.

All organisations reported purchasing the safest light commercial vehicle available consistent with the task and budget and two reported adding additional safety options to bring the vehicle to a 5-star level whenever available. At the National Safety Forum a presenter reported on the company's decision to purchase only 5-star light commercial vehicles and to transition all its vehicles to 5-stars by 2016. This decision is already impacting on the availability of 5-star light commercial vehicles.

No organisations are systematically fitting new technologies or have policies to consistently purchase 'beyond 5-star'. However, all respondents expressed an interest in new technologies and these are expected to become more important in the near future. Technologies discussed included autonomous assisted braking, in vehicle monitoring, fatigue detection, reversing cameras and sensors and ISA.

Monitoring technology was discussed by three of the respondents. Two organisations requiring travel in remote areas considered monitoring technology to be important to ensure safe driving practices and for the personal security of employees. The fleet management company considered analysis of records was more effective than technology to monitor journey planning and safe driving behaviour.

No organisations reported having control of the choices available to employees using salary sacrifice to acquire vehicles under novated lease arrangements, but not all organisations were asked about this.

4.5 Road safety policy

All respondents reported that a road safety or safe driving policy is in place in the organisation. These policies addressed issues such as alcohol and drug use, speed, mobile phone use and journey planning.

Safe driving

All company policies require employees to obey the roads rules and some set stricter conditions such as zero alcohol use. The safe driving policies often provide recommendations and access to road safety information rather than mandating behaviours beyond obeying the law.

Information

All respondents considered the provision of road safety information important and there were attempts to provide this information in different ways. Some organisations provide comprehensive handbooks whilst others are exploring a suite of methods including a handbook, ongoing provision of updates through the intranet, workplace seminars and one-on-one discussions. E-learning was considered important by the larger companies to ensure everyone has access to the information.

Driver training

A number of companies have arrangements with driver and safety training providers. Arrangements vary from employees being referred to the trainers if problems are identified, to the services being available on request to individuals or work groups.

Mobile phone use

Most respondents felt that the use of mobile phones while driving was a major risk to their employees. One organisation has responded by banning all use of mobile phones while driving for work whilst others provide hands free technology in all vehicles. Some respondents expressed concern at banning hands free mobile use while it was still legal while others considered that such a ban had the potential to significantly reduce risk.

Speed

None of the respondents interviewed reported having policies concerning speed beyond obeying all speed limits and providing information about the relationship of speed to crash and injury risk. At the National Road Safety Forum two major mining companies reported requiring speeds lower than the posted speed limits on remote roads when driving long distances.

Fatigue

All respondents, particularly those with employees driving in rural and remote areas, considered fatigue to be an important issue. Fatigue policies took the form of encouraging journey planning to minimise fatigue, but there were different views on how far journey planning outcomes should be considered mandatory or just be treated as recommendations. For example, should employees be allowed, encouraged or instructed to stay overnight if driving a defined distance from home. The fleet management company reported mandatory rules to reduce fatigue and at the National Road Safety Forum one company reported tight controls on employees undertaking long journeys, including a requirement to take regular breaks and to call in when starting and finishing the break.

Alcohol and drugs

As with speed, alcohol and drug policies require employees to obey the relevant legislation and provide information about the importance of alcohol and drug risk to crash risk. Information on the use of prescription drugs is also provided by at least one organisation. The fleet management company reported a requirement for zero alcohol use as their employees mainly drove in order to transport medical patients.

Motor vehicle use

All company motor vehicle use policies include a requirement for drivers to provide evidence of being suitably licensed, although in all cases there was only evidence of an initial check with no regular audit. One of respondents interviewed and two companies at the National Road Safety Forum reported a requirement to check the vehicle and carry out safety equipment checks before driving; all three companies had employees travelling long distances in remote areas.

Consequences of non-compliance

A number of organisations recognise the importance of monitoring behaviour and that there be some consequences for non-compliance with the road safety policies. Two organisations have introduced a system where minor traffic infringements result in a one-on-one discussion with a senior manager. Multiple or more serious infringements may result in more serious consequences. One of the presenters at the National Road Safety Forum in Canberra on 24 August 2012 said that, in one unnamed company, anyone who breached the safe driving policy received a personal phone call from the Chief Executive.

Policy review and audit

The respondents were concerned with the ongoing review and audit of road safety policies and with ensuring all employees are familiar with the policies. Two organisations already had a formal review system and two others were in the process of developing such a system.

There was little evidence of auditing knowledge and compliance of the systems and none of the respondents reported a systematic approach although there was interest in the development of a process.

4.6 Journey planning

Journey planning is beginning to become more important to many organisations. Planning activities include questioning the need to travel, replacing travel with video or other technology, planning journeys to allow car-pooling, planning journeys to avoid high risk times or locations and minimise fatigue problems and considering other travel modes.

The relevance of the different activities clearly varies depending on the type and size of organisation. However, one representative suggested that using technology to reduce travel was an effective safety measure to reduce travel risks. This representative also stressed the importance of company policies promoting journey planning in areas such as the timing of the start or finish of meetings and the provision of accommodation rather than allowing employees to travel long distances at the end of a working day.

Another representative considered journey planning to be of growing importance; currently it is focused on fatigue issues, and options to provide more advice on choosing safer roads are being investigated. Not driving at dusk and dawn and taking appropriate breaks are mandatory.

Respondents mentioned the use of alternative modes of travel but no actions were reported in the area. At the National Road Safety Forum a company reported safety benefits from restricting access to motor vehicles and requiring employees to either fly long distances or use shuttle buses provided by the company.

4.7 Summary

Positive advances in workplace road safety identified from the discussions included:

- Companies have made progress in accepting that the safety of the employees on the road is an important component of their OH&S response.
- Road safety is gradually being integrated into the wider OH&S management system.
- Most companies have a policy of purchasing 4 or 5-star vehicles for their passenger car fleet.
- Vehicle choice for light commercial vehicles is more difficult because of the limited range of vehicles available.
- Journey planning including car pooling, avoiding high risk times or location, taking rest breaks and using other travel modes is important to many companies.
- Larger companies are gaining benefits from questioning the need to travel and replacing travel with video or other technology.
- Road safety policies are in place addressing issues such as alcohol and drug use, speed and mobile phone use.
- Road safety policies can be strengthened with systems that monitor and respond to non-compliance.
- Road safety policies need to be regularly reviewed and audited.

The respondents identified areas where more improvements could be made, including:

- Extending the mandatory use of 5-star vehicles to all cases including light commercial vehicles.
- Further reducing the amount of driving required with greater use of technology.
- Reducing driving in high-risk situations.
- Banning the use of mobile phones.
- Increasing the safety information available to employees by a range of methods including e-learning.
- Recognising that road trauma is a social, human, financial, reputation, efficiency and operational risk to an organisation and needs to be given priority at all management levels.

5 Best practice principles

Some best practice principles regarding work related road safety are discussed in this section, focusing on key management aspects for an organisation that wishes to improve its safety performance, and some key policy aspects that it would need to address.

5.1 Key management aspects

The first key management aspect is to develop a systematic response within the organisation, involving senior management at the earliest stages to ensure good alignment with core business and strategic direction. There is a range of potential motivating factors for a business to develop a work-related road safety program, such as:

- Legal compliance with OH&S laws.
- Reducing costs arising from crashes including downtime arising from injury.
- Strong alignment with organisational values or the values of its leaders.
- Demonstrating safety leadership or credentials within a business market.

Whatever the motivation, or the method of response, senior management must lead by recognising the work-related road safety risks for the organisation as well as identifying the benefits of reducing those risks. Senior management must establish an organisational commitment to reducing those risks as an important start to energising the whole workforce on the issue.

A second key aspect is to develop a road traffic risk profile of the organisation, thereby prioritising a range of objectives and plans and providing adequate resources for delivery. The best means of developing this will depend on the best fit within the organisation. Some organisations are already accredited to or are heading towards ISO management systems and ISO 39001 would be a relatively straightforward means of taking action. Other organisations may have a strong OH&S mechanism that has been effective, and can be adjusted to reflect a more contemporary awareness of the scale of risk associated with road traffic.

It is essential to ensure that the scale and nature of both the tasks and the system fit the scale and nature of the business. The documented procedures must strike a balance between effectively addressing the road traffic risks for the organisation, and ensuring that the process for managing those risks does not weigh down the management system that is established.

A third key aspect is to ensure the highest quality implementation possible. This depends in part on the quality of the leadership and planning work that has come previously, but effective implementation will still require people to be engaged in safety focused discussions and people to make safety focused decisions. Communication and coordination are essential tasks within an overall project management discipline.

The best implementation and oversight will lie within an OH&S unit, but managers and staff need to be engaged throughout the organisation. Induction programs are an important means for communicating safety expectations, but these also need to be reinforced on a regular basis. There also need to be some consequences for failing to adhere to the safety policies which have been set.

A fourth aspect is to put in place a monitoring program so progress can be assessed over time and means of further improvement identified. These need to be meaningful to the organisation and potentially to external stakeholders. The overall results being sought, such as reductions in injuries and crashes, and increases in savings need to be supported by measures directly related to the likelihood of those results being achieved. A safe vehicle purchasing or leasing policy is highly likely to reduce the chances of a crash or an injury occurring, irrespective of an organisation's history of road traffic injuries for car drivers or passengers. Ideally, implemented measures will have a strong link to the overall level of risk and level of injury within the organisation. If the measure is improving, then safety can be judged to be improving.

Aside from these four key aspects, it is important to document the key procedures and results of this process within an overall management system. This allows an easier transfer of knowledge when personnel change, and it provides the basis for any subsequent management review of how effective the road traffic safety risk management approach has been. It is also important to note that the early expectations of organisational leaders are important

so that the safety manager can draw upon the organisation's authority to implement change. Organisational leaders need to be prepared to reinforce their expectations early on, and create an imperative on safety and functional leaders alike to take responsibility for safety, as well as report progress on a regular basis.

5.2 Key policy aspects

Within an overall management perspective and approach, a series of policies and procedures are needed to generate improvements in the safety performance of the organisation. This is addressed with journey planning, vehicle management and staff use of roads.

Journey Planning

Effective journey planning addresses critical aspects of the workplace safety hierarchy of control in relation to road traffic risk:

- Reducing the need for travel (the reduction in exposure to risk).
- Using the safest travel modes available (the substitution of a risk for a lower risk).
- Using roads with the greatest level of protection (provision of technological safeguards against the risk).
- Driver management issues such as fatigue (training and awareness of staff).

Journey planning is therefore an essential starting point for organisations in reducing road traffic safety risks for their employees.

The first issue is determining whether road travel is required of if it could be reduced or substituted with safer forms of travel. Depending on business needs, options to reduce corporate exposure to road traffic risk include:

- Greater use of person-to-person technology between different work locations, which may reduce cost and time.
- Introducing car pooling which may also encourage safer driving through positive peer pressure and lead to improved social interaction amongst employees.
- Consolidating travel between major travel routes such as establishing a frequent shuttle service between two points.
- Making greater use of public transport options which are safer than light motor vehicle use.

A further journey planning issue is determining whether the safest routes are being used, depending on the vehicle which is being used. The Australian Road Assessment Program (AUSRAP) has demonstrated over many years that not all roads provide users with the same level of safety. While many trips will be on unrated roads, some principles can be applied to urban travel, for example, for which a descending order of safety may be:

- Motorways which are fully divided and grade separated.
- Major arterials which have divided carriageways and limited access points.
- Other arterials where signalised intersections have fully controlled right hand turns and parking is controlled.

Safety investment is usually attracted to those parts of the road network where traffic volumes are high, and while the total level of trauma may be higher, the individual risk for each trip may be lower. Back routes do not tend to attract the same level of safety investment, and their use should be limited to their primary purpose which is usually to access specific properties, and not as a thoroughfare from one area to another.

Human factors are also significant in many aspects of journey planning. Trips should be scheduled to avoid creating pressures on staff to travel at excessive (over the limit) or inappropriate (not to the prevailing conditions) speed, or to drive when fatigued. Management should work with staff and be involved in setting the boundaries for journey planning. Fatigue management measures can go so far as requiring staff on regional journeys to stay overnight.

Within an overall set of journey planning policies and procedures, emergency planning is also important. In the event of a vehicle breakdown, for example, the scene needs to be made safe in relation to other traffic, and in the event of a crash, emergency services need to be engaged. The availability of emergency medical care can have a significant influence on injury outcomes.

Vehicle management

The use of technological safeguards in road design is addressed through journey planning, and also needs to be specifically addressed in terms of vehicle selection and management. Selecting vehicles that are fit for the work purpose is the first task in managing vehicle related risk, as some light vehicles are more suited to metropolitan, rural or remote driving. Specific tasks that may be required, by an energy supplier attending faults for example, may also require a

light commercial or heavy vehicle. Once the vehicle type has been identified, a series of criteria can be applied that will improve safety, and also other imperatives such as emissions.

As regulated safety standards in Australia tend to follow rather than lead the widespread introduction of vehicle safety features, ANCAP safety ratings provide the simplest means of assessing the inherent safety quality of a light vehicle. Light vehicles with 5-star ANCAP safety ratings come in a variety of sizes and at varying costs, and set the benchmark for an organisation which places priority on the safety of their employees on the road.

Considerably less safety has been incorporated to date in the light commercial fleet, and the range of ANCAP 5-star rated light commercial vehicles is proportionately much smaller, but there are increasing numbers in the market. Some organisations have set a 4-star ANCAP safety rating as the benchmark for their light commercial fleet, as a transition through to a 5-star fleet in the future. Whatever decision is made, it is useful for an organisation to consider how to best manage their light commercial fleet, particularly regarding aftermarket modifications. Some modifications, such as roll bars in remote driving, may be unnecessary given the inherent safety quality of the vehicle. Others, such as bull bars, may negatively affect the crashworthiness of the vehicle.

Company fleets comprise the greatest portion of the new vehicle market, often under lease arrangements. When a new lease is entered into, the previously leased vehicle, with a higher safety rating, enters the used market and provides a lasting benefit over ten to fifteen years. While ANCAP provides critical consumer information on the relative safety of different vehicle models, some companies may be entering the used car safety market, and it may be relevant to also consult the Used Car Safety Ratings which, like ANCAP ratings, are funded by automobile clubs and government transport agencies and are widely available on the internet.

The key vehicle issues are about the inherent safety quality of the vehicle at the time of lease and purchase. Once incorporated into the fleet on either lease or purchase, manufacturer's recommendations regarding ongoing service and maintaining roadworthiness should be adhered to and built into company fleet costs. The nature and volume of vehicle use such as significant off-road or unsealed road use may require additional maintenance effort, and a specific schedule for ongoing vehicle maintenance should be established. The specific function of the vehicle will determine what needs to be addressed in relation to securing loads in or on the vehicle.

Staff use of roads

Just as in other aspects of workplace safety, protective measures need to be provided for employees who are exposed to road traffic risk. A responsibility remains with each employee, but even then it is necessary to ensure that employees are aware of the key risks they face in the road environment, and the expectations of how they will behave within the road environment. A simple, easily understood document which sets out company expectations of staff behaviour in relation to safety on the road is important. It should be distributed and explained at induction, and there should be a mechanism in which these expectations are regularly reinforced with staff as part of the employer – employee relationship.

Staff members who drive vehicles on the road clearly need to be appropriately licensed for the type of vehicle they drive. Procedures need to be established to ensure that the organisation is informed if there is a change to their licensing status for whatever reason, such as licence suspension, or the staff member has a medical condition that may affect their fitness to drive. Traffic infringements indicate a safety issue and where the organisation becomes aware of these, a formal discussion with the staff member should take place to reinforce the expected safety behaviours within the workplace.

The extent to which additional training is required for drivers will vary between organisations. Some organisations require driving in demanding off-road conditions, or in vehicles that have distinct handling characteristics, and specific training may be necessary to address such matters. Training should first and foremost be specific to the road related risk that has been identified. However, the hierarchy of control emphasises the need to look first at safer technology controls through safer vehicle purchasing and leasing procedures, and controls around the journey, rather than generalised driver training. Where driver training is undertaken, it should be focused on higher order skills associated with self-management and hazard perception on the road. Training that may generate over-confidence on the road should be avoided, such as skills based driver training as there is little evidence that this type of training is effective in reducing crash risk.

Alcohol, drugs, and fatigue can have significant effects on the productivity of an employee, and generate safety risks in a variety of workplaces. Just as these risks can be highly elevated in some situations, such as those where employees are working with heavy machinery, they have a significant impact on the capacity of employees to safely use the road. A number of safety factors associated with driving are the subject of regulation and enforcement, such as driving under the influence of alcohol or drugs, speeding, using a mobile phone, seatbelt or helmet. Staff who are driving must comply with such laws, but many companies go further than these legislated minimum standards and require zero alcohol or drug levels, or no use of mobile phones at all. Other factors such as navigation systems are not regulated, but may also prove to be distracting.

5.3 Priority actions

A review of the literature on vehicle and driver safety interventions available to organisations in order to improve their work-related road safety effort illustrated a number of viable approaches. Ideally, initiatives in this area would be developed as a complete management response to road traffic safety risk exposure, and there are a number of models and programs available to support this. In this respect, journey planning assumes considerable importance and is consistent with the application of workplace safety management principles towards the wider societal goal of safe road travel.

This section addresses the priority actions for an organisation seeking to improve work-related road safety.

- Calculate the company's exposure to risk and impact of crashes and injuries – how much road travel is conducted, and the mode that is used, directly affects the safety risk to which the company is exposed. Identifying this is essential in organising a coherent risk reduction program. Establishing a baseline for the number and cost of crashes and injuries is also important to be able to assess progress over time.
- Commit the company and nominate a senior person to drive an improvement program – the best safety response will come from top management having committed itself to the task of substantially reducing its road traffic safety risk, clearly mandating a senior person within the company to drive a risk reduction program. Ideally, that person will have substantial health and safety responsibilities within the company and be capable of working cooperatively with line managers to develop and deliver the program.
- Undertake and document a road traffic risk assessment – this requires identifying hazards across the dimensions of journey planning, vehicles and users, and assessing the likelihood of each hazard and the consequences of it occurring. A simple high, medium and low matrix for assessing likelihood and consequence can be used for each hazard.
- Identify and prioritise road traffic risk reduction interventions based on established workplace safety management principles – first seek to eliminate the hazard, then substitute it for a lesser hazard, then put technological safeguards in place. Only once comprehensive plans are put in place under this hierarchy should attention be given to how the user interacts with the road environment and consider any protective equipment that may be necessary.
- Document current rules for planning and undertaking journeys on the road – identifying the rules in place for managing work trips is important to be able to determine potential gaps in how risks are being reduced. Policies to reduce the number of trips, to have the trips undertaken through safer means such as public transport, or to support safer scheduling of tasks should be identified and assessed for their capacity to reduce exposure to risk.
- Reduce the need to travel, or reorganise schedules to reduce the volume of travel – face to face contact can be essential, but travel can often be better managed by reducing financial and environmental impacts as well as exposure to safety risk.
- Establish controls around use of the road network – use higher volume, higher quality routes where safety protection is likely to be the highest. For example establish routes in metropolitan areas that use signalised intersections where right turns are fully controlled, and in rural areas that have roadside barrier protection. Only use minor roads for specific property access. State road authorities and automobile clubs provide an increasing amount of information about the risk of different roads.
- Establish an inventory of light and light commercial vehicles – a single vehicle management approach within a company is likely to improve the management of the fleet asset whether in regard to safety, environmental or financial objectives, and an inventory of light and light commercial vehicles (including make, model and year of manufacture) will allow an assessment of the relative safety level of the fleet to be made.
- Plan for any necessary upgrade to the vehicle fleet – there are ANCAP 5-star safety rated vehicles across all light and light commercial market segments, and this rating system provides the best information about to how to reduce vehicle related risk of crashes and injuries to employees. Most new vehicles in Australia are bought (or leased) by company fleets, so a 5-star policy not only reduces employee risk, it supports safety-focused manufacturers and means safer choices are available for subsequent used car buyers.
- Upgrade the purchasing policy to include proven safety features not currently required in the 5-star ANCAP rating – at present the most promising new technology is FCAT which is also known as autonomous emergency braking.
- Assess current road safety advice/training/directives to company drivers – a company should be able to point to a clearly documented and well-reasoned set of safety expectations regarding their employees' use of the road. These should be communicated through an induction mechanism for new employees and a refresher mechanism for all employees who drive, and be supported by integrating direct personal feedback into the normal employment relationship.

- Review and be prepared to change driver education programs – driver education programs should generally avoid acquisition of car-control skills (for example anti-skid or anti-rollover training) as this can create over-confidence and does not reduce crash risk, and focus on acquisition of higher order skills such as risk awareness and self management in the driving environment. This should be backed up by information and behaviour expectations around key risk factors such as licensing, speeding, drugs and alcohol, wearing of restraints and distraction.
- Establish simple audit and monitoring systems – data should be collected that is meaningful to the company and the risks faced, and should be analysed and reported by line managers charged with reducing safety risks.
- Establish simple feedback and consequence measures – where policies have not been followed, the safety purpose of those policies should be reinforced by top management, and possibly clarified to remove ambiguities about safety expectations.

The cost of these priority actions will vary depending on the nature of the company and the extent to which it has systems in place to control work-related road crash risk. Many key elements of improving work-related road safety rely on the simple application of good management practices – for example, the collection of key safety data, the consideration by senior management of the road traffic risks faced by a company, and the accountability of managers to report on progress.

There will be a cost in reviewing risks, and applying workplace safety management principles (improving the environment) ahead of traditional road safety management principles (improve the user). However, a safety analysis of travel needs may assist in establishing improvements in how travel is managed in an organisation, and reduce costs. Similarly, a simpler vehicle management approach which prioritises function and safety can lead to less costly alternatives to the current fleet mix.

Given the wide availability and uptake of driver training courses, better use of current expenditures may also be possible in this regard. Companies need to make their own assessments of risk associated with individual drivers, but the first priority is to ensure that all company drivers understand company expectations, which will often go beyond mere compliance with the law (in relation to alcohol for example), and demonstrate consequences within the company where these expectations are breached. This does not need to lead to disciplinary measures for driver behaviours to substantially improve. Where individual driver attention is considered necessary, this may better target towards those exposed to the greatest risk, or towards a coaching or development environment where the focus is on risk perception and self-management, not vehicle control.

6 Summary

In safety management terms, the workplace is a largely closed environment with controlled access. The road network is by contrast a largely open environment with open access. For companies charged with the safety of employees on the road, the task can at first seem relatively complex. How can employee safety risks be controlled in an open access environment? And where the employee is performing this task everyday outside of work how does the company intervene when the employee is at work?

The answer lies within the growing notion in road safety of 'shared responsibility'. Companies have legal obligations for the safety of their employees, and can play a vital role in improving the safety of the entire community at the same time. Over many years, road users were largely held responsible for their own safety, but that notion is coming to an end with the realisation that the inherent safety of the environment and the technology deployed within that environment largely determines the safety of any individual.

This essential lesson of workplace safety management is beginning to be applied in road safety management. Companies wishing to reduce the risk of their employees on the road should, firstly, reassess the need for travel; secondly, reorganise work journeys to reduce exposure to risk or use lower risk journey options; thirdly, invest in the upfront safety quality of vehicles that are being used; and fourthly, engage their staff about risk management on the road as they would engage them about anything in the workplace which directly affects the performance of the company.

Ideally, these actions should be managed within a standard management cycle of establishing direction, implementing plans, monitoring progress, and looking for opportunities to improve. This requires a person to be tasked with coordinating activity and working with line managers to ensure that the company's objectives in the area are being met.

This cycle will continually review safety performance and identify actions with the most potential to improve road safety within the organisation. These actions will change with time, location and organisation. However, this review has identified a number of measures that have the potential to produce immediate benefits and so it is possible to provide some short-term recommendations. Organisations will need to determine which of the following actions are relevant and which have already been implemented.

- Immediately move to a policy of purchasing 5 star vehicles wherever possible and do not compromise the whole fleet if 5 star vehicles are not available for all vehicle types purchased.
- Analyse driving patterns within the organisation and implement technology and other policies to reduce the amount of driving required.
- Provide information for safer journey planning to avoid high-risk times and locations.
- Ensure all employees are familiar with company road safety policies.
- Provide road safety information in a form accessible to all employees.
- Review road safety policies regularly in consultation with employees.

The costs and benefits of improving work-related road safety will vary from company to company, but will play a potentially vital support role for efforts within the wider community towards a safe road traffic system.

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