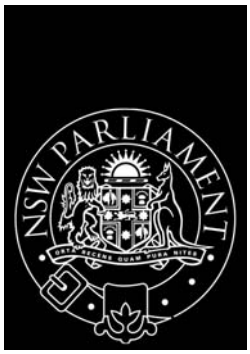

PARLIAMENT OF NEW SOUTH WALES

STAYSAFE Committee

REPORT ON WORLD HEALTH DAY 2004
"ROAD SAFETY IS NO ACCIDENT"

Wednesday 7 April 2004

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Terms of Reference

Resolution of the Legislative Assembly on 8 May 2003:

That a Joint Standing Committee (to be known as the Staysafe Committee) be appointed to inquire into and report upon road safety in New South Wales with the following terms of reference:

1. As an ongoing task, the committee is to—

    a. monitor, investigate and report on the road safety situation in New South Wales; and

    b. review and report on countermeasures aimed at reducing deaths, injuries, and the social and economic costs to the community arising from road accidents.

Chairman's Foreword

This report is a collation of papers given at a forum on road safety held in Sydney, New South Wales, on Wednesday 7 April 2004. The forum—one of numerous events held on that day around the globe—marked World Health Day.

For the first time in the history of the World Health Organization, World Health Day was devoted to road safety. The slogan for the day was "Road Safety is No Accident". This slogan was adopted for the New South Wales event.

The major launch of World Health Day 2004 was celebrated in Paris, France, and was hosted by President Jacques Chirac of France, who delivered a powerful keynote speech calling road traffic collisions an "evil which strikes at the modern world". He stressed the need for political commitment to road safety at the highest level and called for action by all countries to address this crisis.

The Secretary-General of the United Nations, Mr Kofi Annan, pledging his support to World Health Day and called on all countries to take heed of the growing toll of road traffic collisions and begin implementing preventive action. Mr Annan said:

> "Despite enormous improvements in road safety in some countries over the past few decades, nearly 1.2 million people are killed every year in road traffic crashes around the world. Most of these deaths, each of which is a personal tragedy, occur singly and draw no attention from the world's media. About 90 per cent happen in developing countries, most of them among pedestrians, bicyclists, motorcyclists and passengers of public transport. Between 20 and 50 million more people are seriously injured in such incidents every year, often resulting in disability.
>
> Beyond the human suffering they cause, road traffic injuries result in considerable additional costs to societies. Globally, more than half of all victims are between the ages of 15 and 44, the age at which they would be most able to contribute to the livelihood of their families and communities. This loss of breadwinners has enormous implications for the security of families. And estimates show that road traffic injuries cost nations as much as 2 per cent of their gross national product.
>
> Yet most of this loss can be prevented -- by tackling dangerous driving, such as speeding and driving under the influence of alcohol; by promoting the use of helmets and seat belts; by ensuring that people walking and cycling are more visible; by improving the design of roads and vehicles; by enforcing road safety regulations; and by improving emergency response services. The key to successful prevention lies in the commitment of all relevant sectors, public and private -- health, transport, education, finance, police, legislators, manufacturers, foundations and the media -- to make road safety happen."

Dr Lee Jong-wook, Director-General of the World Health Organization, officially launched the *World report on road traffic injury prevention*. This report emphasizes the role of public health in the prevention of road traffic injuries. It offers countries six recommendations for action on road safety at a national level.

Among the report's recommendations are the appointment of a lead agency in every country to coordinate multisectoral efforts, the preparation of national road safety strategies and plans of action with clear roles and objectives for each sector, and the implementation of proven interventions to prevent crashes and minimize injuries and their consequences. The report notes that road safety is a shared responsibility, and calls on the expertise of people across many sectors and disciplines, including public health professionals, health care providers, road and motor vehicle engineers, law enforcement officials and educators.

Dr Lee called for a concerted effort in road safety, particularly among the public health community, saying that

> "We must now use every day to act on road safety, and implement effective sustainable action to prevent injury and death on the world's roads... Everyone can increase road safety in their private capacity as well - as drivers, passengers and pedestrians, and as members of the public who influence decision-makers. Road deaths and injuries are preventable."

In Australia, events for World Health Day 2004 were co-ordinated by the Australasian College of Road Safety, Parliamentary Committees, and motoring organisations. STAYSAFE, the College, and the National Roads and Motorists' Association (NRMA Motoring & Services) organised the New South Wales event, and participated in the launch of the World Report on Road Traffic Injury Prevention

The STAYSAFE Committee

The STAYSAFE Committee was established in 1982 to investigate and report on road safety matters in New South Wales. Its terms of reference include the review of countermeasures to reduce the incidence and severity of road crashes, and the monitoring of actions taken to address the social and economic consequences of road trauma.

As a result of reports of the STAYSAFE Committee, successive governments have taken a number of initiatives to improve road safety, including the introduction of random breath testing, changes to driver licensing practices (including the new graduated driver licensing system for young drivers introduced in 2000), improvements in heavy vehicle safety, the development of more effective and efficient traffic enforcement, the revision of criminal law relating to road use, safer and more effective traffic control around schools, and the introduction of 50 km/h speed limits in urban areas.

Road safety efforts in New South Wales are co-ordinated through the Roads and Traffic Authority. Other government agencies involved in road safety efforts include New South Wales Police, the Motor Accidents Authority, NSW Health, Transport Services, the Department of Education and Training, and the Attorney General's Department. Significant non-governmental organisations involved in road safety activities in New South Wales include the National Roads and Motorists' Association, the Australasian College of Road Safety, the

Pedestrian Council of Australia, the Institute of Public Works Engineering Australia, the Australian Institute of Traffic Planning and Management, and Bicycle NSW. There are a number of research bodies involved in road safety in New South Wales, including the Injury Risk Management Research Centre (at the University of New South Wales), and the George Institute for International Health (at the University of Sydney).

Acknowledgements

The STAYSAFE Committee is grateful for the partnership with the Australian College of Road Safety (now Australasian College of Road Safety), and the National Roads and Motorists' Association in preparing and conducting this event for World Health Day.

The STAYSAFE Committee is grateful for the contribution of the staff of the Committee secretariat: Mr Ian Faulks, Committee Manager (who as Vice President of the New South Wales (Sydney) chapter of the Australasian College of Road Safety was able to establish and manage the relationship with our partner organisations for the event); Mr Jim Jefferis, Project Officer; Ms Millie Yeoh, Assistant Committee Officer; and Ms Ashika Cyril, Assistant Committee Officer. Mr Faulks and Ms Cyril acted as co-editors for the production of this report.

The Committee also thanks Mr Dennis Wilson, Chief Parliamentary Attendant, and the staff of Hansard and the Catering section for their work on the day.

'2005, 2010 and 2020: Where will the road take us?' Paul Gibson MP

Member for Blacktown
Chairman of STAYSAFE Committee

Introduction

Roads in New South Wales, as throughout the rest of Australia, are the major form of transport within and through our communities, through:

- the facilitation of private motoring
- the carriage of the major part of the freight tonnage, and
- the provision of the bulk of public transport services such as taxis and buses.

This transport function comes at a cost, primarily through injury and property damage in road crashes. Sometimes it seems that the consequence of road usage must inevitably be road trauma. However, there is no reason to believe that this should have to be so.

This forum today—which marks the World Health Organisation's release of its global report on road trauma prevention—is serving as a practical exploration of what has been done to road safety in New South Wales and of what might be done in the future, beginning now, looking to the short term, and into the longer term.

When we examine the performance of the New South Wales road transport system across a broad scale, for example, from 1950 to the present, we can notice a dramatic reversal in road trauma since the late 1970's. New South Wales has made major progress in reducing the road toll since the early 1970's, through the introduction of major safety programs that have integrated legislative change with enforcement and education programs in areas such as mandatory seat belt usage (in the 1970's), random breath testing (1982), and speed camera technologies (through the 1990's). Supporting these major programs have been regular targeted advertising and public education initiatives for the New South Wales community, and the implementation of road safety education throughout the primary and secondary school years.

The current estimate by the Roads and Traffic Authority is for about 560 road deaths in New South Wales in 2004. This is more than a 55% reduction from the 1,303 people killed in road crashes in 1980. Indeed, the current level of road trauma in New South Wales represents a significant improvement since 1990, where 797 people died on New South Wales roads, the Roads and Traffic Authority's estimate is about a 30% reduction.

The scale of these reductions in road trauma in New South Wales compare favourably with other Australian States, and most westernised countries. Justifiably, road safety workers in New South Wales during the 1970's and 1980's have a reason to be proud of their successes in reducing road trauma.

Unfortunately, there are also less encouraging signs. If we take a shorter term view, then the level of road trauma in New South Wales remains more-or-less constant in comparison to the immediately preceding years. For example, if we examine the period 1996-2003, road trauma outcomes averaged about 570-580 deaths each year, slowly reducing to around the 550-560 deaths each year that are typical today.

The road trauma situation in New South Wales has effectively plateaued. This is the ambiguity we face: We have the lowest levels of annual road fatalities in 50 years, but we are also now faced with the plateauing (stalling or stagnation) of our efforts.

Today I want to make several brief comments that will pick up on the themes developed by Dr Henderson, but invite the following speakers to extend the focus to a future scan incorporating:

- 2005—this is the immediate focus: where will we be at the end of this year?
- 2010—this is the short term focus: where will we be at the end of the current road safety strategic planning cycle?
- 2020— this is the longer term focus: What are the kinds of world we might see in fifteen years?

Looking back to 1990

If we look back to the time to about fifteen years ago, in the late 1980's when the Road Safety 2000 strategic plan was being developed, the world is both familiar and strange. Let's remind ourselves of that world as reflected in its road transport system:

- Virtually no vehicles were fitted with air bag technologies.
- Many vehicles did not have provision for the installation of a baby capsule.
- Motorcycle riders did not have to wear a helmet, providing they could claim a medical exemption.
- Bicycle riders did not have to wear a helmet.
- The 4WD vehicle, a ubiquitous feature on the roads of the present, was much less prominent—instead, station wagons and panel vans were a much more common vehicle.
- Most articulated trucks were semi-trailers, with only limited numbers of B-Doubles using very proscribed routes.
- Most major highways in New South Wales remained as 2-lane undivided roads, with few passing lanes (and so broken white line markings were placed in as many locations as possible to allow for overtaking)
- Known crash locations—now known as blackspots—often remained unchanged until the major reconstruction of large lengths of road was scheduled
- Driver fatigue was only just becoming recognized as a major factor in road trauma.
- Random breath testing was only a few years in operation, with many drivers still unfamiliar with, or unaccepting of, the idea of not drinking and driving.
- There were no speed cameras in use (neither mobile nor fixed sites)
- Speed limits in New South Wales were being revised to shift from a basic 60-80-100 km/h hierarchy (with 110 km/h on a limited number of freeways) to allow for 70 and 90 km/h speed limits
- The general urban speed limit was 60 km/h in all streets

- Local area traffic management precincts featured 40 km/h speed limits
- School precincts featured 60 km/h speed limits or more
- Most adult drivers over the age of 40 years had not been subject to any form of driver licence testing other than a check by local police
- Licensing for young drivers featured a learner licence that expired after a year (effectively forcing young drivers into going for the driving test to avoid the cost of a replacement learners licence), and the provisional licensing phase lasted just one year (with automatic transition into full licensure)
- Mobile telephone technologies were expensive, large and cumbersome.
- Vehicle telematics (or on-board computer technologies) were not a feature of vehicle design.
- Road technologies were essentially limited to signage and road markings, with poor retroreflectivity. There was no use of variable signage.
- Traffic management techniques were limited—no tidal flow arrangements, few signalized turn arrows, traffic signals only on major intersections
- There were few toll roads, excepting the F3 (to Newcastle), the F6 (to Wollongong) and the Sydney Harbour Bridge, all of which required a cash payment with no electronic toll provision
- A number of significant road safety-related agencies and organizations (government and non-government) did not exist, including the Motor Accidents Authority and the Pedestrian Council of Australia

This list is not exhaustive. I am sure that everyone here could contribute their own observations as to how much the world—at least the world limited to the road transport system in New South Wales—has changed over the past fifteen years.

Looking forward to 2005, 2010 and 2020

Today, the road toll in New South Wales is up about 10% on last year (+10% on the average over the last 3 years). If recent years are to provide a guide, then the road toll will remain more or less constant—plateaued, stagnant, stalled—well above the target set for the first State-wide road safety plan, Road Safety 2000 (less than 500 road deaths each year to be achieved by 2000) and above the expected interim target established in the Road Safety 2010 strategy.

The National Road Safety Strategy 2001-2010 provides for a target reduction of:

> "... the number of road fatalities per 100,000 population by 40%, from 9.3 in 1999 to no more than 5.6 in 2010."

This national target of a 40% reduction in road trauma also appears to be the target set for New South Wales in the Road Safety 2010 strategy, although the Minister for Roads, the Hon. Carl Scully MP, also refers to a halving of the road toll in his foreword to the New South Wales strategy.

The targets set as part of the national and New South Wales strategies may not relate well to community expectations. Community opinion of road injuries and deaths does not focus on

technically accurate terms (or benchmark terms) such as deaths per 100,000 population, deaths per 10,000 vehicles registered, or deaths per 100 million vehicle/kilometres driven. Instead, the general public and the media have been educated, through long exposure to the debate over road safety, to think of road trauma as being the road toll—how many people die each year. For example, as the Road Safety 2000 target for New South Wales is less than 500 deaths, a further reduction of 40% by 2010 would probably be expected to be less than 300 road deaths (and a halving of the road toll by 2010 would probably be expected to be less than 250 road deaths). In other words, what the community would likely understand to be the target in 2010 would be, at a minimum, a road toll of less than 300 deaths.

But this expectation is at odds with the 'technically accurate' 2010 target in the New South Wales road safety strategy. The New South Wales target for 2010 – that is, the expected road toll in New South Wales – is, in fact, a toll of more than 400 deaths, and probably closer to 450 deaths. This variation from the expected occurs because the New South Wales target is specified in terms of a ratio: road deaths per 100,000 population. The target reduction is, of course, dependent on the rate of population growth over the next decade. Calculations based on estimates for population growth in New South Wales over the 2000-2010 period, which range from a minimal 7% increase against the 2000 population, through to a 12-15% increase in population, yield a projected target road toll of a toll of more than 400 deaths, and probably closer to 450 deaths.

Expressed in the bald terms of the road toll—the way the general community thinks about road trauma—the New South Wales target for 2010 begins to look a little shaky indeed. Given the gains in road toll reduction since the 1980's (a 55% reduction in people killed on the roads), the community will expect that much, much more will be done and achieved in reducing the road toll.

What can be done?

There are a number of major measures outlined in the New South Wales Road Safety 2010 strategy, including:

- the new graduated driver licensing scheme, requiring a log book of training undertaken, extending the provisional licensing phase, and requiring different performances regarding the recognition of risk and hazard from novice drivers; and the
- the reduction of the general urban speed limit to 50 km/h

These are now implemented.

Outside of the road safety strategy, some measures can rise and be implemented rapidly without government leadership or sponsorship, for example, the introduction of airbag technologies into the Australian vehicle fleet during the mid-1990's, which occurred outside the framework of the New South Wales Road Safety 2000 strategy or the corresponding national road safety strategy.

But the process can also be very slow. The implementation of 50 km/h speed limits in our cities and towns was proposed in the New South Wales Road Safety 2000 strategy, published in 1991. The STAYSAFE Committee strongly recommended a general urban speed limit of 50 km/h in 1996, yet, it was only introduced in 2003—13 years after its original promotion as a desirable road safety measure.

There are probably other, as yet unrecognised measures. It is difficult to guess where they might be found, but such issues such as:

- the monitoring, management and control of vehicle performance (e.g., 'black boxes' in vehicles, speed limiters in vehicles)
- the implementation of intelligent road technologies, or
- relating occupational health and safety concepts to people who use roads while 'at work' may eventually provide new countermeasures.

Consideration of broader philosophical approaches such as 'sustainable safety' (as used in The Netherlands), and the 'Vision Zero' concept in Sweden may yield new insights and allow for the development of new measures to counter road trauma. For example, the 'Vision Zero' concept requires a move away from economic rationalist 'cost-benefit' models for decision-making towards models that place more weight on the elimination of reasonably preventable injury. Measures that fail to pass the test in a standard cost-benefit model may well be seen as desirable and effective when assessed against a different criterion.

But how far into the future should we scan? What should we consider? These are questions for consideration in the later presentations today, and in the panel discussion this afternoon.

Structures for road safety-related activity

In addition to looking into the future for new countermeasures to road trauma, it is useful to also ask questions about the very way we organise and administer road safety in New South Wales:

- Should we, for example, have a separate Minister for Road Safety?
- Should we have a separate and distinct road safety organisation?
- Is the Roads and Traffic Authority the appropriate organisation to lead road safety efforts in New South Wales.
- Are there are too many conflicts of interest for the Roads and Traffic Authority?
- What are the roles of the other government agencies and non-governmental organisations in addressing road safety matters?
- What are the relationships between the Roads and Traffic Authority and the other government agencies and non-governmental organisations in addressing road safety matters—should these relationships be altered, can these relationships be improved?

These are not unreasonable questions. The Roads and Traffic Authority is primarily a roads builder and manager, and an administrator of driver licences and motor vehicle registration. The Roads and Traffic Authority is about managing commercial contracts for road infrastructure and technology and is about maintaining databases where people and vehicles have a unique identifying number for record-keeping and revenue purposes. Where does road safety fit in relations to these two major parts of a very large government business? Road safety doesn't generate revenues like the licensing and vehicle registration area, or manage dozens of very large commercial contracts like the road building area.

In New South Wales, we have a Minister for Science and Medical Research. We have Ministers for some of the State's regions (western Sydney, the Hunter, for the Illawarra, and for the Central Coast). But we don't have a Minister for Road Safety.

All indicators are that as the New South Wales economy goes ahead, the challenge of keeping our roads safe—and making our roads safer in the future—will become increasingly difficult to achieve. For example:

- Our driver population is ageing, and there will be demand for their mobility needs to be addressed
- Distraction and impairment of drivers—through use of communications technologies, drink-driving, drug-driving, driving while tired will remain as problems
- The failure of vehicle occupants to wear selt belts will remain a major problem.
- Non-compliance by drivers with speed limits is likely to remain a major problem.
- Issues associated with the diversity of vehicle age, and vehicle size and types, within the New South Wales vehicle fleet will be a major problem
- Truck numbers, and the distances travelled by trucks will continue to increase.
- The demand on the NSW road freight routes, which are our major regional highways, will continue to increase.

But the next fifteen years promise, as has occurred over the past fifteen years, dramatic increases in knowledge and scientific achievements. We can likely continue to expect major advances in available technologies, including new materials, advanced computer technologies, new biosciences and medical technologies, new management structures, different types of vehicles becoming predominant. We may also see the beginnings of new ways to produce energy, such as the development of a hydrogen economy. Many of the measures that will impact positively on the road safety situation will not derive from a process of policy and program development within the road safety community, but will rather be offshoots or tangential to commercial and management processes such as transport logistics, travel demand management, energy management, health care management, and so on. Some crucial issues therefore, are the development and maintenance of comprehensive and accessible data sources documenting road safety and road trauma reduction efforts, and of diverse educational and training for people working in road safety and road trauma reduction.

Strategic planning for road safety

What do we need?

We need to have a systematic approach to identifying, monitoring and reviewing the diverse developments in knowledge, science and technology, and assessment of the impact on the road transport system of the marketing of these developments into industry and the community.

We need a review of the strategic planning process to be developed and implemented, so that progress can be better monitored over the next two decades.

We need strategic timelines that project forward over the next 15 years and detail the knowledge, science and technology that could be delivered.

We need key indicators of success that are tied to the road safety and road trauma reduction goals, to reliable and timely statistical collection and analysis of relevant road safety and road trauma data, to budgets, and to the performance of road safety program managers.

We need to build upon the past five decades of road safety science, and provide a blueprint for road and transport safety well into the 21st Century.

The challenge is to identify policies and programs that agencies and organisations involved in road safety should pursue over the next fifteen years and beyond that will enable New South Wales to move to the forefront of innovation.

This is not an easy challenge, and it is not a comfortable challenge. The environment in which road safety work is conducted is a complex mix of politics, bureaucracy (government agencies and non-governmental organisations), commercial interest, community advocacy, and private or scientific organisations primarily dependent on funding from a limited number of government agencies involved in road safety. There are acknowledged tensions and problems in this complex mix, but at the same time there are many beneficial and productive relationships.

But the environment in which road safety work is conducted is your world. Take up the challenge, believe in what can be done, and get out and do it.

But I'll conclude with a cautionary comment. Strategic planning is a very difficult process, once the focus shifts from the known, immediate environment into the short and longer terms. We can be reasonably sure what will be the road safety situation in New South Wales in 2005. The task becomes more challenging when we begin to look at possible situations in 2010 and 2020. Nils Bohr, Nobel laureate in Physics, provided a pithy acknowledgment of this, saying:

"Prediction is very difficult, especially if it's about the future."

'Lessons from History: The road ahead' – Michael Henderson

Progress, far from consisting in change, depends on retentiveness. Those who cannot remember the past are condemned to repeat it.
(George Santayana, "The Life of Reason")

This important forum happens to have been timed to occur very soon after a reunion for those who worked at the Traffic Accident Research Unit (TARU) of the Department of Motor Transport, and at its various incarnations after its original formation in 1968.

At the reunion, many of us reviewed the "old days", and a common theme emerged: many of the problems now faced in road safety are the same as we faced then, in the dark days of a record road toll, and many of the lessons we learnt then are as salient now as they were at that time. Despite this, it seemed to us, some lessons from history were being forgotten, ignored or set aside.

I therefore thought it would be useful to look again at some important principles defined 30 and 40 years ago, and restate them in the light of today's environment. I take a big-picture approach, as many essential points of detail are well identified in the myriad road safety frameworks, targets and action plans that are multiplying all over the world as well as in this state and this country. Further, many specific high-priority issues will be later today identified and discussed by experts who are active in the field. It's important, however, to keep an eye on the big picture, because if we don't, it's like studying a grain of sand while losing sight of the beach.

This is World Health Day, and we among many others are recognising the importance of road traffic injuries in the health of nations. The Secretary-General of the United Nations, in discussing the challenges facing those who seek to prevent traffic injuries, recently referred in an address to the General Assembly to the "global road safety crisis".[1] The word crisis means not only a moment of special danger; it is also, especially in the medical context, a turning point, a time after which matters will improve. That's a constructive outlook. And it is much needed, because at the global level road crashes already account for more deaths and disabilities than malaria, tuberculosis or HIV/AIDS, while vehicle population forecasts in low and middle income countries show that the desire for personal motorised transport is as fundamental as food and health.

There are, however, huge differences between nations in deaths and injury, in terms of both absolute numbers and rates. Further, the distribution of casualties differs between countries: for example, in Australia pedestrians represent about 18% of all fatalities, but in Thailand the figure is about 47%. In Australia, fatalities among vehicle drivers and passengers are about 65% of all, but only 12% in Thailand. Clearly, priorities will differ, and the numbers in large developing countries are daunting. For example, more than one-third of all the world's traffic-related morbidity occurs among our neighbours in South-East Asia.

As stated by the Secretary-General, the burden of traffic injury falls disproportionately on to people in low and middle income countries, and at present, the most vulnerable road users are bearing that burden. Australia is fortunate to have been among those countries which took to the motor vehicle early in its existence and has to a large extent come to terms with it, while still struggling with traffic injury and its other ill effects.

I have chosen for this keynote address to consider lessons from the history of road safety measures for two reasons. First, I see signs that the lower-income countries are tending to make many of the early mistakes made by us and other developed nations as we struggled to come to terms with traffic injury and reduce it, and they are doing so just as their problem is getting worse. Second, even in the most highly developed countries, such as ours, I see a tendency among road safety administrators and commentators to reinvent the wheel while ignoring or forgetting the lessons from the past.

Lesson: Traffic injury is a systems issue

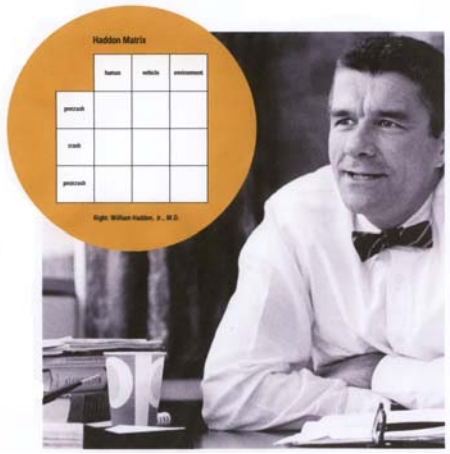

Figure 1 - Dr William Haddon Jr

The systems approach to road safety emerged as a powerful model on the 1960s. It was clarified by the acerbic writing and elegant research methods of Dr William Haddon Jr, who was hugely influential among the growing band of road safety researchers around the world, including Australia. His background in public health established the multi-factorial and multi-dimensional dimensions of the road safety problem. This lifted the publicly focussed pressure from the "nut behind the wheel", who was essentially the single target for road safety countermeasures at the time, and distributed it widely among car manufacturers, road-builders, traffic engineers and legislators. He encouraged moves towards "passive" measures that did not require changes in human behaviour, while accepting those "active" measures that had been shown to work. He strongly advocated the use of measures which scientific research demonstrated were effective, because science had shown that most of the orthodox approaches of the day were ineffective. As the first federal administrator for road safety in the United States he introduced national standards for vehicle safety and highway design with echoes that reverberate even today.

Today, official messages concentrate, quite justifiably, on important factors such as alcohol use, inappropriate speed and failure to wear seat belts. However, plugging away simply and solely on such factors draws attention from the much wider and more complex nature of the road safety problem. This enables administrators and law enforcement to blame the people for failing the system, rather than pointing to the system for failing the people who use it and become its victims (and I'll return to this point). All this was becoming clear to Australian researchers and administrators as the 1970s dawned and road fatalities reached their historical peak. [2]

Let me give you an example of how the systems approach to safety can work, an example with which I have been closely associated for 40 years. It is perhaps the most successful transport safety story of all time, yet it involves a sport where very high speeds are of the essence - the ultimate expression of recreational mobility, if you like. During the 1960s, no fewer than in every eight crashes in Formula 1 Grand Prix events resulted in a fatality or serious injury, and in some years the rate was as high as one in four. This was WW2 aircrew stuff. However, during the 1970s and 1980s the rate fell to fewer than one death or injury in 250 crashes, a reduction of about *30 times*. [3] The reason was the determined attention paid to vehicle design and circuit safety. There was not a single driver death in a Formula 1 race in the 12 years 1982 to 1994, when Ayrton Senna was killed. Meanwhile, maximum speeds rose to over 300 km/h. The actual number of crashes per race kilometre has risen about four-fold over the last 40 years, [4] which shows that these huge improvements in injury rates had nothing to do with drivers performing more "safely" (if this is an appropriate word in this sport!). The example of motor racing is a striking manifestation of the fact that it's not just speed that's important, it's the management of energy in the sudden stop. While resource allocations may be grossly different, Newton's laws and the biomechanics of injury are just the same for motor sport as on the road.

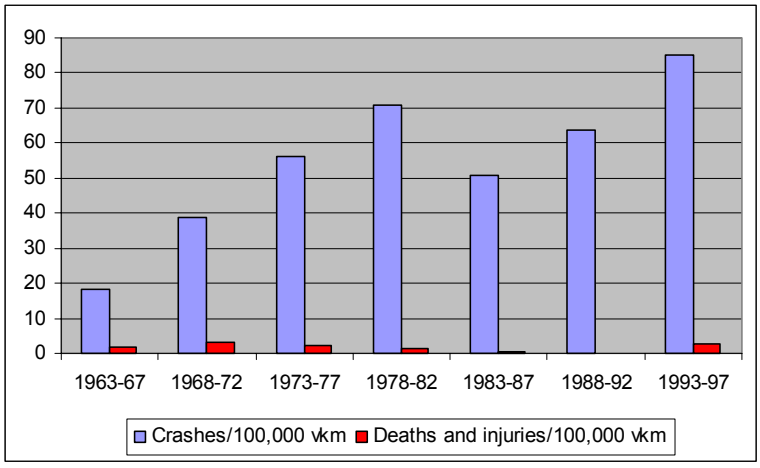

Figure 2 - Formula 1 race deaths and injuries

Lesson: "Vision Zero" is simply a modern restatement of old public health principles

The race story is a dramatic example of what is now being called "vision zero", a smart new term for an old concept. Haddon and others taught us 40 years ago that if the system environment can be adapted to human capabilities, then crash losses can be reduced to minimal levels. We demand no less for bus, train or aircraft travel, just as motor sport officialdom demanded no less for top-level racing. It is stated as a principle of "vision zero" that the ethical approach to traffic injury reduction is rejection of the notion that injuries are an inevitable consequence of mobility. Mobility is a human need and a massive benefit for most people. If it can be maintained while adapting the environment, then everyone wins. If we cave in and reduce mobility in order to reduce crash losses, then there is a net loss to society. The point is, we can have both. Nobody is forced to use the roads, but in this country most people both want to and need to. Wider public policy must of course embrace other, much safer modes of travel such as buses and trains; but road safety professionals have their own part to play in the mobility team and cannot escape their systems responsibility for reducing injuries among all road users.

There are no more important public investments in road safety than in measures that make the system tolerant of human error, whatever the reason behind that error, and sympathetic when it comes to the crash. Road crashes cost about $15 billion per year in Australia (1996

figures). [5] Spending on road infrastructure by States and Territories is a lot less than that, about $5 billion a year including Commonwealth funding, [6] with Council spending on local roads approaching $3 billion. [7] Safer roads and roadsides reduce deaths and injuries among all road users, young or old, skilled or incompetent, drunk or sober, at fault or simply in the wrong place at the wrong time. This, to me, is the ethical approach to road safety and should be a strong incentive for infrastructure investment.

And it is recognised by the Secretary-General of the United Nations. In his 2003 address to the General Assembly he stressed the need for an approach to road safety that recognises the fallibility of the road user and is aimed at reducing road crashes by designing the traffic environment with their limitations in mind. In a systems approach, he said, not only the driver but also the environment – the infrastructure – and the vehicle are seen as part of the system in which traffic injuries occur. If that isn't a restatement of the lessons learnt so painfully 30 or 40 years ago, which is nearly half the time the motor vehicle has been on the planet, I don't know what is.

Unfortunately from the point of view of public road safety policy, people and their elected representatives are far more open to spending money on reducing very small risks – commonly environmental and chemical – than on much higher ones, including the risk of traffic injury. Public interest groups who demand ever more safety can be said to be blind in one eye when they fail to look beyond their pet grievance. It is an ethical imperative to provide as much safety for as many citizens as possible within available limited means. This places administrators and political decision makers in a severe dilemma, the resolution of which is a social obligation involving great responsibility. Decision makers must become fully aware of this dilemma and its consequences, and they have not always done so. Reacting to the squeakiest wheel is easier. The basis for a responsible resolution of this dilemma is a realistic appreciation of the causes and the practical significance of public perceptions of hazards which, in some cases, though widely held, may be quite irrational.

Lesson: Don't panic!

The history of road safety is replete with examples of countermeasures that seemed like a good idea at the time, which were introduced because "doing something" was perceived as better than doing nothing, but which later research showed to have made no difference. Very few ineffective measures are ever later dropped.

Long-term trends in road safety benchmark rates include countless short-term changes. Short-term upward glitches tend to get exaggerated into crises. When these short-term jumps revert back to the underlying trend, canny politicians capitalise on regression to the mean by throwing in a dramatic new measure or two (perhaps a "tough new law"), but that doesn't usually change anything fundamental. This reaction typically occurs during holiday periods, yet the average daily holiday fatality numbers (tragic as they are) are no different to the average daily toll through the whole year. [8] Even annual figures have their ups and downs (Figure 3). See the fall in figures for Victoria since 2001; this might be the result of some new measure, but is more likely to be regression to the mean following the 1999-2001 climb.

I emphasise that there are few if any short-term "crises" in road safety over the years. The problem is the *opposite*: it is one of inertia, a stable system that takes a deal of time to change. This is the real big-picture crisis to which the Secretary-General referred.

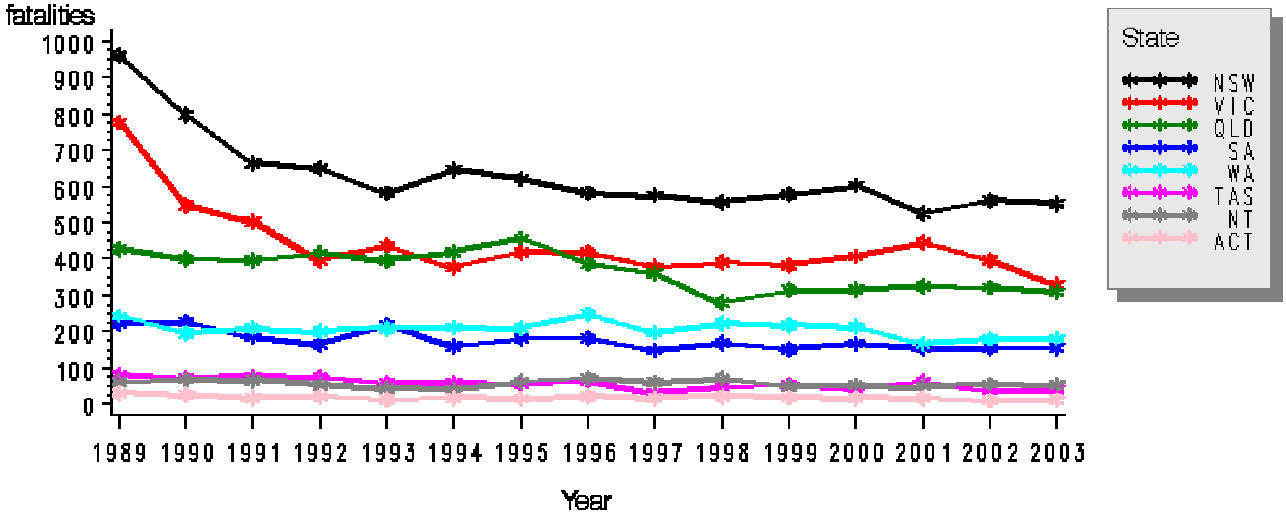

Figure 3 - Annual fatalities 1989-2003, States and Territories (*data source: ATSB*)

The good news is that over the long term, most trends in traffic injury rates are favourable. In Australia the rates of death per vehicle and per licence (rough surrogates for exposure to risk, or the distance-travelled death rate) have been falling ever since they were first measured. From 1970 until 2002 the population fatality rate in Australia dropped from 30.4 to 8.8 deaths per 100,000 population, in spite of a huge increase in motor vehicle use. From 1970 to 2002, the fatality rate per 10,000 registered vehicles dropped from 8.0 to 1.4. In terms of 100 million vehicle-kilometres travelled, the fatality rate has dropped from 4.4 in 1970 to 1.0 in 2000.

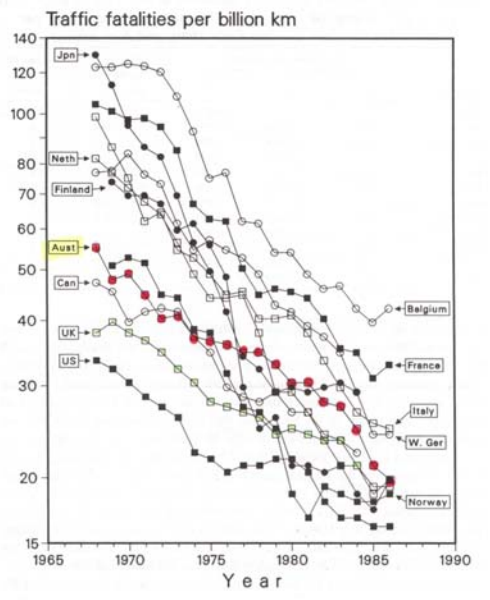

Figure 4 - Fatalities per billion km in 12 industrialised countries *(Evans, 1991)*

Researcher Len Evans has pointed to the remarkable similarity in trends for travel-related deaths in developed countries (Figure 4)[9]. Australia is right there along the others, and has been improving at a slightly faster rate than the average. Recent figures show that the rates have further halved since 1985.The chart is on a logarithmic scale, which circumvents the pessimism associated with asymptotic curves.

I see no indication from present trends that we need to panic, even while we work ever-harder on successful countermeasures to keep these trends going downwards or at worst, to stop them going up again.

It's worth noting, incidentally, that the "magic bullet" model for road safety, where every so often we bemoan the lack of any new measures that would dramatically reduce the road toll, is flawed.

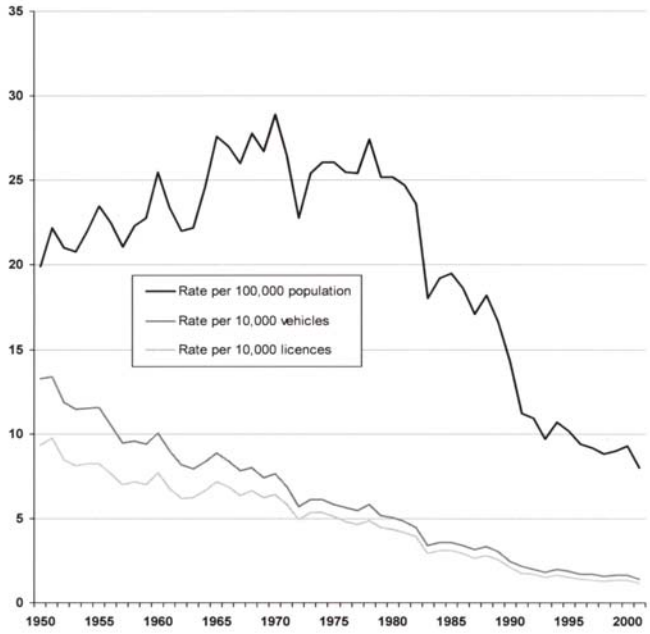

Figure 5 - Fatality rates NSW, 1950 to 2001 (*Road Traffic Accidents in NSW - 2001*)

It is possible to infer from some commentary that the only reasons for reductions in injury rates over the last 20 years were the introduction of compulsory seat-belt wearing and random testing for alcohol use. Of course, these changes each had a measurable effect, and a relatively large one. But if neither had been introduced, death and injury rates would still have gone down in Australia, as they are shown for New South Wales in Figure 5.[10] This only goes to emphasise the extraordinarily complex and multifactorial nature of the traffic injury problem, and we do ourselves no favours by trying to over-simplify it.

Lesson: Don't play the blame game

To maintain analogies between health and road safety, remember that over recent months we have all been dismayed to read of the tragic deaths of people under medical care in New South Wales. Inquiries continue, and I make no comment on their specifics. But it has been known for years, especially in trauma care, that errors and unwanted outcomes are commonly precipitated not by incompetence or carelessness but failings in the system under which hard-pressed medical and support personnel have to work. It is now well accepted that improving the how the health system functions in hospitals would improve both patient safety and medical care. The medico-legal environment and the blame culture are unlikely to do either.

There are plenty of parallels in road safety. I have always considered that the criminal justice system is an unwieldy weapon for encouraging safe performance and discouraging human error. That is not to say that miscreants who deliberately risk the lives of others should not be punished. They should be, of course. But the day-to-day experience of crash researchers is that no-one *wants* to get hurt in a crash or to hurt others, and that the vast majority of drivers who crash have been doing their best, incompetent or impaired though it may have been. A start might be for the increasingly expert police crash investigation units to include within their ambit those crashes where a deceased driver is at first glance considered to be "at fault", but whose "fault" may have been precipitated by poor road design or layout, or the dangerous siting of roadside obstacles and barriers.

Consider the present situation of the Pacific Highway, the most dangerous road in New South Wales, which both Commonwealth and NSW State transport authorities are now desperately trying to fix. It is another lesson from history. When the Whitlam government decided to nominate roads for its admirable national highways initiative, it chose the New England Highway for its Sydney-Brisbane link. The reasons were political (the country vote), and made irrelevant the popularity of the Pacific Highway for both professional and recreational drivers. It is we who have reaped the whirlwind (see Figure 6), and the cost in lives has been horrendous. Who, then, do we "blame"?

Lesson: Remember the research imperative

At the Third Conference on Alcohol and Road Traffic in 1962,[11] Dr William Haddon

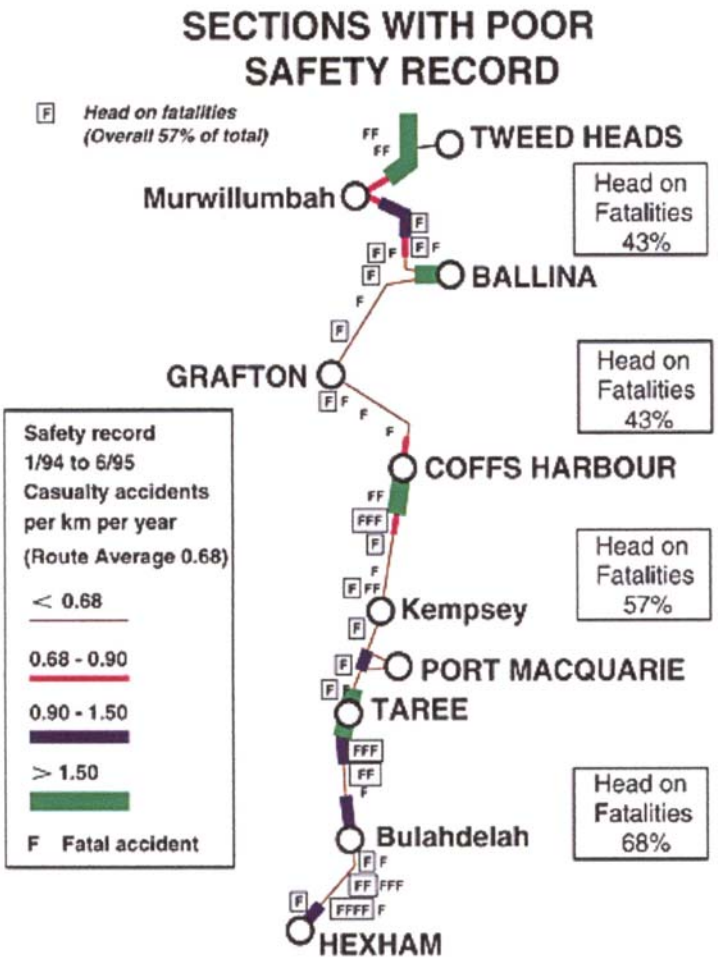

Figure 5 - Pacific Highway fatalities 1/94 to 6/95 (*Transport Programmes, DOTARS*)

discussed the relationship of alcohol and road safety. With characteristic impatience, he told his audience: *"The literature abounds with authoritative statements which bear little demonstrable relationship to the problem insofar as it is now known to exist"*. It took the careful epidemiological studies of his own team and others over the following ten years to clearly establish the increase in crash risk for both drivers and pedestrians associated with

raised levels of blood alcohol. This was followed up by others using even more elegant methods, leading to a well-constructed set of measures for the control of drink-driving.

A year later, in Britain, a 1963 book on road safety research written in the Road Research Laboratory confirmed the need for research because *"the task of reducing the number of accidents presents many technical problems which require more than common sense and common knowledge for their solution. Moreover, untested views are frequently in disagreement as to important causes and desirable remedies"*. This is still just as true as it was.

Fortunately, we are today generally very well served in Australia by our safety researchers, in government and outside it. But there are still many reservations and some huge gaps. Universities and non-government agencies depend heavily on tied grants from government and industry bodies which have a vested interest in the results. The Staysafe committee in this state has over the years identified many issues that have been poorly researched and where "inconvenient" results have never been published. There are parallels in other states. In New South Wales, we *still* cannot properly link hospital injury data with road crash data; the time is approaching, maybe, but years after Western Australia.

Lesson: Remember the primary aim of public health

The prime aim of public health in this field is to reduce death and injury in traffic crashes. In working towards that goal, it may be that "accidents" are reduced in number. But they do not have to be.

Intuitively, this does not make sense. Isn't it better to prevent "accidents" in the first place? Well, yes – but the most successful approaches in public health over the centuries have accepted that when tasks become too hard or unacceptable to fallible humans, they may indeed fail, and the best countermeasures manage the effects of failure so that the outcomes are not harmful. Do we require everyone to boil their tap water? No, we ensure purity at source. Do we campaign against risky use of domestic balconies? No, we write and enforce building standards that mandate minimum levels of height and strength for balcony rails. Do we attempt to ban unsafe sex or two-wheeled vehicles? No, we promote the use of barriers such as condoms to prevent the transmission of disease-carrying agents, and helmets to manage the exchange of energy when heads hit the ground.

If "road safety is no accident", as the title for this forum, reminds us, we must stick to strategic priorities identified by good science. These are reasonably well established in Australia, but we still need reminders from history to keep our eye on the ball and to help our poorer neighbours to avoid mistakes we have made in the past.

We might summarise some public health priorities for the road ahead as follows:

- Reduce exposure to high risk.
- Design and operate the road system to minimise the risk of human error.
- Design and manufacture road vehicles to minimise the risk of human error.
- Improve human behaviour and performance while recognising human nature and fallibility.

- Control injury by improving crash performance when vehicles interact with each other, the roadsides, and with vulnerable road users.
- Improve trauma management and pre-hospital care

No one has said that any of this was easy. It is not. But it is imperative, now that global trends show an inevitable explosion in motor vehicle use, that we use the lessons from the generally successful history of road safety in this country to maintain our own advances and to help prevent an impending global tragedy.

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'Road Safety is No Accident' – Professor Mark Stevenson

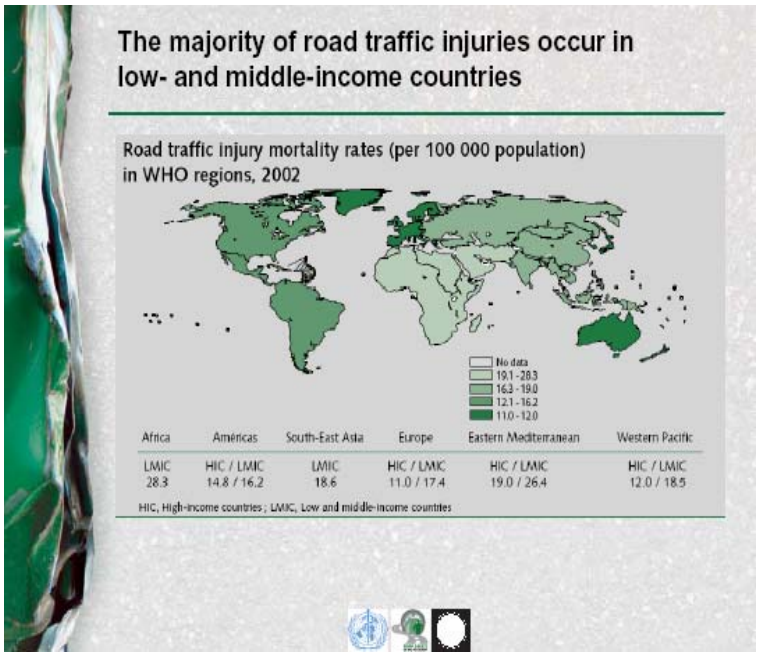
Thank you for the introduction and welcome everyone. It gives me pleasure today to be standing here really on behalf of a number of organisations—not only the George Internal for International Health and the Australasian College of Road Safety, but also the World Health Organisation—to launch the World Report on Road Traffic Injuries, which was developed by the World Health Organisation and the World Bank.

Yesterday 345 people died on the roads in China, so that is equivalent to about three and a half times the number of people sitting here today, and, if we think about the number of injuries, around 1,835 Chinese drivers were seriously injured. That is just one day of road carnage in China. I selected China, but I could have selected Vietnam or Thailand. These countries are really experiencing rapid urbanisation. In China, for example, the urban population will increase from 30 percent to 50 percent by 2020 and they are expecting to see car ownership increase ten-fold over that same period. It is not surprising that road traffic injury prevention has become one of the leading issues that governments in the region are dealing with and in recognition of the global road safety crisis - and that is what it has become in the region - the World Health Organisation has designated today World Health Day to draw attention to the ever-growing problem of road traffic injury.

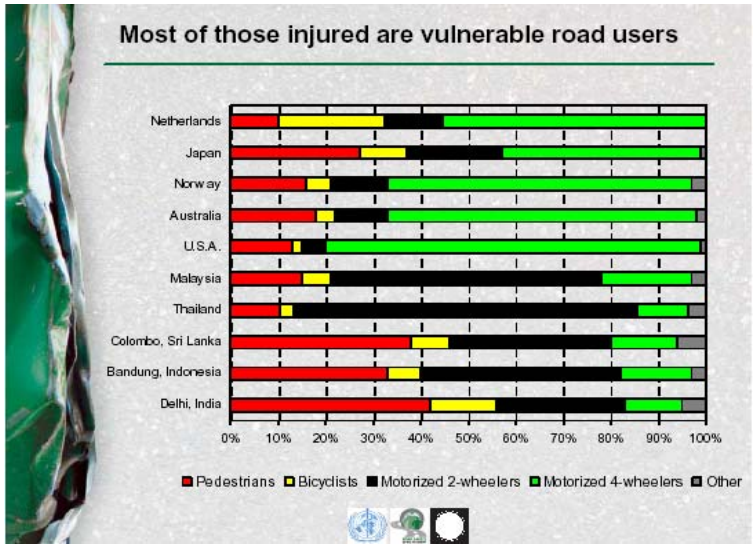
In the short time I have this morning I am going to highlight some of the more salient points from the World Report on Road Traffic Injury prevention. It is being officially released in Paris by the President, Jacques Chirac, in about seven hours, so one of the benefits of living down-under is that we are ahead of everyone else. This report will be on the WHO web site for downloading as of tomorrow.

There is acknowledgement that road traffic injury is a huge public health problem. Approximately 1.2 million people die each year and almost half of these injuries and deaths occur in the Asia-Pacific region. Road traffic injury is the eleventh leading cause of death and expected to climb to the sixth leading cause of death by 2020. As a consequence, the UN General Assembly is forecasting a global road safety crisis.

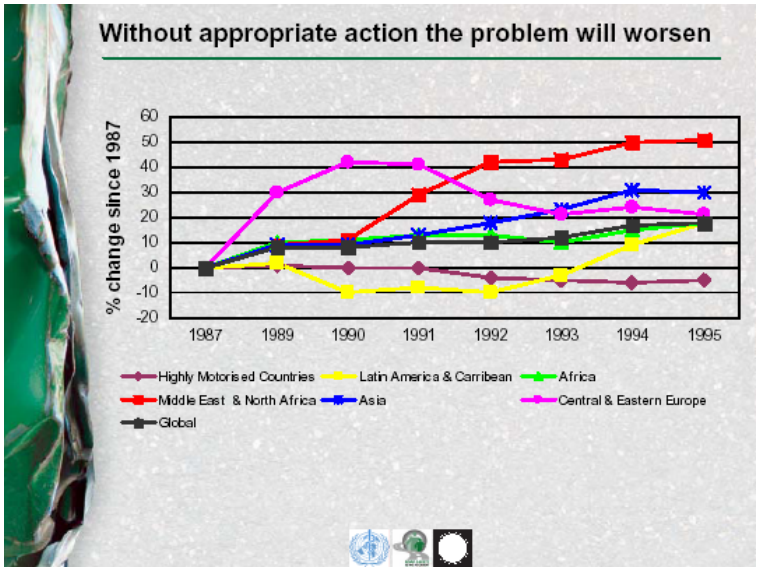
The majority of road traffic injuries occur in low-income countries with the African countries, eastern European, some countries in Latin America and Asia having the highest mortality rates. The rates in Africa, for example, are 1.5 times higher than those in Australia. There are also regional and national differences in the distribution of road user mortality with the vulnerable road users, namely pedestrians and bicyclists, accounting for much of the road traffic deaths in low-income countries.



The type of traffic and the mix of road users - many of you may have travelled through Asia and, for example, in Vietnam you will encounter not only an ox but a pedestrian, a cyclist, numerous motor cyclists, a car and a bus - is obviously very different and the types of crashes in low-income countries are often quite different to what we see here in high-income countries.

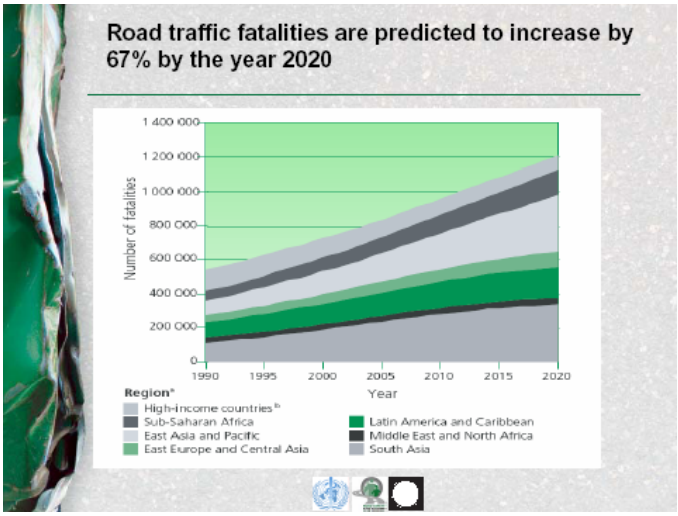


Although road traffic injuries have continued to rise globally, there are clear differences in the pattern of growth between high and low-income countries. In Australia, for example, there has been a decrease since the 1960s and 1970s. In contrast, you can see from the blue lines reflecting Africa and Asia that there is a steady rise in road traffic injury. Of significant concern is the projected trend in road traffic fatalities in low and middle-income countries over the next 15 years.

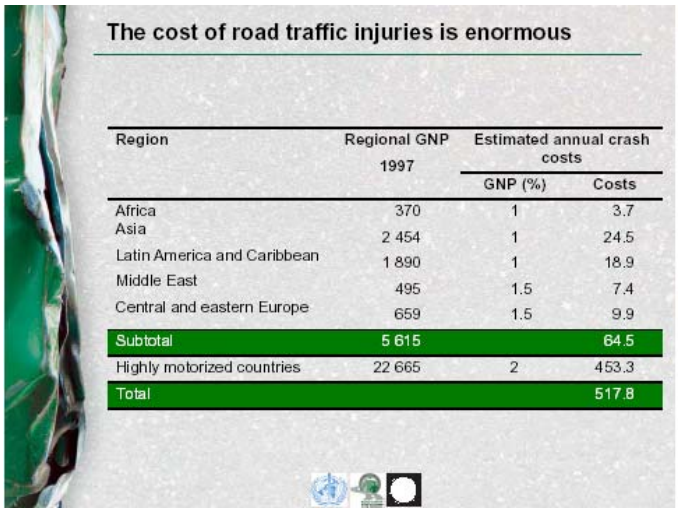


It is estimated that fatalities will increase by 67 percent by the year 2020 accounting for 2.3 million deaths annually. Road fatalities will increase by 80 percent in low-income countries and they will decrease by about 30 percent in high-income

countries. Of concern to us is the fact that our neighbouring regions, south Asia - the top grey line and the figure - will record the largest growth in road traffic deaths with a dramatic increase of 144 percent. These models also project that India, for example, will not see a decline in road traffic deaths until around 2042.

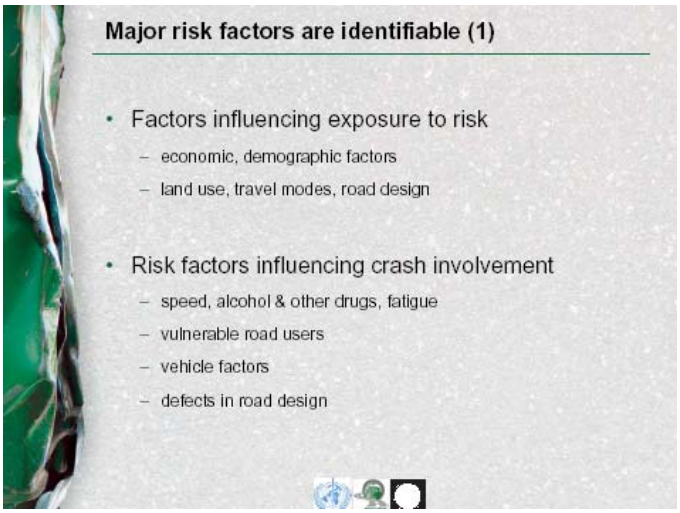


It has also been estimated that the annual economic cost of road traffic injury globally is approximately $US518 billion accounting for approximately 2 percent of the gross national product in high-income countries. Interestingly, the estimates for Australia have suggested that it accounts for around 3.6 percent of gross domestic product. It is estimated that economic losses from road traffic injury in low-income countries account for approximately $US100 billion. What I find fascinating is that that is twice as much as all overseas development assistance.



Region	Regional GNP 1997	Estimated annual crash costs	
		GNP (%)	Costs
Africa	370	1	3.7
Asia	2 454	1	24.5
Latin America and Caribbean	1 890	1	18.9
Middle East	495	1.5	7.4
Central and eastern Europe	659	1.5	9.9
Subtotal	5 615		64.5
Highly motorized countries	22 665	2	453.3
Total			517.8

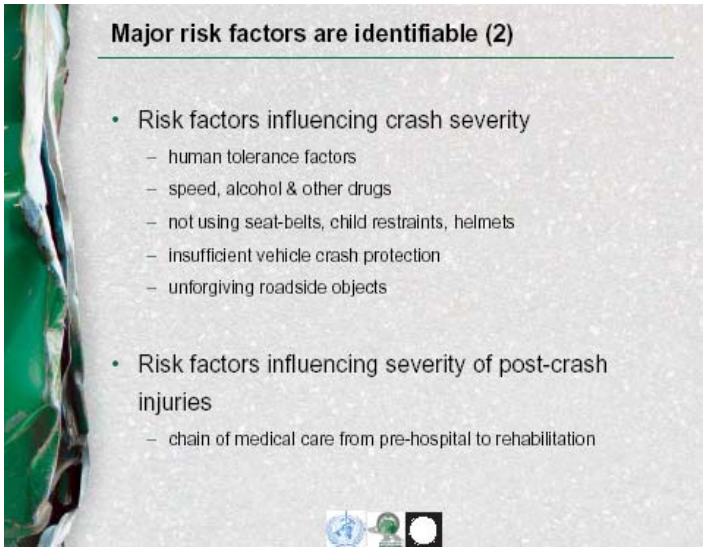
These economic losses will certainly perpetuate poverty, particularly when those aged 15 to 44 years are over-represented in road traffic injuries. As you might expect, in many low-income countries, injuries to individuals in this age group tend to affect productivity severely, particularly amongst the lowest income groups where exposure to risk is greatest and where earning capacity is most likely to rely on physical activity.



So what does the report highlight? It highlights a number of risk factors for road traffic injury. Many of them you will be very familiar with, so I am not going to go through each of them, but in relation to factors that influence exposure to risk of road injury I bring your attention to risk factors related to land use and road network planning. It relates a little to what we have heard about already this morning. It is in this area and with Government commitment that we could achieve significant gains. The development of a network of roads, or indeed other forms of transport such as rail, has an enormous effect on communities and individuals. It influences economic activity, property prices, air and noise

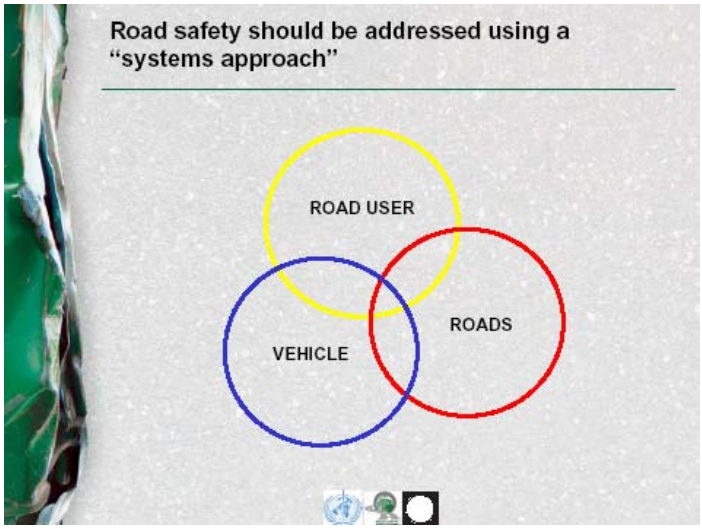
pollution, social deprivation and crime, in addition to health. In the absence of proper land use planning we are ending up with heavy traffic through residential areas and high-speed traffic mixing with pedestrians and bicyclists. It is time that planning land use goes beyond just efficient traffic flows and consideration of environmental issues and includes safety criteria. We know that when safety criteria are built into land use planning, significant reductions in exposure to traffic injury are achieved.

In Australia and around the world a great deal of attention has been focused on the risk factors associated with crash involvement and future gains in road safety can be achieved in this area. In particular, a greater focus on building safety features into new and existing roads must become priority for governments. It appears that the Federal Government intends to support road infrastructure in the upcoming Budget. We must ensure that safety is integral to such infrastructure investment and it is not merely an add-on.



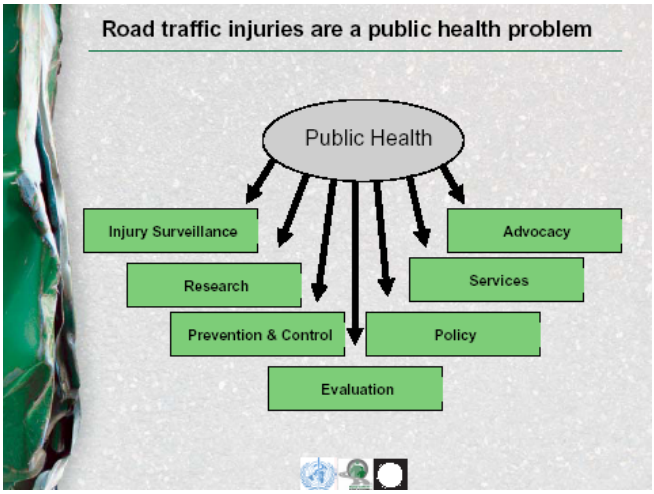
Further gains can still be achieved by focusing on risk factors that influence crash severity. For example, although seatbelt use in Australia is very high - approximately 95 percent - in New South Wales, for example, 33 percent of drivers injured in road crashes were not using a seatbelt at the time of crash.

It is also very evident that inadequate post-crash care is a significant problem in most low and middle-income countries. The availability and quality of care has a substantial effect on whether a road traffic injury leads to subsequent death or disability.

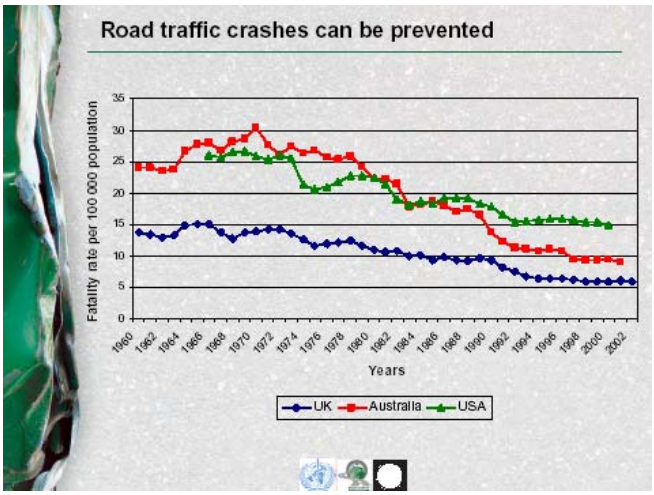


So we are all aware that the road traffic system is highly complex and hazardous to human health. Elements of the system include the motor vehicle, the road infrastructure and the road users, and the physical, social and economic environments. Making a road traffic system less hazardous requires a systems approach. It is necessary to understand that system as a whole and the interaction between its elements and, importantly, we need to identify where there is the potential for intervention in those interactions. It is also important to recognise that the human body is vulnerable to injury and that we make mistakes. A safe road traffic system is one that accommodates and compensates for human vulnerability and fallibility.

Historically, when crashes occurred they were considered the responsibility of the individual. However, by adopting a systems approach, road safety becomes a shared responsibility. Reducing the risk in the world's road traffic systems will require commitment and informed decision-making by government, but not only by government, by industry, by non-government organisations, international agencies and participation by people like yourselves here from different disciplines and community groups.



Importantly, this report highlights that road safety is not solely a transport issue. It is a significant public health issue. Public health can play an important role in the prevention of road traffic injuries from the collection and analysis of data in order to demonstrate health and economic impact of road traffic crashes to research on risk factors like the Drive study, the implementation, monitoring and evaluation of interventions, the delivery of appropriate primary prevention and the care and rehabilitation of injured people.



The positive message from the World Report - it is not all doom and gloom - is that road traffic crashes are predictable and can be prevented. This slide highlights the sharp reduction in fatalities over the past couple of decades. This has been achieved by adopting a systems approach to road safety that emphasises environment, vehicle and road user intervention, rather than solely focusing on direct approaches aimed at changing the behaviour of road users.

However, more can be achieved both in Australia and globally and the time to act is now. We need to manage exposure to risk, particularly via land use policies. We need to shape the road network with road traffic injury prevention at the forefront. The Swedish Government has adopted this approach. We too need to take up that challenge. We need to ensure crash protection continues to be a priority; that enhancement and compliance with key road safety rules have a great deal of focus - enforcement is particularly important - and, finally, deliver efficient post-crash care, certainly a challenge in a country as vast as Australia.

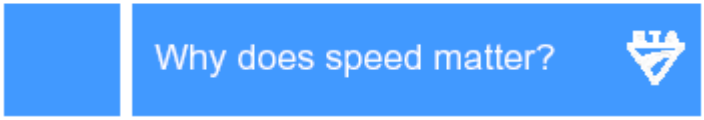
'Road Safety is No Accident' – Professor Mark Stevenson

Finally, road safety is no accident. It is important for us to reflect on the many successes in road safety that have been achieved both here and overseas over the past five decades, but we need to adopt those strategies that have been successful that have been clearly shown to be effective. It is also important that we export the successful strategies to those countries, particularly those countries in our region, which are grappling with this crisis.

'Speed Management in New South Wales' – Dr Soames Job

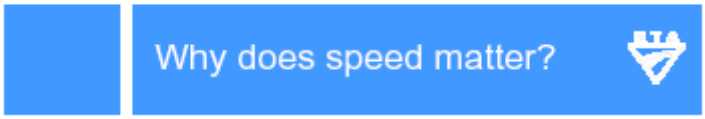
This talk is more of getting down to the nitty-gritty of how we are might apply many of those lessons we have been hearing about earlier today. Speed management, in particular, is what I want to focus on.

I want to begin just with addressing the issue of why speed is so important. Why does this matter? Because we have a disturbing amount of misinformation around about speed not being a significant problem for road safety and as Waltz & Co said in the 1980's regrettably it must be proved in every country that the laws of Isaac Newton are true, and sadly that has been proved in New South Wales and for Australia generally as well. We seem, for some reasons, to believe that the rules of physics will not apply to us or that speed will not make it worse, and there are a lot of people out there who have a vested interest to maintain that claim.



'Regrettably, it must be proven in every country that the laws of Isaac Newton are true.'

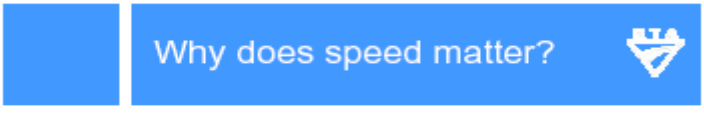
- FH Walz, M Hoefliger and W Fehlmann, 1983
- In a research paper on the likelihood of pedestrians surviving when struck by cars travelling at different speeds



'In road injury epidemiology, kinetic energy is the pathogen.'

- Robertson LS. *Injury epidemiology*. Oxford: Oxford University Press, 1992

As Robertson said, in road injury genealogy, kinetic energy is the pathogen. The more we can do to reduce kinetic energy, the better outcome we will achieve. The bottom line of a lot of research from a number of methodologies which I will go on to summarise, is that very small changes in speed, of reductions of around 5 per cent of speed, not speeding, will result in relatively large changes in terms of casualty crashes. Small reductions in speed, substantial benefits for road safety.



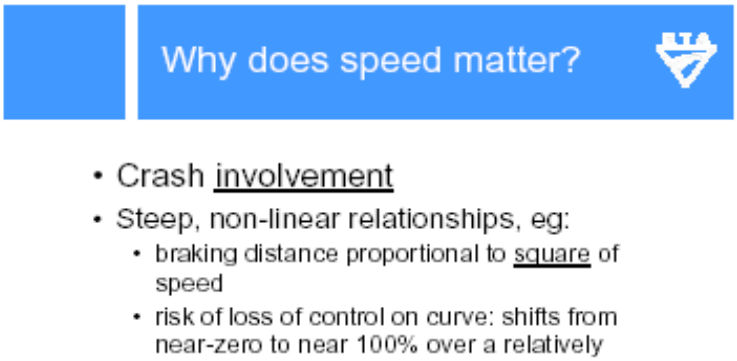
- Bottom line of a lot of research:
  - Small speed changes (<5%) result in relatively large changes in casualty crashes

The research methodologies which converge to give us that indication are these, first, crash reconstruction and recalculation of speed indicates that speed is a major contributing factor. Of

course, many of us will argue that that is an uncertain methodology and in some cases it is and in some cases of crashes it is not.

There are also the effects of changes in speed limits or changes in force needed so that speed limits are actually adhered to and it is those that reliably indicate that when you reduce speed limits on roads, you get a reduction of crashes and injury crashes. When you increase speed limits you get an increase in injury and severe crashes especially. Correlational studies of road sections show the same thing, so if we compare road sections with different speed limits, we get the same result. The last one, correlation of studies across drivers show the same thing. So if we look at the driving history of people who have a significant speeding record or are shown to speed in specific locational studies then we when we follow up their driving record, they have more crashes.

So no matter how you cut and slice the data, you get the same answer and perhaps the most rigid form of control we have is the case control methodology. This is the research which you are probably all familiar with from Jack McLean's group, which shows that if you actually look at cases of crashes, even in the control vehicles driving through those sites without crashes, then you test the speeds of those vehicles, you get a dramatic change in crash risk with very slight increases in speed above the speed limit.



This happens by virtue of two factors, crash involvement, speed contributes substantially to crash involvement. The stopping distance is considerably greater if the speed is greater, you have a reaction time component, during which time you are travelling faster, you get closer to the object, then you have a braking distance component, which is also larger. You have more potential for loss of control. You have more potential for and more dramatic consequences. Misjudgement from other drivers or other driver's speeds and you have perceptual information processing effects which are more difficult at speed. All of those things contribute to speed a factor in crash involvement.

The subsequent data supports, as a net outcome that that is the case. So speed shows a non-linear relationship with the critical outcomes. Braking distance is proportional to the square of the speed, and the risk of loss of control sits quite dramatically over a rather short range of speeds from near zero probability of loss of control to nearly 100 per cent on given curves.

The other way in which speed contributes is by contributing to crash severity. Small increases in travel speed lead to very substantial increases in crash impact speed, as we have been educated about in recent media emanating from Victoria. The consequence of that is a curve like this. The probability of fatally injuring a pedestrian, as an example, by the speed of the car on impact. We can see that over a very short increase in speed from about 40 to around 60, the probability of a fatality in terms of the pedestrian who is hit goes from less than 20 per cent to around 90 per cent. A very, very dramatic increase in probability of fatality for a very small increase in impact speed.

These are the case control data which I referred to and this graph shows the relative risk of a crash for speed above the speed limit and for, by comparison, blood alcohol concentration. What the data say is that these curves are actually quite similar, surprisingly similar, so this is the blood alcohol concentration count, this is the speed curve, which actually rises slightly more steadily here but it is quite similar even at a low level.

Why does speed matter?

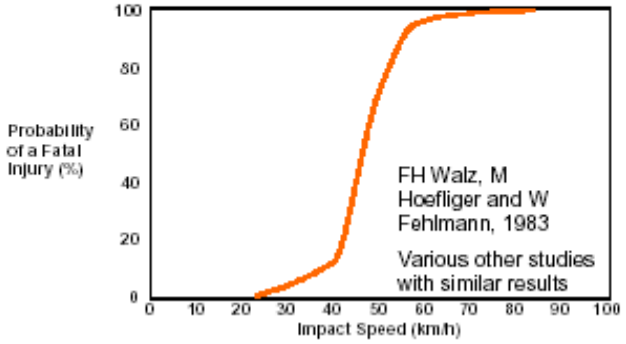
- Crash involvement
- Steep, non-linear relationships, eg:
  - braking distance proportional to square of speed
  - risk of loss of control on curve: shifts from near-zero to near 100% over a relatively narrow speed range

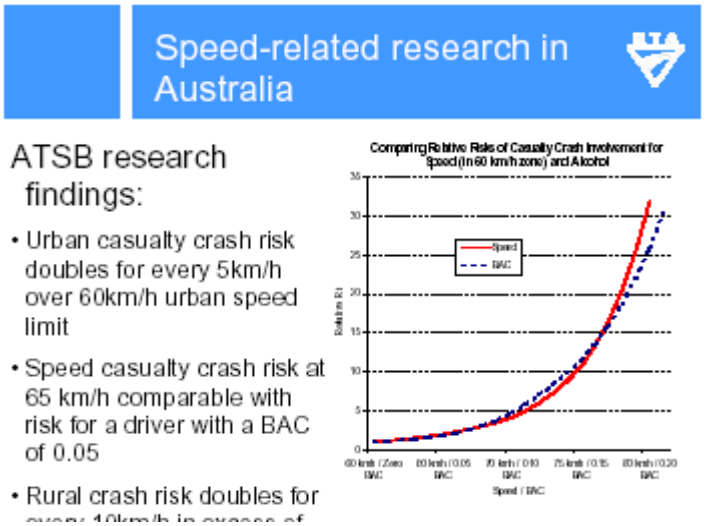
Why does speed matter?

- Crash severity
  - A small increase in travel speed can lead to a very large increase in crash impact speed

Why does speed matter?

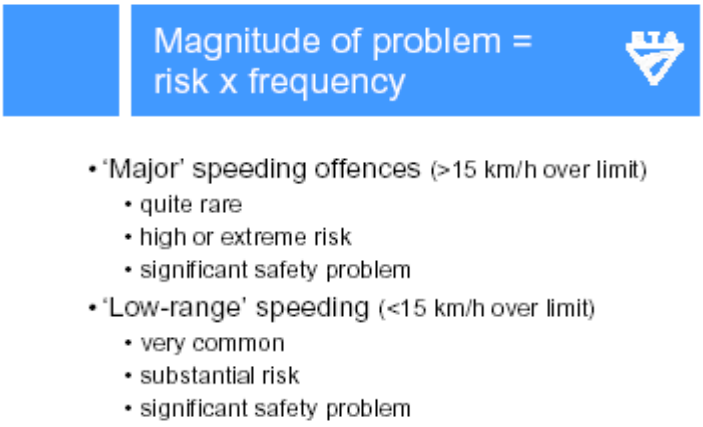
Probability of fatally injuring a pedestrian *by* the speed of the car on impact



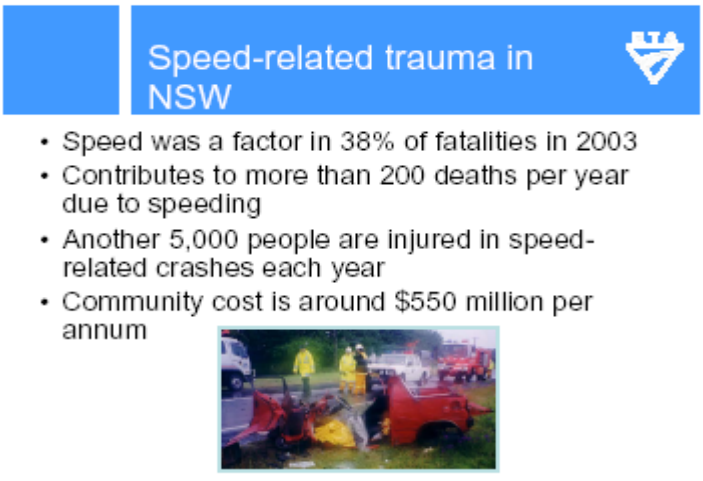


Now in terms of the public's perception of it, this curve is radically different from the way people view it. We find it pretty acceptably that .05 BAC is an unreasonable point at which to drive yet the risk of five kilometres above the speed limit is just about spot on the same as .05. Yet most people do not think that driving at 65 kilometres an hour in a 60k zone is unacceptable. They do think drink driving is unacceptable. In fact, the risk for those two behaviours is approximately the same.

If we divided these things up – and I have only chosen the 15ks because it is the most common demarcation point for the change in an offence – but major speeding offences are relatively rare, not as rare as we would like obviously enough. There is a height of extreme risk and the consequence of that extreme risk though in crash terms is not the most common form of speeding in crashes, but you have a very significant safety problem.



On the other hand you have the low range speeding, which is much more acceptable to the community, less than 15 kilometres over the speed limit, which is very common. There is a substantial risk, it is not the extreme risk but because it is very common the consequence is again less extreme problem but many, many more occasions of it. You again get a very significant road safety risk as a consequence, so even low level speeding gives us a substantial road safety risk.

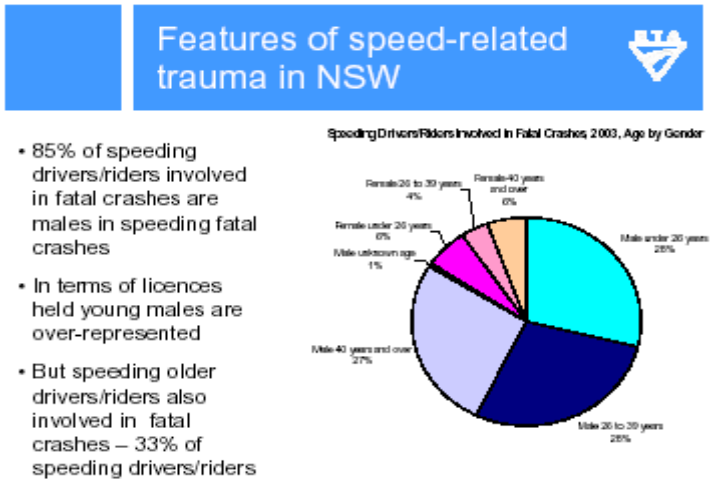


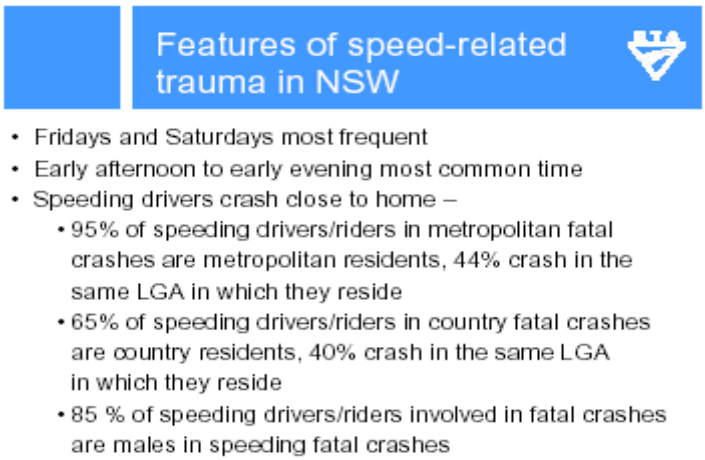
In New South Wales last year we estimated that speed was a factor in 38 per cent of fatal crashes. That was a bit of an improvement on previous years, where it has been in the 40s. It contributes to more than 200 deaths per year and another 5000 people significantly injured in speed related crashes, giving us a community cost of around $550 million a year and that is just when you turn those figures into dollar numbers, that is the real cost to the community in economic terms,

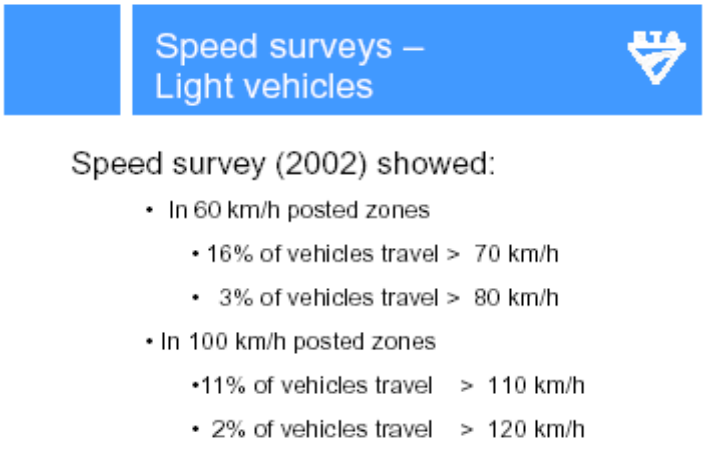
without considering the psychological trauma and the grief and loss that we suffer at a social level and it is also not considering perhaps the more extreme way but from a public perception point of view, the more valid way to measure the cost of the toll, and that is by preparing us to pay for correcting them which I think would give us a considerably higher value.

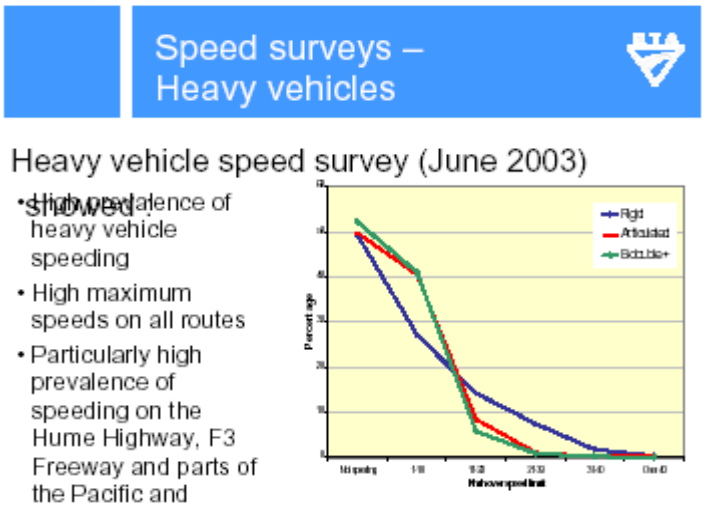
If we look at the details in New South Wales in terms of the speed related trauma, then there is important information here in terms of how we should go about addressing it. Fridays and Saturdays are the most frequent times of speed related crashes, early in the afternoon and early in the evening are the most common times and speeding tends to be a problem in terms of trauma relatively close to home, consistent with what the Minister identified for country road safety. 95 per cent of speeding drivers involved in metropolitan fatal crashes are metropolitan residents and nearly half are in the same LGA as they reside in. Speeding, 65 per cent of speeding vehicle of controllers in country fatal crashes are country residents. 40 per cent of them are in the same LGA as they reside in and 85 per cent of speeding vehicle controllers involved in fatal crashes are males.

Speed surveys for light vehicles show that we have a significant problem, so in 60k posted zones 16 per cent of vehicles are travelling 10 kilometres above the speed limit or higher and 3 per cent are travelling more than 20 kilometres above the speed limit. Those are drastic consequences if we compare the risks with drink driving. In 100k speed limits it is a little bit better, but not much better, where we have 11 per cent travelling at 110 or more and 2 per cent travelling at 20 kilometres or more above the speed limit in 100k zones. Again, a very substantial road safety risk.







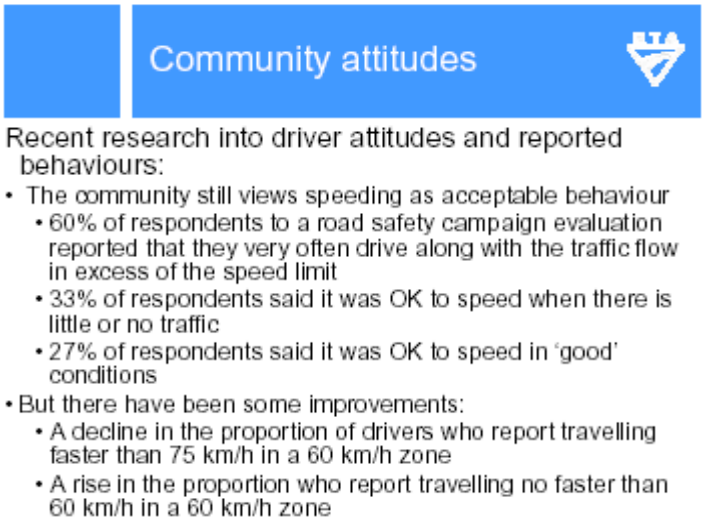


As I said, it does not seem to have come out perfectly but these are our surveys across a large number of survey points on highways throughout New South Wales including the Hume, the F3, the Pacific, the Newell et cetera and this data represent proportions of heavy vehicles speeding in different types across all those locations for 2003, and you get a fairly similar pattern, so what we see if we take the most extreme data point, which is B double, the largest of our vehicles, imagine the tonnage and the momentum we have involved here. Then only just over 50 per cent of B doubles across all of these survey points are travelling within the speed limit.

So any claim that this is just the extreme end of a bunch of cowboys seems to be thrown out the window by this data and these are objective speed data, these are not self report, these are speeds clocked on our highways.

If you go to the other heavy vehicles, articulated vehicles and rigid heavy vehicles, then just under 50 per cent are within the speed limit. So, around about 50 per cent of heavy vehicles are driving above the speed limit on our highways.

If you go to the extreme ends of 21 to 30 per cent above the speed limit, then we have still got quite significant percentages of rigid vehicles and we would have some clocked at over 40 kilometres above the speed limit at these sites. It is a dramatic level of speeding and you can see why we are looking for policies to address speeding amongst heavy vehicle drivers.



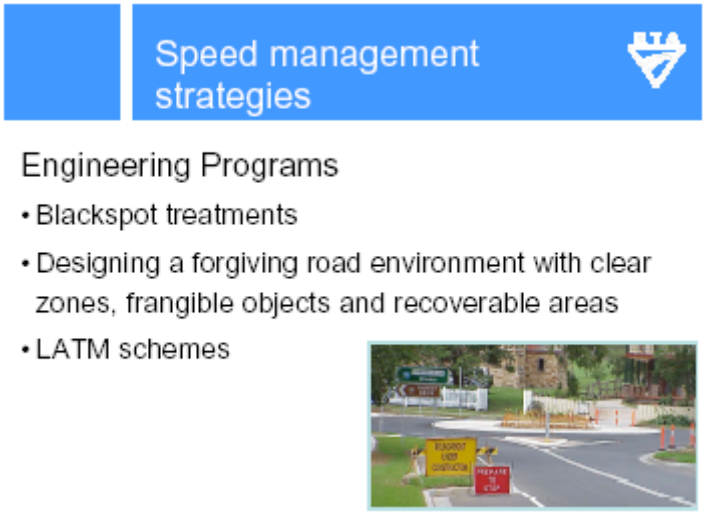
Going to driver attitudes, recent research indicates that the community actually finds speeding relatively acceptable. 60 per cent of respondents in a campaign evaluation reported that they very often drive along with the traffic in excess of the speed limit. One third of respondents thought it was okay to speed when there was little or no traffic and 27 per cent thought it was okay to speed in what they considered, good conditions.

What it comes down to is in a sense, our view of an unsafe speed I think is anyone who drives faster than we do. That is kind of how we do it. So if we drive along at 70 in a 60k zone and we somehow think that is acceptable, if someone goes past us at 75, then they are a lunatic. So we can still decide that there are lots and lots of other lunatics out there but we personally are entitled to speed, and therein

lies one of our major problems with this, that unlike drink driving it has a high level of community acceptance and lack of awareness of the extent of the problem.

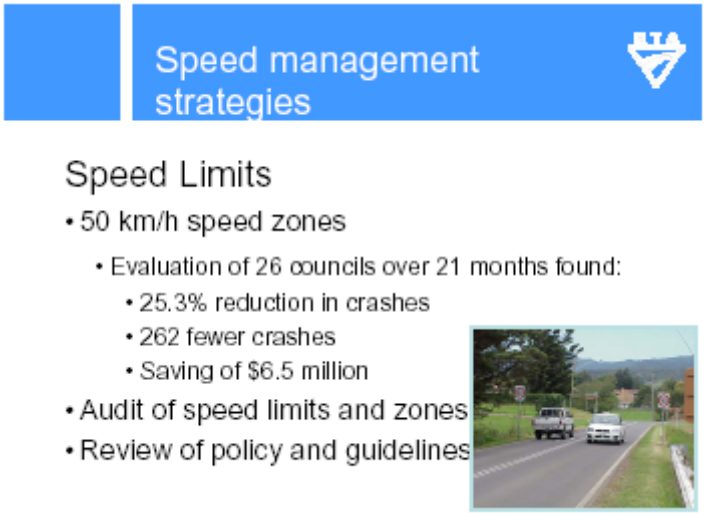
Now happily there have been some improvements. There is a decline in the number of drivers of proportion who report that they travel 15k above the speed limit in a 60 kilometre an hour zone and there is a rise in the number who say they do not drive above the speed limit in a 60k zone. Nonetheless, we have a long way to go.

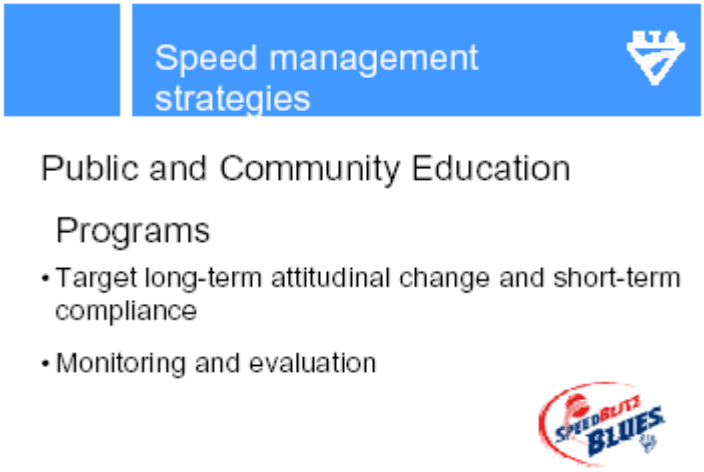
In terms of strategies, there are a variety of things we can do, there are programmes which will address speeding in terms of provided new design roads, et cetera. There are speed limit programmes which we are trying to reinforce, so we have a lot of reminder signs as well as speed limit signs, et cetera, and we have education programmes we are pushing and all the new versions of those coming out later this year. We are trying to encourage speed enforcement and we are reviewing fines and penalties for speeding.



In terms of the engineering programmes, we have substantial black spot treatments for roads where we identify speed, as well as other related crash problems. We are trying to design more forgiving road environments with clearer zones, with frangible objects and recoverable areas, so there are areas to recover if you have made a mistake.

In terms of speed limits, we have made some substantial changes. As we know, late last year we introduced the 50k automatic default urban speed limit and we have evaluations which indicate that there are significant reductions achievable through those things with the 26 Councils who originally started that programme prior to its compulsory introduction. We get significant reductions in crashes and consequently very substantial savings per year in terms of what is going on for those benefits of 50k. I think the data is clear that 50k gives a substantial road safety benefit.





We will be reviewing our policies and guidelines for speed auditing in collaboration in part with the NRMA in terms of reviewing those processes for New South Wales. Further to our speed management strategies, obviously the public community education are critical parts of this programme, especially attitudes of accepting speeding. Our target is long term attitude change and short term compliance. In part they will go together. We believe that short term compliance behaviour will actually in part generate improved attitudes, so I think we should be careful not to assume that the only way to get attitude changes is to get attitude change first and driver behaviour to change. Sometimes behaviour change will drive commensurate attitude change and we will be evaluating those programmes as we go.

Speed enforcement is obviously a key factor here for us and we work closely with the force to try and encourage that. So we have enforcement enhancement programmes where we pay for extra hours, and in fact get many extra hours above those that we pay for from the police, to ensure that we are getting effective road safety enforcement. We support those operations in various logistical support ways and we have an extensive fixed digital speed camera programme which I will go on to describe in the next few slides. We have changed to front facing cameras, especially to try and detect more heavy vehicles. It is difficult to detect heavy vehicles with rear facing cameras and you may know we are trialing point to point speed cameras. I think this is a critical element for us if we can get this technology to work.

Just to outline for a minute or two, we have trials in several locations going. The longest of those locations is 35 kilometres and we will be looking to basically check that we can get effective speed technology to work effectively to detect number plates at each end of the 35k zone and the plan will be to impinge drivers for averaging above the speed limit over that 35k, so that we will get away from the problem we have with fixed digital speed cameras where they work, but people complain they only work for a relatively short length where you know they are. If we can get both forms of programmes to work, we will have speed management over longer distances with a similar level of technological input.

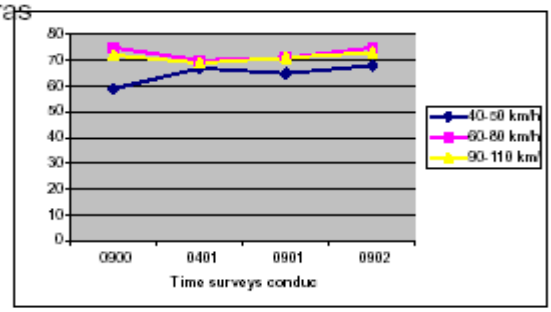
In terms of fines and penalties, double demerit points is one of the factors we constantly push and as the Minister identified, that will be working again this Easter and Anzac Day weekend and the data indicate that that is a successful programme. If we look before and after the introduction of double demerit points over this similar periods of holidays where they were applied versus did not apply, then fatal crashes are down 22 per cent, fatalities are down around the same number. There are some confoundings in those data, especially later in the comparisons, as you extend it over more years then there are more and more things contributing but early in the comparisons things were pretty tight, you get a very clear road safety benefit of double demerit points and we will have new speed penalties introduced later.

We have, as you probably know, the fixed digital speed camera programme. They were installed and operated by the RTA. Contrary to popular belief, we do not collect and get the money, we do not have some kind of personal incentive – I do not actually get any of it in my wallet, despite what people write to me. They are there to treat black lengths so there are specific criteria which determine whether or not it is an appropriate site for a fixed digital speed camera and they involve crash rate and injury rate and vehicle speeds. So those criteria are used to determine what is an appropriate site.

We had 100 in the general programme, 10 in school zones. That has actually changed slightly just recently because of expansions to school zones, so three of our normal ones have now been absorbed into 40 kilometre speed zones at dangerous spots near schools. We have a substantial evaluation being finalised of the fixed digital speed cameras.

Agreement with use of cameras

Majority of drivers support use of fixed digital speed cameras



The majority of drivers actually support the use of fixed digital speed cameras in each of those zones, so this reports the percentage of people who support over, this is a little bit obscured, this is 2000, early 2001, late 2002 and as you can see, there is strong support for it, well above the 50 per cent mark, heading up towards 75 and 80 per cent and in fact that has tended upwards in recent years. So there is good support amongst the community for fixed digital speed cameras and that support is not being lost but in fact gaining.

Fixed digital speed cameras – Behaviours

- Reductions in mean speeds after 24 months (20 sites):

Speed zone	Change km/h	Stat signif
60	-6.2	<0.0001
70	-4.3	0.0577
80	-9.2	<0.0001
90	-6.7	0.0005
100	-2.7	0.0211
All	-5.8	<0.0001

In terms of the evaluation we have going, this is an evaluation of 20-odd sites, these are the early sites where we have enough data, where this camera programme has been rolled out over years and if we look at 24 months worth of data in terms of the speed changing kilometres an hour, the mean change in kilometres an hour across the speed zones, then you can see that in every single street zone the consequences of those camera sites has been a statistically different reduction in mean speed of vehicles going through.

Fixed digital speed cameras – Behaviours

- Reductions in vehicles exceeding speed limit by 10 km/h or more after 24 months (20 sites):

Speed zone	% Reduction	Stat signif
60	88.3	<0.0001
70	72.2	<0.0001
80	98.2	<0.0001
90	79.8	<0.0001
100	81.8	<0.0001
All	87.9	<0.0001

These are reductions in number of vehicles exceeding the speed limit by 10k. Again, you can see dramatic reductions in the proportion exceeding the speed limit by 10k or more. In terms of crashes, let me just cut to the chase – we have substantial reductions in casualty crashes, substantial reductions in fatality crashes at those sites where we have introduced the speed cameras. They work.

The use of those highly conspicuous speed camera devices, bear in mind that you get three warning signs like this on either approach side of the speed cameras. So, if it is revenue raising, in my opinion, it is also frankly a stupidity tax.

I am embarrassed that they put this in. They thought it was funny. Speed related crash signs, and indeed, I have always been an advocate of the view that we should stop using the term accident. Accident gives us a good excuse – it is kind of like when you are a little kid and you hurt your sister, and you said, "But, Mum, it was an accident", and it got you out of trouble, it absolved you from responsibility. Let's talk about crashes.

Fixed digital speed cameras – Crashes

- Reductions in crashes (evaluation of 28 sites):
  - All 19.7% (0.0001)
  - Tow-away 16.9% (0.0116)
  - Injury 20.1% (0.0164)
  - Casualty 22.8% (0.0051)
  - Fatality 89.8% (0.014)

Fixed digital speed cameras – Conclusions

- The use of highly conspicuous fixed speed cameras to treat blacklengths with a speeding and crash problem has been shown to be highly effective in terms of:
  - speed reduction and speed variability
  - crash reduction
  - greatest crash reductions for the more severe casualty crashes, especially fatality crashes

Overall conclusion

'A speed-related crash is no accident.'

– Soames Job, 2004

'Medical Perspective – Reflections on Road trauma' – Professor Danny Cass

As surgeons, we are much more used to being in the operating theatre and doing things, but not all that good at talking, so I hope you will forgive us. I do not have slides, but I thought I would try to do four things. One is to introduce the commission's perspective to the problem of road trauma and to expand it a bit with an example of a major disaster to make two points, firstly, how we try to organise the trauma system in New South Wales and, secondly, to confirm a point already made this morning, that the public takes great notice of a one-off event but really goes to sleep and becomes complacent with day-to-day trauma. I would like to also lend my support for a single national lead agency. We are all very busy with this issue of road trauma, but are we maximally effective? Another point is to talk about balance in the system. At the moment, just to bring this to your attention, the trauma people out there doing the work are probably not sustainable under current policy.

First of all, I am the chief executive officer of the Institute of Trauma and Injury Management. My Executive Manager, Trish McDougall, is also here. We started work in 2002 and our key aim is to implement a patient-focused approach to trauma injury management. We are an association of allied health, nurses, doctors, in the greater Sydney metropolitan area—encompassing Newcastle, Sydney and Wollongong. What we see in this area each year is probably half a million patients attending casualty, about 120,000 admitted, 10,000 with serious injury, some of those with permanent disability, and over 1,000 deaths. If you include suicide/self-harm it is 1,500 and, as you heard this morning, 550 from road trauma. When you take our perspective, just standing back a bit, on the patients we see and record with serious injury, half are road; a third are due to falls, increasingly the elderly, and 10 percent are due to assault, but half our work is road. We agree, from a commission perspective, that we have done much better than many years ago, but we think we have stalled, to use the word that Paul Gibson MP, Chairman of the STAYSAFE Committee, used this morning, and we are now lagging behind. We have a lot of contact through the college with our colleagues in Victoria and overseas and we think we are starting to slip behind.

As clinicians, we know how much each and every crash causes injury and death and that these are tragedies for the family and our community. In many cases it is a young fit life which ends in an instant or after many hours of our eventually futile efforts in the operating theatre. We try to take a systemic approach to this most difficult of patients. If someone here had chest pain and fell down, we would say that is a heart attack and, it is difficult, but you know where to go. If someone developed hemiplegia and fell over, we would say that is a stroke, but we would know where to go. If you are injured in a car accident and you are brought in to hospital, perhaps in twos and threes, that is the most complex and difficult patient to come through the door. We really do not know what is going on, we have to look at all body systems and we have to have a very rigorous system to make sure we manage that properly.

Each of these injuries is really a disaster for the family. Although I have trained in adult surgery, initially I trained in paediatric surgery, which is a specialty in Australia which started in about the 1930s, but only after the 1950s did people actually do it full-time. In the United States the origin of children's surgery can be pinpointed to one day: December 6, 1917. A young surgeon, William Ladd, was dispatched from Boston Hospital as part of a team to help at a disaster in the Halifax harbour in Canada. What had happened was that a French freighter, the *Mont Blanc*, was sailing into the one mile long harbour, which was about half a mile wide at that spot - I am not sure if they were speeding - and it rounded the corner and there was another freighter coming on a collision course. The *Mont Blanc* had just come from New York and was full of munitions for the war effort in Europe. There was confusion—they were both on the left-hand side of the road, as it were—and the boat that had right of way signalled that it would move across to the right, which was a bit against nautical procedures, so the captain of the *Mont Blanc* thought, "No, his signal is confused, he is actually going to go the other way". The end result was that the boats collided. The captain of the *Mont Blanc* steered it so that it hit the front of the vessel where the benzene was stored and not the hull where the TNT was stored. Five minutes were spent trying to put out the fire in the harbour, then the crew abandoned ship and rowed away safely—none of them were killed—and the ship drifted aimlessly into the harbour and hit the wharf, which caught on fire. The police and fire department came down and tried to put out the fire, and many people came to their windows and out into the streets around the Halifax harbour to watch the event. Some 20 minutes after the fire started the ship exploded. About 32 acres of Halifax was flattened in one instant. That is about 20 times the size and site of the World Trade Centre area. There were about 1,700 people killed instantly and another 9,000 seriously injured. Of those, about 600 to 1,000 were blinded by glass. This was the origin. This surgeon—William Ladd—came and got involved and was particularly moved by the problems with the children, so he went back to Boston and started children's surgery as a special area.

At the trauma institute we have often been called and asked to get more involved in disaster management. The point we keep making to the people who are talking to us is that there is only one preparation for a disaster, that is, a very well functioning trauma service that operates day in and day out and provides care for trauma patients from road accidents and other things I have mentioned. This has been mentioned as one of the great disasters. We have heard today that 1,700 Australians die on the roads every year, but it does not seem to have the same impact on the public mind.

The second point I would like to make is that, as clinicians at the coal face, we are very involved in injury prevention but, as we survey the area, and again with the Australasian College of Surgeons, although we are very proud of getting behind seatbelts and drink driving, we agree that this has tended to be stalled. There does need to be a re-invigoration and new focusing and we do need to get the balance right. I read this from a paper on children, again about trauma, in Europe:

> "As important as the need for better data, however, is the need for a better fit between the results of research and current practice in injury prevention, and probably more important than the force of the evaluation studies for a particular intervention is the inadequate implementation of already proven strategies for injury intervention."

The quote then goes on to actually review the themes in the United Kingdom and says:

> "By its very nature, prevention strategies involve many different operational layers: Research, policy formulation, public and political education, publicity campaigns, legislation, changes in manufacturing, environment, road system modification, monitoring and data collection. This in turn can involve many different participants, including several different government departments, both national and local, and very often a variety of voluntary and non-government organisations and community groups. This diversity of agency and activity can at one level extend the outreach, effectiveness and sustainability of injury prevention programs. At another level it can lead to bureaucratic inertia, buck-passing, duplication of effort, lack of coordination and poor conductivity between the research and on-the-ground practice".

Not only is this the view about the United Kingdom, it was said to be a problem in all OECD countries. A similar review of community based programs in the United States concluded:

> "Most injury prevention efforts are scattered and uncoordinated resulting in little impact on the overall incidence and outcome of injuries".

A 1999 French study had a similar report.

Again, this group and many others have led the case for a recognised national agency in each country to take a lead in injury prevention. The establishment of such lead agencies in each country would demonstrate a serious commitment by the Government to injury prevention and could help to meet the urgent need for promotion of evidence based policy.

I think we have stalled now and we have to do some creative things to get to that next level in reduction of injury prevention.

The fourth thing is a little report from the coal face, as it were, on trauma. It is anecdotal. Surgeons are very good at making strong cases from anecdotal things, not very good at systematic research. We are a bit perplexed in hospitals because we do know that cars are safer, we are getting good reports on the efficacy of airbags, we are getting good reports on the use of seatbelts, and vehicles seem a lot safer. There are extensions of safe roads with the motorways and dual freeways, but the road toll is not changing. We get the impression that in many ways the community is not just becoming complacent but is actually drifting into a lack of focus on the plot. Many people we are getting in the hospitals are actually adopting this attitude, and I am not saying it is the only way to go, but I have a safer car, the roads are there, and they are just not paying as much care and attention as we think they should. While it has to do with everything, we are still convinced it is the collisions—and we see the bad ones, of course, we are not seeing all the other injuries—but the people who come to us and who we care for have often lost the plot when it comes to the complexity of driving in a modern society and the skill level that is needed. They are just out of touch with what happens to them.

The last point I would make is that people in your hospitals are tired and a little demoralised, and particularly in this area there are no recruits. There was an article, if you are interested, by William Millesky called *Incorporating Sustainability in the Concept of Optimal Trauma*

Care in the Journal of Trauma in May last year. The point made in that was that the area of medicine called Trauma Management, both the nurses, the allied health and the doctors, has become extremely difficult with changes in people wanting a lifestyle. Medico-legal has not helped. It is just dreadful to fix someone up, save them after a car accident, and then get sued because there is a limp left, and that has happened in the States. Trish and I were in Las Vegas last year at a trauma meeting and the Governor was having to intervene to keep the trauma centre open, which was closed because of medical indemnity problems. We have problems in this country and again we are arguing for the balance where resources and things go. People are dispirited, given this American paper; they feel they have been overworked; they feel that human resources are being abused and a lot of them are leaving and it is difficult to recruit. We are not as bad as America at the moment where they are even having trouble recruiting some medical students, we are still getting recruits, but trauma areas are difficult. We have not been able to recruit a trauma surgeon for Newcastle, we have had to go overseas to recruit for that job as an area of need. I would say 90 to 95 percent of the trauma fellows in Sydney are overseas surgeons who have come here for extra training. It is almost impossible to get an Australian registrar to volunteer to be a trauma fellow and hence go on to be a trauma surgeon. There needs to be awareness out there that a lot needs to be done on prevention. We are totally committed to that and we think that for every life we save by better management there are probably another five to ten that can be saved on prevention. We would make an appeal not to forget that area, not to assume it is there. The military recently had a disaster day, it went on for a couple of days, and on the second day they asked: Where is your trauma management plan? They did not have one; they just assumed that someone else would do that. Within the community there has been an assumption that this would always happen and I am just letting you know that it is a very difficult area and one of the things we are trying to do in the institute is to really rejuvenate our peers for management of trauma, and that applies also to road trauma.

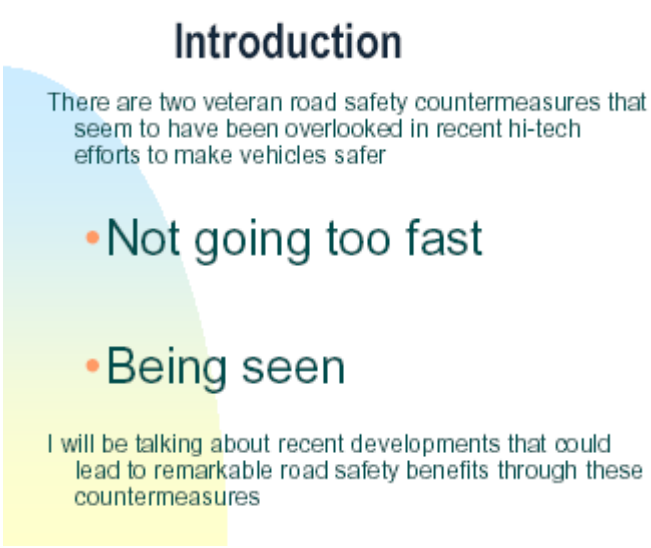
Hopefully in this short talk I have introduced a clinician's perspective and shown that the institute is involved in a broad range of trauma of which road is about half and what we learn on road is applicable to other problems. The example of the disaster in Halifax just showed you that big things can happen and we have to be prepared for them, and the best structure for that is a trauma system.

I would appeal with my colleagues, as clinicians, for a national lead agency to try to make the best use of our dollars and argue for balance in the system. The trauma people who are out there are probably not sustainable under current policy.

My final message, in summing-up this morning, would be to buy a safe car with air bags; where possible, drive on a motorway or dual road and, particularly if you are outside the metropolitan area where there is no orthopaedic surgeon or anyone beyond the mountains, drive very carefully.

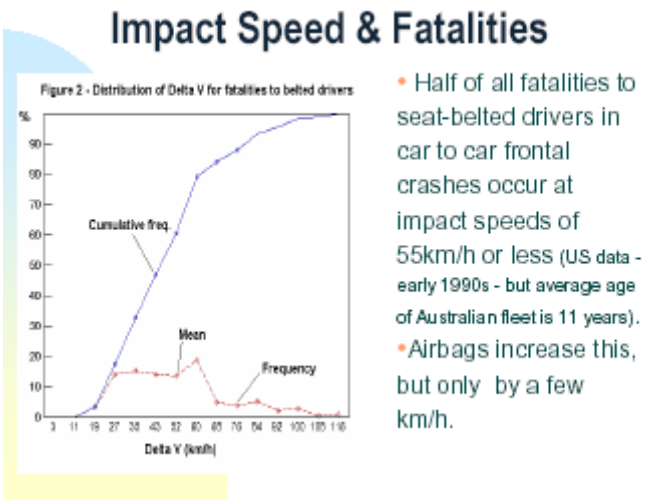
'Old Ideas + New Technology = Crash Saving'- Michael Paine

There are basically two veteran road safety counter measures that seem to have been overlooked in recent years, especially in the intelligent transport system (ITS) area. That is, not going too fast and being seen. I will be talking about some technology developments that could lead to remarkable road safety improvements.

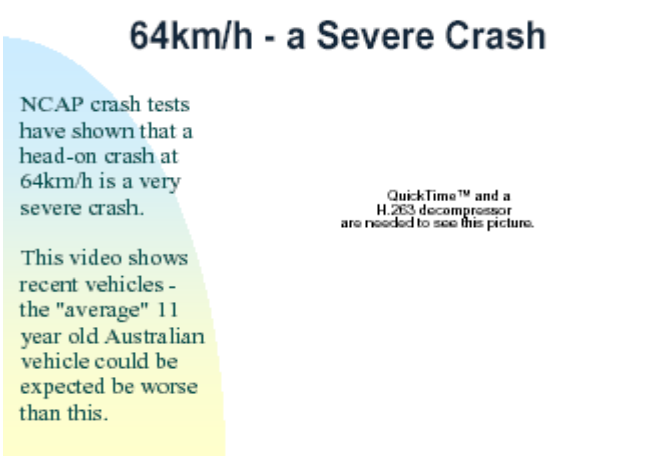


Really, I will be reinforcing some of the points that Soames Job just made about the problem of speed on the roads but I want to show technology there, there is a physical limit to the capability of vehicles to cope with a crash and there are some technologies to assist people in controlling their speed.

This graph often surprises people, this is data from the United States of fatalities of seatbelt wearing drivers in frontal crashes and the surprising thing here is the medium, 50 per cent of those fatalities are occurring at impact speeds of 50 km/h or under. I do not expect Australian data to be really any different to that. We have got an average speed data of about eleven or twelve years.

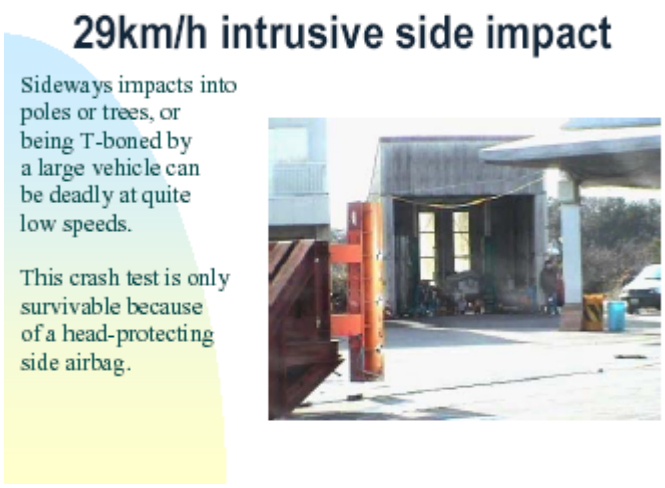


The other point is, yesterday I received some data from the United States which basically confirms for road fatalities the situation has hardly changed at all with the use of air bags in their fleet. The point is that low speed crashes can account for quite a large proportion of our fatalities.

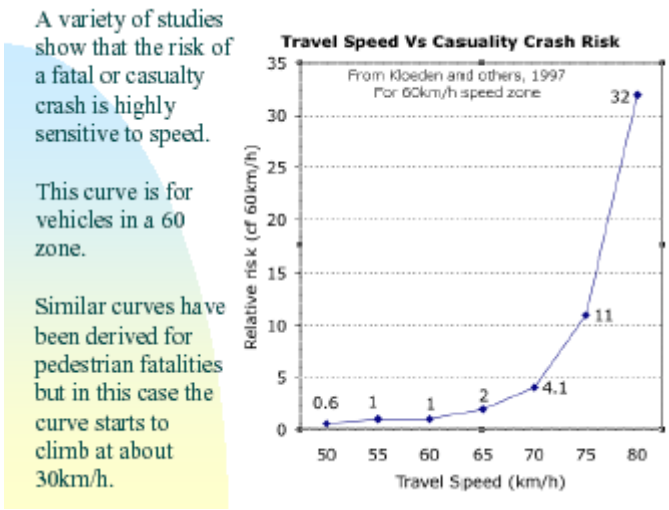


Recently the Australian New Car Assessment Program (ANCAP) crashed a Subaru Liberty and I thought I would show you a real time crash with the sound. Most times you see slow

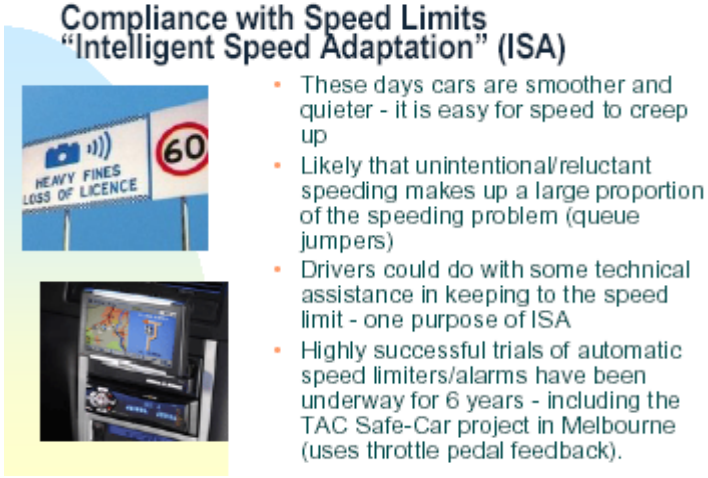
motion—I thought you should see what a 64 km/h crash is like in reality. Here are some other crashes. This is the low speed motion for a fairly poor performer, this is a United States crash test. Those two vehicles have an extreme difference in survivability. The first one was one of the best vehicles I have ever seen, and, in fact, the windscreen was not even cracked. The second vehicle crushed up pretty horribly, as you can see and the occupants have a very high risk of serious injury. Again, when we look at the average Australian fleet, I would expect most vehicles in Australia to do worse than the worst vehicle we saw there.



Side impact crashes can even be more serious, in fact it is a much lower speed before they become fatal. That is a pole test conducted for Australian New Car Assessment Program. In that case the side air bag with head protection made it a survivable crash. Now the typical Australian vehicle at that speed, 29 km/h, would in fact be a fatal crash. So, it does not take much to do a lot of damage in vehicles.

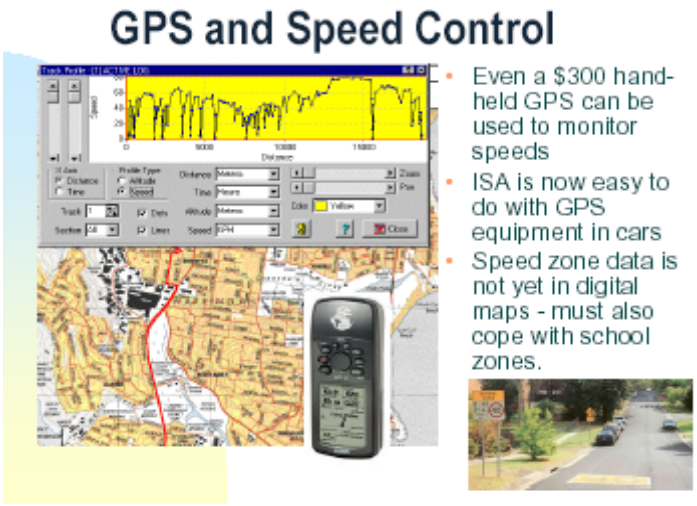


I will not dwell on this, but this is a study that Soames Job has referred to from the University of Adelaide. Basically it is showing that every 5 km/h above the speed limit you double your risk of casualty crash involvement. There is a bit of a brick wall effect there, you do not need to increase your speed much for it to become a very serious road safety problem.



Technology to help drivers control their speed, I think it is true that vehicles are smoother and quieter these days and it is easy for speed to creep up and it is likely that unintentional or reluctant speeding, as I call it, makes up a large proportion of the speeding problem. Drivers could do with some technical assistance in keeping to the speed limit and this is one purpose of intelligent speed adaptation (or ISA). There are several highly successful trials being undertaken around the world, mainly in Europe. There is also a trial underway in Melbourne—the Transport Accident Commission *SafeCar* project.

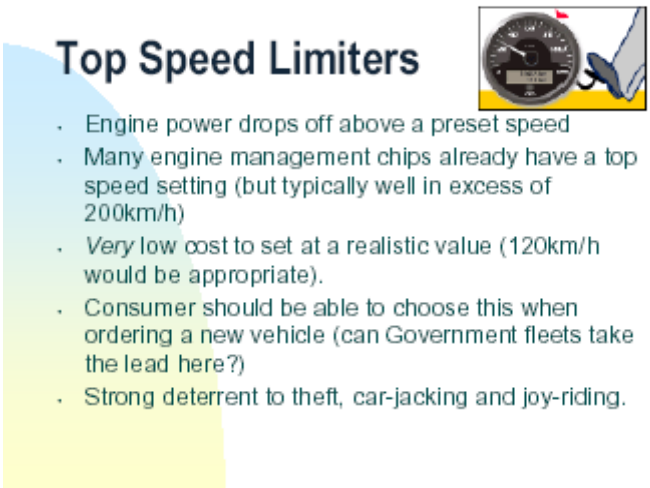
There are a whole variety of ways of letting drivers know that they are exceeding the speed limit. One simple way is a throttle pedal feedback. For example, the accelerator might start to perform as a brake as you start to exceed the speed limit. A $300 handheld global positioning system (GPS) device can be used to monitor speeds. This is actually an example, I was driving along the road in Warringah and just set up the GPS in the car and came back and down loaded it into the computer and produced a speed profile. The highest point of the graph is 70 km/h, probably over it. So I can actually analyse where I was on the road and what speed I was doing and it is possible to do it with readily available technology these days.



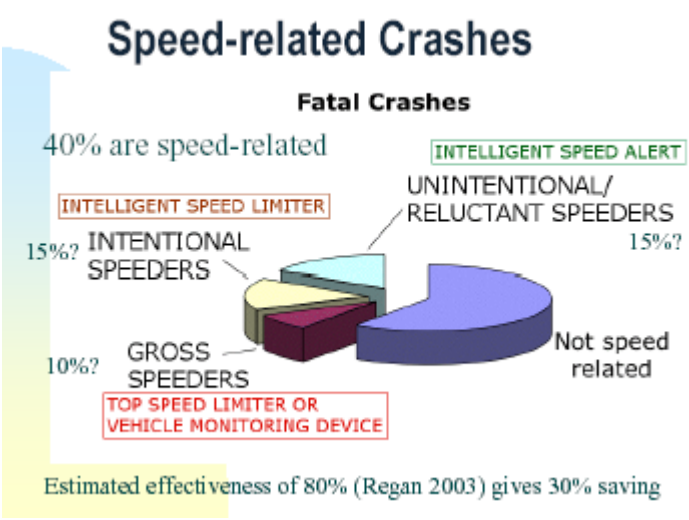
When I looked at speed control for the Roads and Traffic Authority here in New South Wales some six years ago, these types of global positioning system devices were unheard of. We had military limits on accuracy of global positioning systems. That has all changed. They have become cheaper and more accurate and it is very easy now to feed information into the car about the local speed limit, just from global positioning system information. One of the big problems is, and I think the standard today is probably changing, but you cannot get digital maps in Australia that have speed zones in them. It is a bit of an old thing because a lot of people are buying navigational systems for several thousand dollars and a lot of them actually expect to have the speed zone information in there and are disappointed when it is not there.

There is a complication here that it is not just geographical, it is technical as well. You need to know if you are in a school zone during school hours, so there are some complications there that need to be brought out and some standards set.

The other issue on speed limiting is top speed limiting and that is basically that the engine management check will not allow the vehicle to exceed a certain speed. Just about every car on the road now, new car, has a top speed limit set in there, generally well over 200 km/h but it would be very easy to reset that to a practical limit and the work I did for the Roads and Traffic Authority suggested 120 km/h. I am suggesting that governments particularly should take the initiative there and demand fleet vehicle purchasers that they do have a top speed limit.

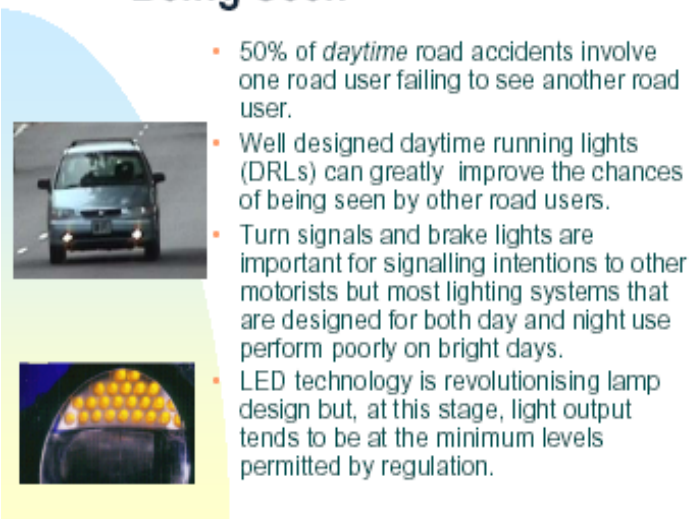


The other point is that joy riding and theft are very high risk activities and top speed limiting would be very effective there. Who is going to steal a Porsche if it won't go over 120 km/h?

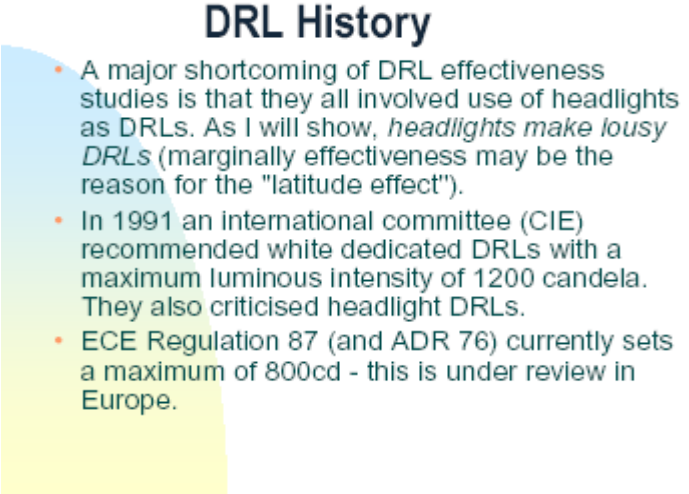


Again to reinforce some of the points that Soames Job made, we have got about 40 per cent of fatal crashes are speed related. On speed related here, that maybe 15 per cent of all crashes are by the unintentional reluctant speeders and a speed alert system would be adequate to help them conform to speed limits.

Maybe another 15 per cent are intentional speeders and we need something more Draconian like an intelligent speed limited that will not allow the vehicle to speed and then we have got that other group, the top end, maybe 10 per cent, of gross speeders, very high risk people and maybe top speed limiting is going to arrest those too.



We have got a whole range of intelligent speed controls. If the whole fleet had them then researchers here and in Europe are looking at 80 per cent effectiveness. You get rid of 80 per cent of those 40 per cent speed related crashes, so quite a remarkable saving for a relatively simple device.



Surprisingly, over 50 per cent of day time road accidents involve one user failing to see the other road used and studies overseas show that well designed daytime running lights (DRLs) can greatly improve your chances of being seen.

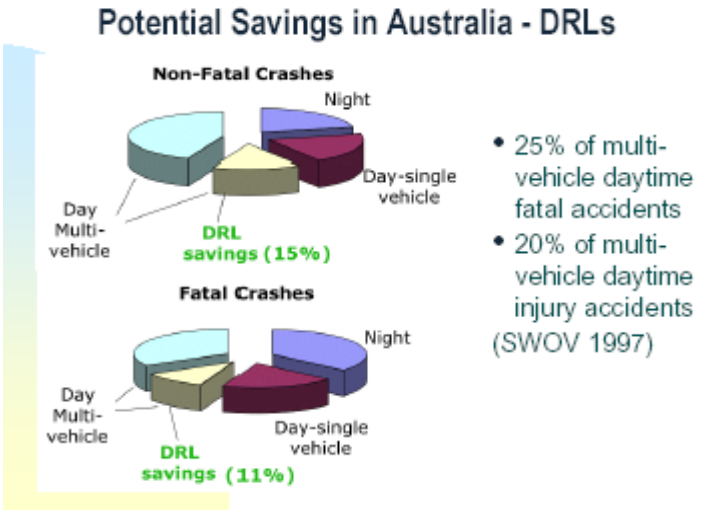
Another point is that turn signals and brake lights are important for signalling your intentions to other road users but most lighting systems are a compromised day/night light system and they actually perform quite poorly on bright sunny days and I will show that in a graph. Also in this area is LED technology. LED lights are taking over from ordinary tungsten lights and

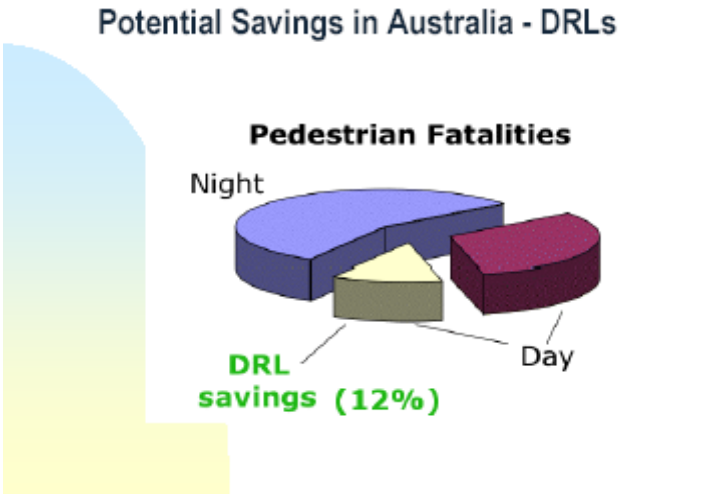
there could be great advances here. One of the problems is that it is a bit early in the technology and they are really not bright enough for bright days.
Headlights make pretty lousy daytime running lights. The whole idea of low beam headlights is to not shine the light in the direction of the oncoming road users and here we are trying to use that during the day.

Accident savings here, fatal accidents in the day time make up the large majority of accidents and if we take multi vehicle accidents, European research is suggesting that 25 per cent of those day time multi vehicle accidents could be saved by day time running lights. So overall we are probably looking at about 11 per cent of all fatal accidents and this with very simple technology.

Pedestrians also benefit from being able to see vehicles approaching them. I think this is based on United States data, is suggesting about 12 per cent saving in all pedestrian fatalities.

Let's just look at a couple of design issues here. Road designers for many years have had design guidelines and – okay, the colours are not showing up all that well – but in a 60 km/h zone you are looking at an intersection sight distance of 120 metres, in the diagram on the left, that is how much distance you need to be able to see an approaching vehicle for the intersection to be safely designed. So, we can actually apply these limits to the lighting systems on vehicles. What we are really talking about is signal lighting, which is when the light signal becomes noticeable to the other road user.

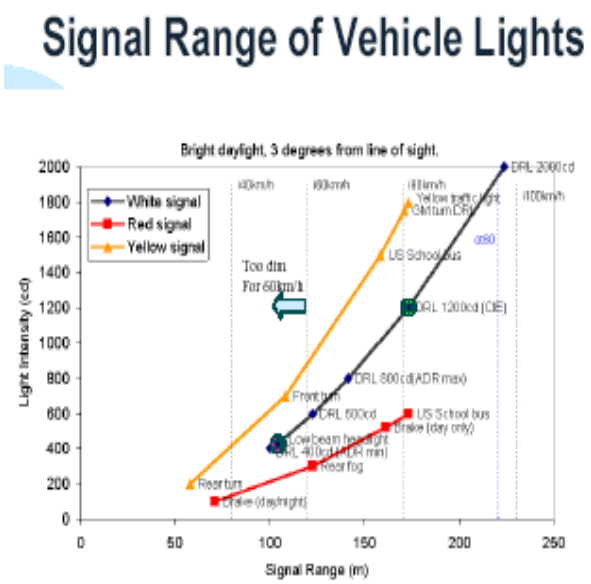




Road Design Sight Distances

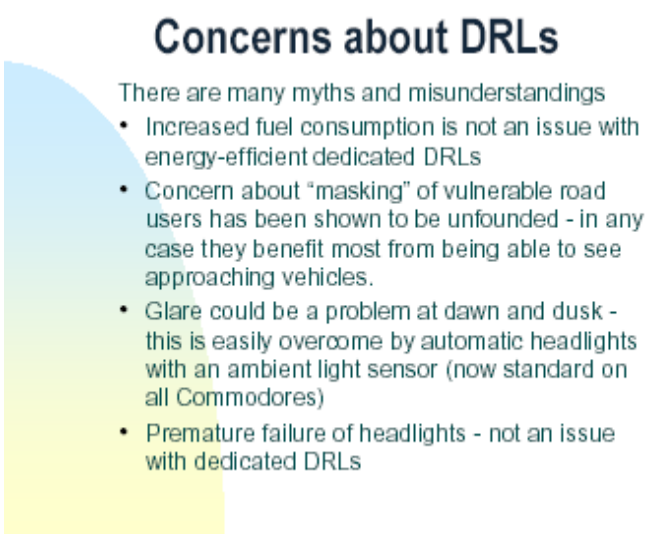
Design Speed	Intersection Sight Distance	Overtaking Sight Distance
40km/h	80m	160m
60km/h	120m	220m
80km/h	170m	340m
100km/h	230m	480m

'Old Ideas + New Technology = Crash Saving'- Michael Paine



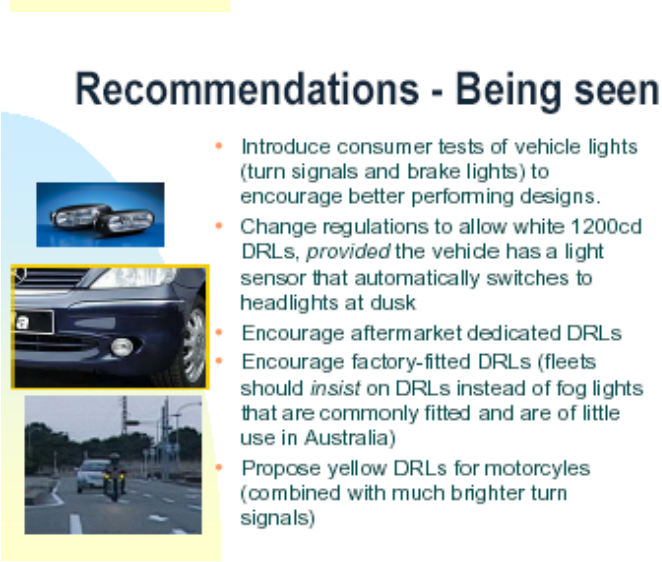
The left pointing arrow in the middle of the graph there shows that intersection sight distance of 120 metres, anything to the left of that line is too dull to be seen on a bright day. So we can see right down the bottom of the yellow line, red turn signals, that is the lowest illumination allowable by the Australian Design rules, we are looking at around 60 metres signal range and the same with brake lights. Poor brake lights that comply with the Australian Design Rules (ADRs) we are looking down at about 70 metres signal range on a bright day, well under what you would use for road design standards.

If you go to the other extreme there with the brake lights, up the top of the red line I have got a day lit, design rules allow a day only brake light, sort of dual intensity light, there we have 150 metre signal range, so we have got double range from a better designed light.



Let me just point out on this graph now the day time running lights, they are white lights because that gives a black centre line, what I have circled in the bottom of that line, the purple circle, that is the maximum that a low beam headlight is allowed to send light in the direction of the oncoming driver. So you can see we have got a signal range down from about 100 metres there.

A lot of the headlights I would expect to be too dim to be effective as a DRL on a bright day. On the other hand, the green circle is what was recommended by an expert in the lighting committee about twelve years ago in Europe, those lights are about 1200 candela, have a signal range of about 170 metres, so again, a huge range in signal range.



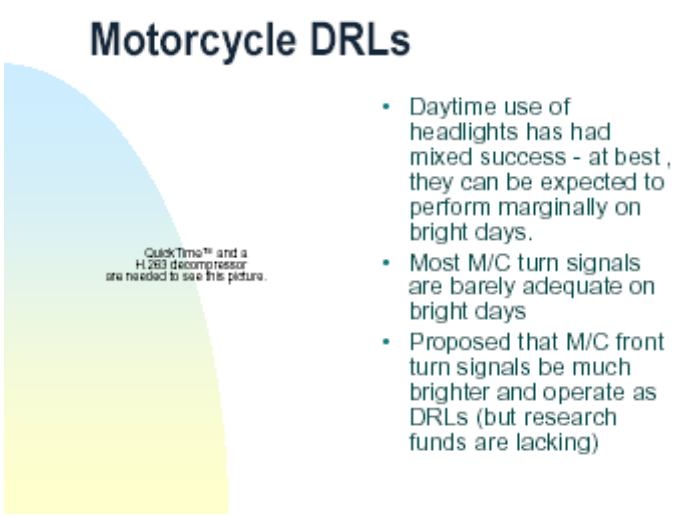
Day time running lights, as I say, most of the studies have been based on low beam headlights, they are marginally effective. What I have been trialling is dedicated day time running lights, they basically replace the fog lamps that are common on a lot of vehicles and very high wattage,

they shine the light exactly where you want it, so very energy efficient and in fact your headlights, you have got all the other lights on the vehicle and it seems like maybe 150-170 watts. If you have got dedicated DRLs you could be down to 20 watts, big difference.

Studies looking at masking other road users have shown that it is not going to be a problem and they really benefit from being able to see the approaching vehicles. Glare at dawn or dusk, that is easily overcome with the latest technology. Every Commodore that is sold now has a light sensor, if you set you headlight switch to auto, the headlights automatically come on at dusk and that totally eliminates any problem with daytime running lights if you are using that technology.

I have heard in Canada there is a problem with failing headlights, but what they do in Canada is various schemes to try and get existing lights to work as DRLs and it is not going very well. You have got a lot of people running around with one headlight, put it that way, and again, if you have got dedicated DRLs then you are not going to have that problem.

Another issue I have looked at just lately is motorcycle conspicuity. There is a problem here that I think motor cycle turn signals are probably worse than car turning signals, really minimal technology and the motor cyclists' intentions are not coming out all that clearly. What I am suggesting is we use brighter turn signals on the front but also use them as daytime running lights, so normally you would see two yellow lights and it indicates that a motor cycle is approaching you. In fact, a lot of General Motors cars in America use just that, turn signals as daytime running lights.



My recommendations for being seen are I think there should be some consumer tests of vehicle lighting systems, there is a huge range in performance and consumers could be better informed about which vehicle lights are performing well. We should change the Australian design rules to allow brighter day time running lights as recommended by the European committee, provided that we have a switch like the Commodore that avoids glare at dusk.

We should encourage the after market fitment of dedicated day time running lights and certainly again the police could play a role here and insist on day time running lights instead

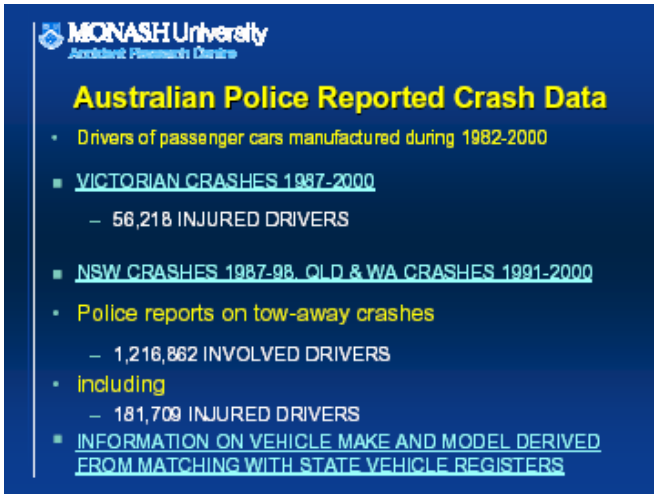
of fog lights. Frankly, fog lights are a waste of time in Australia and I would like to look more at this idea of improving turn signal daytime running lights on motor cycles, and just to refresh on the speed issues, and reinforcing what Soames Job said, we have got to make motorists more aware that even low speed impacts can be fatal. There is really a lot of complacency there about travelling in 60 km/h zones, we can really get the message across to people that people are being killed in these low speed crashes.

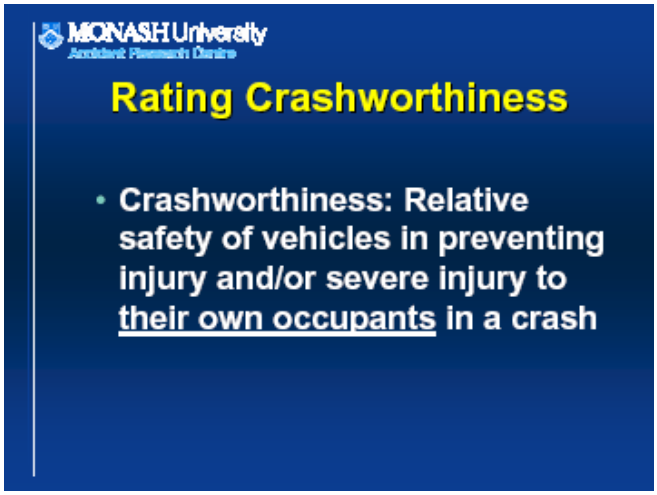
Intelligent speed limiters on new vehicles, particularly with the rise in popularity of navigation systems. Fleet vehicles should be top speed limited and perhaps consumers could be provided with more information about speed devices on vehicles.

'Vehicle Safety Research in Australia based on analysis of Police Crash Reports' – Stuart Newstead and Max Cameron

Today I am going to be giving you a brief Cook's tour on our vehicle safety research program at the Monash University Accident Research Centre based on analysis of police crash reports. Before I start I have to acknowledge my colleague, Max Cameron, who is a bit of a pioneer in this work area. One of the biggest elements of our research program on vehicle safety is producing vehicle safety ratings for Australian passenger vehicles. You have heard Michael talk about barrier crash test programs where vehicles with dummies are thrown against walls. This is all about what happens in real life and we, tongue in cheek, occasionally call it the public crash test program where we rely on the grace of the public to go out and smash cars up for us, capitalising on their misfortune to learn something about relative vehicle safety.

The facility to do research in this area is really dictated by an extremely large crash database that we have put together from four of Australia's most populous States. The crash data covers crashes over 14 years in both Victoria and New South Wales and 10 years in both Queensland and Western Australia. We have particular focus on the drivers of passenger vehicles manufactured during the years 1982 to 2000. That crash data covers some 1.2 million drivers involved in tow-away crashes, which are reported in three of the States, and some 230,000-odd injured drivers reported in all four States. Victoria is unusual in the data we have in that they only report crashes where a driver is injured, so that has some unique complications. One of the important aspects of being able to do this sort of research is to have information on vehicle make and model to put into the research, so we have to match the information on crashes to information from the vehicle register, which gives us exceptional detail on the make and models of vehicles involved in these crashes.



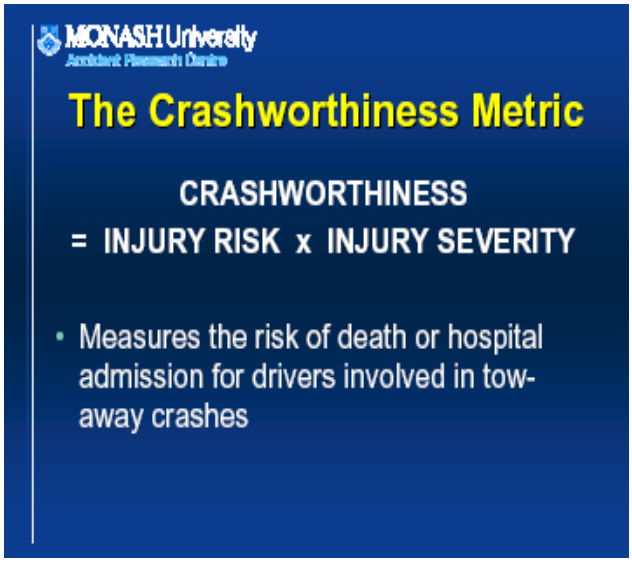


In the early 1990s the focus on vehicle safety was really about how vehicles protect their own occupants. This is a concept which is commonly known as vehicle crashworthiness, so it

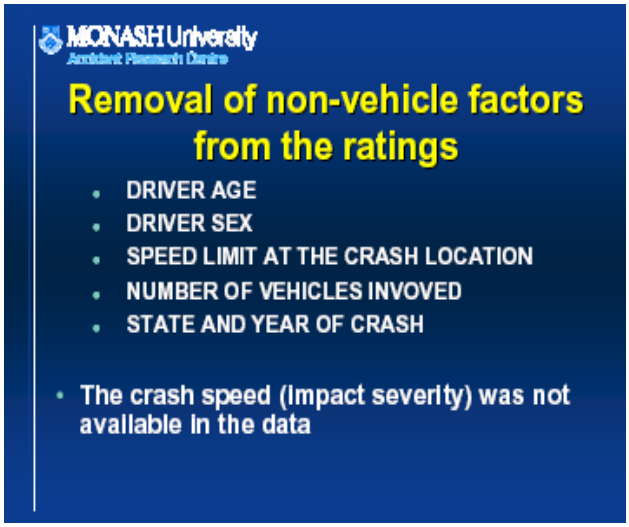
is about the relative safety of vehicles in preventing injury or severe injury to their own occupants in the event of a crash. It is not about the risk of having a crash; it is all about what happens to vehicle occupants in the event of a crash. Committees such as the Social Development Committee of the Victorian Parliament in the early 1990s called for information to be available and research to be done on the relative occupant protection performance of vehicles in crashes because there was not a lot known about it. So the Monash University Accident Research Centre, in conjunction with road agencies and motoring clubs from both New South Wales and Victoria, in the early 1990s, went about developing a system of rating the crashworthiness of vehicles.

To do this we had to develop a crashworthiness metric and the metric we came up with had to reflect the sort of injury information that was available in police reported crashes. Injury in police reported crashes is categorised into death, hospitalisation, other relevant injury and not being injured, so our metric had to reflect that. Obviously the more severe outcomes are important in a crash, where you are dead or you end up in hospital, and so the crashworthiness metric was formulated to basically measure the risk of death or hospital admission, i.e. serious injury, given that you were involved in a tow-away crash or one that is reportable in States that report tow-away crashes.

The crashworthiness metric was comprised of two different components: An injury risk component, which basically measures the probability of injury given that you are involved in a reportable crash, and an injury severity component, which measures how severely injured you are given that you are injured to some degree. Why did we do that? For two reasons. Firstly, in States like Victoria where only injury crashes are reported, the data is only really useful for measuring that component, and so the Victorian data along with the other data goes into meeting that component, whereas States that report non-injury crashes have data useful for that component.

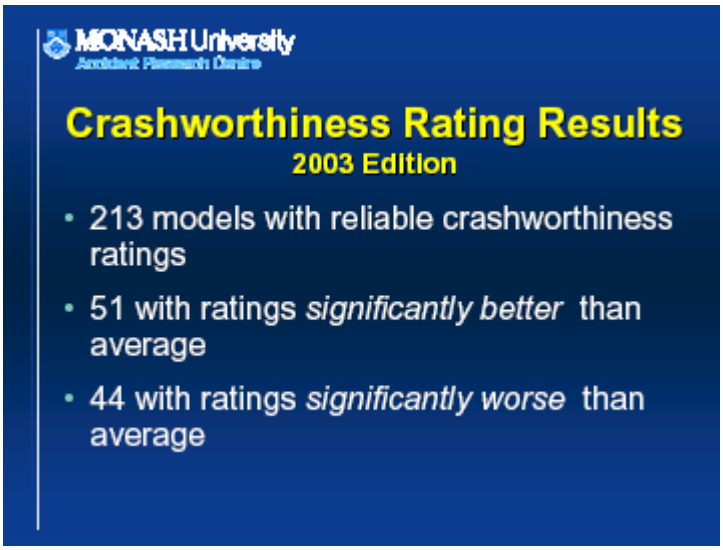


There are also a number of non-vehicle factors that alter injury outcome in those two components quite differently. When we are rating vehicle safety we want to rate the properties of the vehicle and not the properties of those who are driving it, so we want it to be all about how the vehicle is protecting you and not about the person in the vehicle and what they have been doing that is susceptible to injury. We have developed statistical methodology - and this is as much as I am going to say about the methodology - to remove the effects of the non-vehicle factors that are



available in this crash data and these include driver age and sex, which we know alter injury susceptibility; the speed limit at the crash location; the number of vehicles involved and, of course, the State and the year in which the crash occurred, because we know that there have been trends in overall safety and there are different levels of safety in different States, so we end up with an estimate of crashworthiness which is free of those factors.

One limitation of using police reported data is that there is no indication of impact severity through a measure such as the Delta V because police are not trained and do not have the time to go out and collect those as part of the data, but we believe, having sufficiently wide crash coverage across the Australian States, all crashes reported over 10 or 14 years and some other proxies for impact severity like speed limit at the crash location, et cetera, it is not a serious shortcoming of our rating system not to have impact severity in the data.

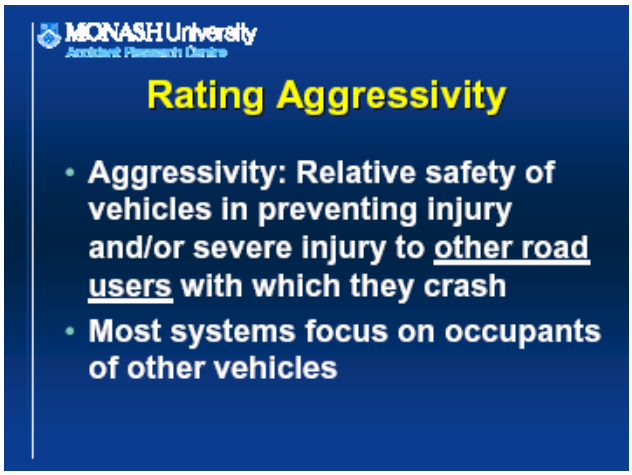


From the available data up to the end of 2000, which were the results most recently published in 2003, we were able to rate the relative crashworthiness of 213 different vehicle makes and models widely, so statistical confidence which gives us relative confidence about what our real crash performance in terms of crashworthiness of that vehicle is, and of course we are able to differentiate the performance widely across vehicle makes and models. When comparing to the average we can identify out of those 213 vehicle makes and models about 51 which have a crashworthiness much better than average and about 44 which are much worse than average. If nothing else, the research is able to pinpoint that still on Australian roads we have a wide range of safety performance in vehicles in protecting their own occupants. I think the difference in severe injury risk from the best performing vehicle to the worst differs by about a factor of 7, so the occupant of the worst vehicle is seven times more likely to be killed or seriously injured in a crash than the occupant of the best performing vehicle, so clearly there is a wide range of performance there.

Having more or less by the mid 1990s got the idea of rating crashworthiness under our belt, society was then turning more to looking at how vehicles were performing in protecting other road users with whom they crashed and I think the predominance of four-wheel drives that has come up in the mid 1990s has certainly kicked this debate along. Is there a differential performance of different vehicles in protecting other road users if they crash? Australia is certainly not the first place in the world to focus on this concept and rating systems have been developed in other countries such as Finland. Most of the other systems focus on occupants of other vehicles, so how does your vehicle protect the occupants of other vehicles when involved in a crash together? The problem is a little broader than that, though. In Australia we considered two types of what we call aggressivity ratings. The first looked at, as had been done in other parts of the world, the risk of injury to other vehicle occupants or drivers specifically with whom you might crash and also what other people in presentations

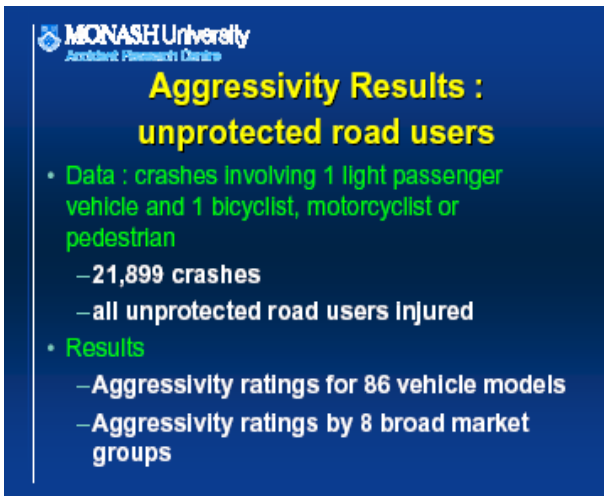
today have shown as the important dimension: How your vehicle protects unprotected road users with whom you might crash, namely pedestrians, cyclists, motor cyclists and those who have relatively limited protection in their mode of transport.

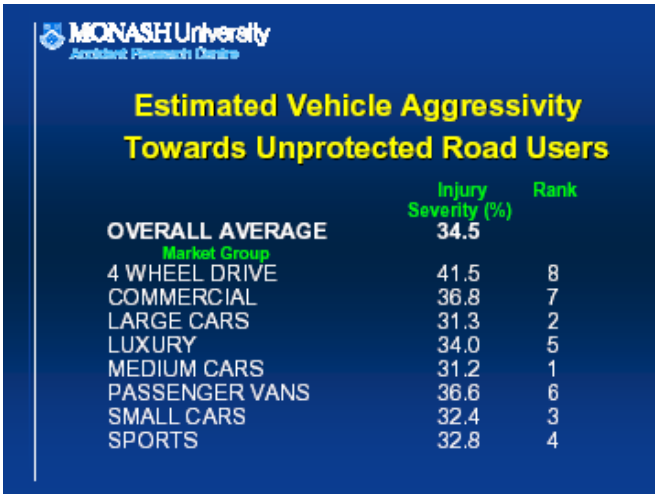
The crashworthiness data was also very useful in addressing the question of differential vehicle performance in terms of aggressivity rating. The only difference we needed to make in the data in preparing it for rating accuracy was we needed to know what was hitting what, so we needed to obviously match two vehicles involved in a crash and look at the relative injury outcome of their drivers and we also needed to identify the vehicles that had been hitting unprotected road users in the same way.



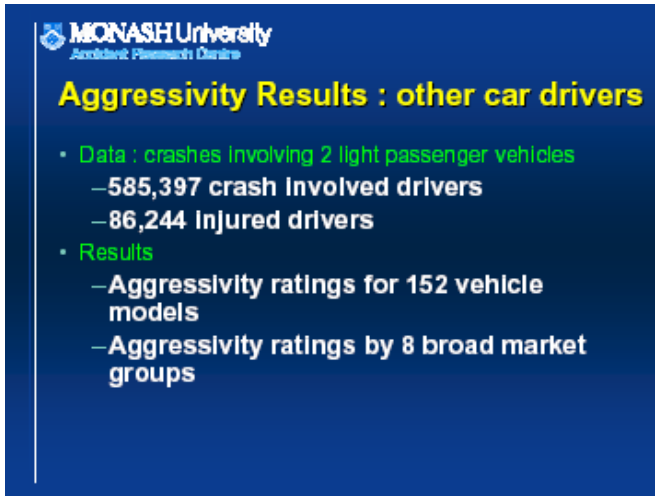
First we looked at rating aggressivity towards unprotected road users and, as I said, that refers to bicyclists, motorcyclists and pedestrians. When you look at police reported crash data, an unprotected road user tends to be injured in all crashes that are reported to the police. They are the most likely to be injured and we found that when you look at the data all were injured, so it is not about injury risk, it is about injury severity, and the aggressivity measure that we developed for our unprotected road users was the relative risk of death or serious injury given some level of injury as a function of the sort of car, either make, model or market group, that was running into them.

We originally undertook this work in about 1997 and at that time we had 22,000-odd crashes involving a light passenger vehicle hitting either a bicyclist, motor cyclist or a pedestrian and, as I said, all unprotected road users were injured in these crashes. We are using the same types of analysis techniques used for rating crashworthiness. We apply those for aggressivity rating and we are able to rate aggressivity towards unprotected road users and find differential performance of 86 different vehicle models and also classify them amongst eight broad market groups. We will not go into the specific makes and models performance, but certainly the results you get for different market groups pretty much confirm what people





suspect. If these represent the risk of being killed or hospitalised given you are injured in a crash as a function of the vehicle that hit you, you will see that four-wheel drives clearly are the class of vehicle that does the most damage to unprotected road users. We are able to quantify this. Perhaps surprisingly, what people did not expect, medium and large cars are the two best classes of vehicles to run over unprotected road users and the relative injury severity to the unprotected road user was significantly lower than the worst class of vehicle and four-wheel drives, so certainly we have identified that different classes of vehicle have differential performance in protecting unprotected road users which has also confirmed people's fears about what four-wheel drives in particular are doing.

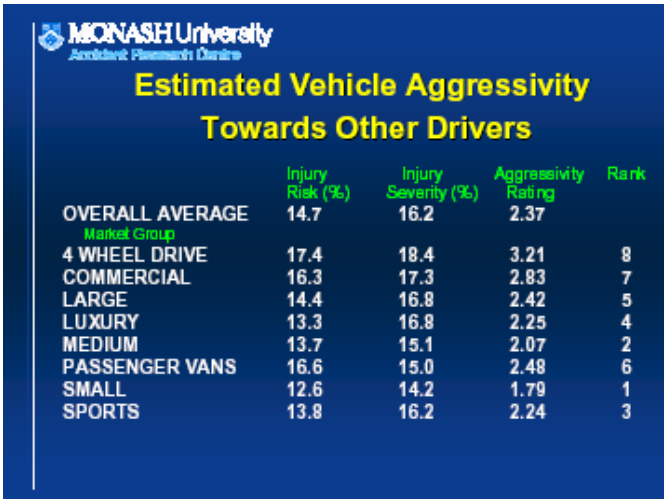


We also looked at the aggressivity measure towards drivers of other cars and the metric we came up to was basically the risk of death or serious injury to the driver of the other vehicle as a function of the make, model or market group of the vehicle that had collided with them. Because we had uninjured drivers in the other cars we could formulate this in the same way as we had our crashworthiness measure by having injury risk component and injury severity component which again make appropriate use of the data sets depending on how the reporting criteria worked.

We had substantially more data in this area, up to the end of 1998, I think, over 580,000 involved drivers in crashes between two vehicles, of which about 86,000 were injured. From these we were able to rate relative aggressivity towards other vehicle occupants or other vehicle drivers for 152-odd vehicles and again eight broad market classes.

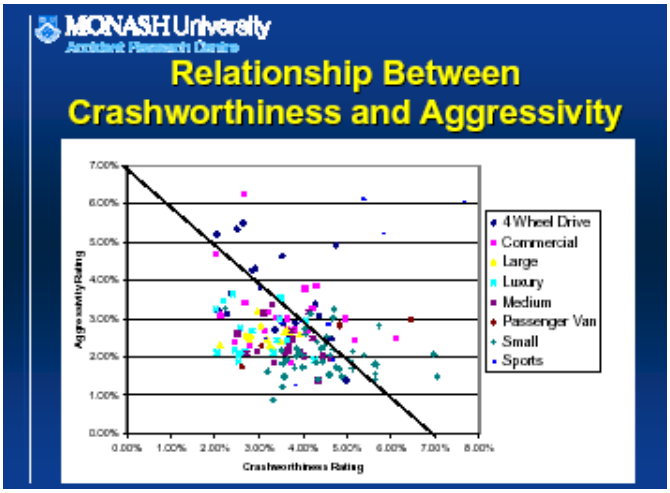
There is a mix of results by market group. We can see the average injury risk to drivers of other vehicles when hit by a light passenger car of about 2.3 percent, so about 2.3 serious injuries or deaths for every 100 drivers involved in a crash with another light passenger vehicle. It is interesting to compare that to the aggressivity measure for unprotected road

users where the similar figure is about 36 percent. It is clearly much better to be hit by a car when you are in another car than when you are walking along the road or on your bike. We can see differential performance between the market groups. As before, we have four-wheel drives posing the most risk to other vehicle drivers but, different to the unprotected road users, we have small and medium cars being one of the better classes of vehicle for protecting other vehicle occupants. So these aggressivity ratings seem to have efficacy.



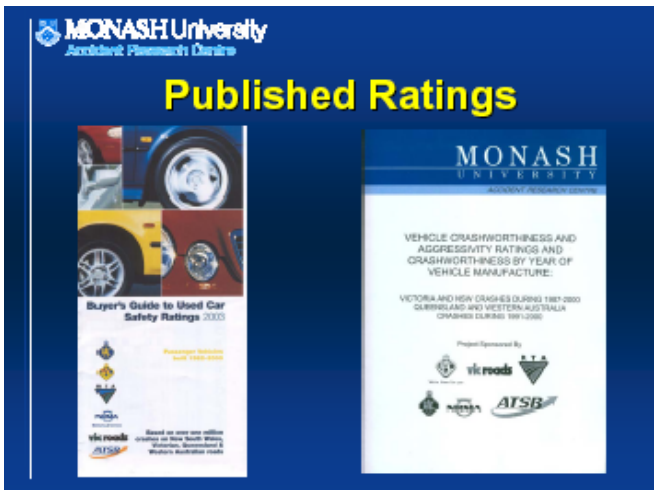
	Injury Risk (%)	Injury Severity (%)	Aggressivity Rating	Rank
OVERALL AVERAGE	14.7	16.2	2.37	
Market Group				
4 WHEEL DRIVE	17.4	18.4	3.21	8
COMMERCIAL	16.3	17.3	2.83	7
LARGE	14.4	16.8	2.42	5
LUXURY	13.3	16.8	2.25	4
MEDIUM	13.7	15.1	2.07	2
PASSENGER VANS	16.6	15.0	2.48	6
SMALL	12.6	14.2	1.79	1
SPORTS	13.8	16.2	2.24	3

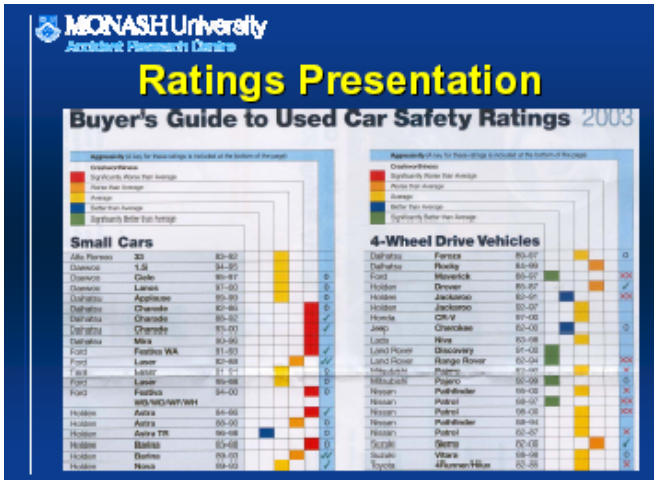
One of the key things about the Australian crashworthiness and aggressivity measures is that they seem to be rating relatively independent aspects of vehicles' safety performance. Along the bottom here we have a crashworthiness rating plotted and up the side we have the aggressivity rating plotted for vehicles that have ratings under both dimensions and you can see very little correlation at all. We have vehicles down in this corner that perform well in both aspects, they protect both their own occupants and other vehicle occupants very well, compared to here where we have classes of vehicles that do not protect anyone, they do not protect their own occupants or other vehicle occupants, so clearly those vehicles that can optimise their safety performance in both dimensions and vehicles that are failing to do so, and of course there are other vehicles that are right down here that perform only well in one dimension. This is quite a contrast to other aggressivity systems that have been developed internationally, which seem to really just be an endless measure to crashworthiness, so the Australian system is unique in reliably rating two dimensions quite independently.

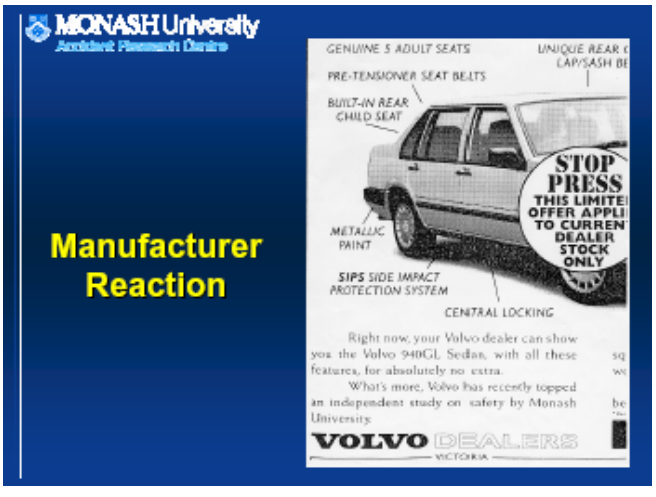


One of the questions we had with aggressivity ratings, and certainly for the sponsors, who tend to use our work for consumer information, was what do you do about marketing aggressivity ratings? Crashworthiness ratings obviously have a direct bearing to the consumer about protecting themselves in the vehicle. What do we do about aggressivity? Is it the consumer's problem? Many consumers

say, "I only care about me, I don't care about anyone else". Our colleagues in America have said that that attitude is very prevalent in the US. In fact, if you show them a car that is aggressive, they reckon they will go out and buy it in preference to one that is not, which is a bit sad. So that becomes more of a society problem in people's choice of vehicles and not being appropriate for everyone involved. It is also perhaps a problem for Government in trying to regulate for a fleet that protects everyone.





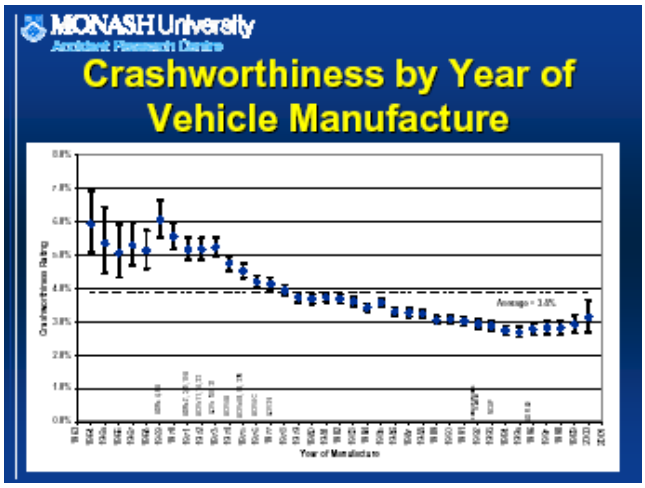


In Australia we had the guts, unlike the Americans, to publish our aggressivity and crashworthiness ratings together. We believe that Australian consumers have enough social conscience to be worried about other people as well as themselves. Typically the ratings are published by the project sponsors as the brochure for consumer information where they can take that brochure and look at the safety performance of their car. It is also supported by a technical report which the Accident Research Centre produces which gives the in-depth technical detail of how the ratings are calculated to ensure people of its scientific validity. We do the brochure. People fill in the relative crashworthiness of their vehicle, different vehicle types in a five class rating, so we have green vehicles protecting their own occupants very well down to red vehicles which do not offer very good protection for their own occupants at all. That is given relative consumer focus, that is the primary focus of the brochure, but it also tells them about the relative aggressivity of their vehicle, so vehicles that are very kind to other road users, other vehicle occupants, get the big double tick and vehicles that are very bad get the big double cross, and there are various degrees of performance in between. Clearly, if someone is choosing between two vehicles that have bad performance, if you like, which we hope they do not, you would clearly take the one which performs better on the aggressivity scale, so it gives them a two-dimensional approach to determine the vehicle buying preference.

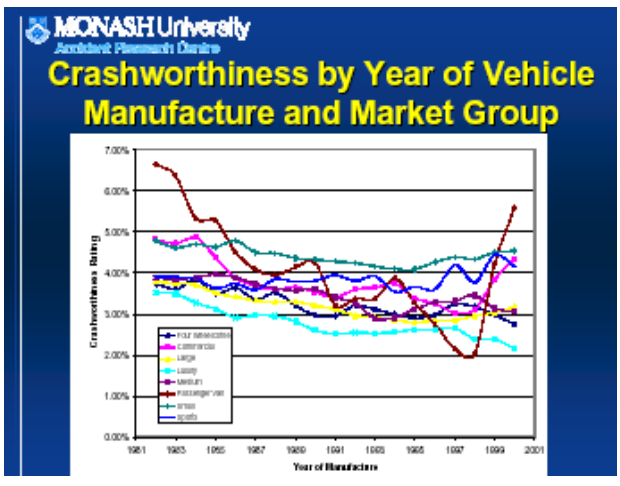
Consumers have very good reaction to these brochures - we have lots of anecdotal evidence that it is well used and our

technical report is well downloaded off our web site - but, like NCAP, it is also aimed at being a monitor on performance of the manufacturers too. Manufacturers keep close check on how their vehicles perform in our crash rating system too. Obviously, more and more, safety is becoming an issue in selling cars and when a vehicle has done well in the past they have generally used that as a marketing ploy, so it helps to install a safety culture into the manufacturers as well as provide valuable consumer information.

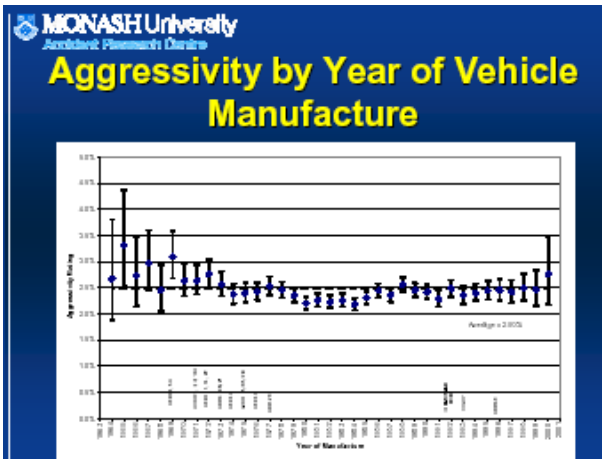
I have talked about vehicle safety ratings, but one of the other great uses of this sort of data is monitoring changes in the safety of a vehicle fleet over time and the chart, which many of you have probably seen before, reflects some work we have done looking at the changes in vehicle crashworthiness by the year of manufacture of the vehicle, and we have rated vehicle manufacture, so instead of using rating by make/model we rate by the year in which the vehicle was made. We have rated through from 1964 to the latest published work, vehicles manufactured up to 2000. I think this work gives clear indication that in times where a lot of effort has gone into regulating safety we have seen huge benefits in reducing the risk of death or serious injury for vehicles manufactured over the period, so here we have things like seatbelts mandated, collapsible steering columns, side door strength, those sorts of things, and they have all had a massive impact. You will notice through this period, where regulation has slowed down, so have improvements in safety. Through the 1990s we had things like the Australian New Car Assessment Program (ANCAP) crashworthiness ratings and a couple more Australian Design Rules were introduced, but there was some debate about whether we are still winning the war in terms of occupant protection in the car.



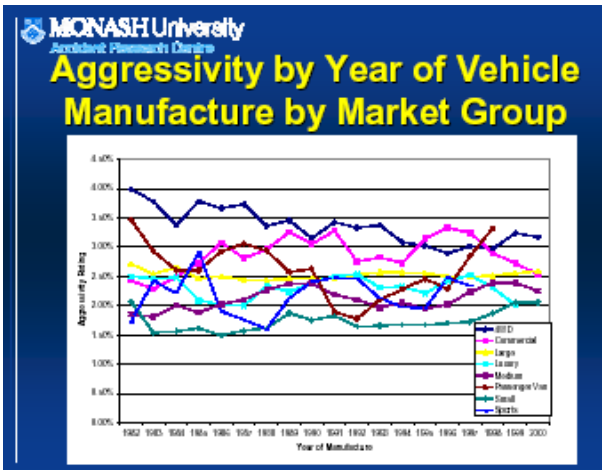
Noting this, we went off to look at what was happening to relative crashworthiness in the different market groups. This shows each of the eight market groups that we considered in our workings and how the crashworthiness performance changed the vehicles manufactured from 1982 through to 2000. Clearly in some groups, for example this group down the bottom, luxury cars, where we have lots of airbags typically, improvement has been quite dramatic over that timeframe. Others,



like small cars, have had a tendency to poorer performance in recent times. This not only reflects the improvements in engineering changes, it also reflects what sort of vehicles are out there crashing on the roads. It is representative of what vehicles are crashing. What we have established here in small cars is that there was a trend during the late 1990s for people to buy far less safe vehicles. They all complied with the standards, but they were the worst safety performers in their class. They were buying them based on price. So clearly, if you do not mandate for safety across all price ranges, you will get people who shop only on price ending up in less safe vehicles and we have seen that that is actually driving the trends for that market group, in particular, backwards. Overall the exposure of those cars on the road is of less safe cars, which I think is a concern, so we need to concentrate on getting all of those market groups to head into the better range.



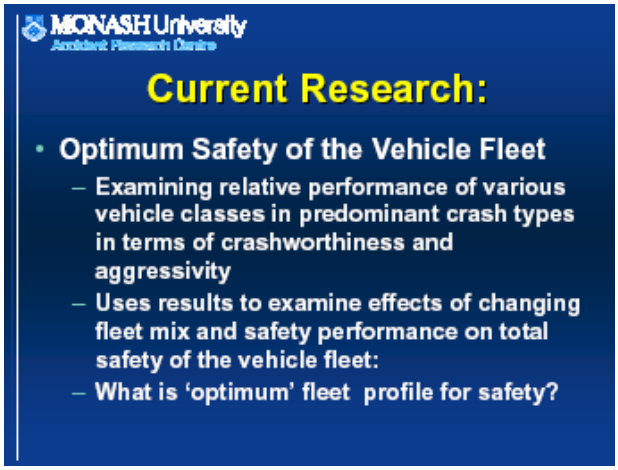
Similar recent work we have done is look at the issue of how vehicles have changed in terms of aggressivity performance by the year of manufacture. I think you can see from this chart that in terms of protecting other vehicle occupants our design is going nowhere. We have not shown any significant improvement in the way a vehicle protects occupants of other cars throughout the last 40 years, which I think is some concern, so obviously we need a lot more effort going into the area of compatibility. We have some aberrations, obviously stiff old cars up here performed a bit worse and when we had a bit of an oil crisis in the 1970s we got a few lighter cars in the fleet and they were a little less aggressive, but overall the trend was going nowhere. A bit facetiously, I put the Australian Design Rules in, but those Rules were only dictating occupant protection and not partner protection of the vehicles, so I think it is an area we really need to start looking at: How vehicles can better protect other occupants of other vehicles.



Again we can see differential performance in aggressivity by vehicle classes as well and perhaps some surprising trends here. The four-wheel drive class is actually getting better, which is reflecting trends to perhaps lighter, more recreational four-wheel drives, away from the big behemoths that were popular in the 1980s, but the small cars are actually going backwards, they are getting more aggressive, and perhaps that is a reflection of the need to meet occupant protection demands put on through regulation. I think when you add all of those together you see that we get the average going nowhere.

That brings us now to some current research areas. One of the things we have seen is that we have very different trends in improving occupant protection performance and relatively

little gains in improving aggressivity. Our current work is saying how can we bring all these factors together to see how we can move to a more optimum safety profile for our vehicle fleet? That involves examining relative performance of each vehicle class in all the predominant crash types, single vehicle crashes, multi-vehicle crashes, unprotected road user crashes and heavy vehicle crashes, which are a problem, and those four crash types make up the majority of crashes in which passenger vehicles are involved; looking at the differential performance in terms of crashworthiness and aggressivity and then using those results and reflecting how the Australian fleet looks in terms of its mix, and particularly the crash profile to see where we need to go forward in trying to optimise our vehicle safety profile.I have not got any results to show you today, that work is going to be hot off the press, so stay tuned in the next few months to see the key results of that coming out, and I think there will be some surprises in where we should be heading in that work.

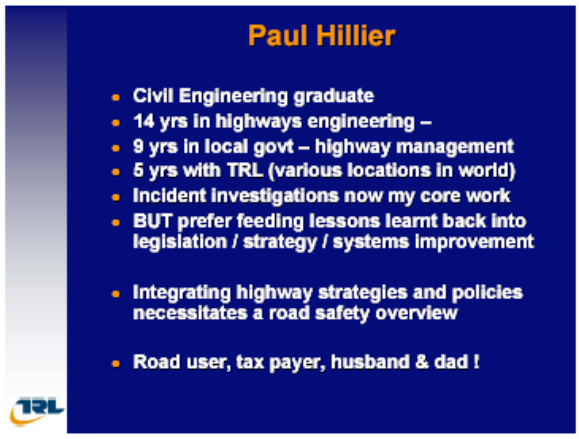


Regular updates of vehicle safety ratings are also important to give consumers the most up to date information on relative vehicle safety as well as to continue monitoring where our fleet is going. Recently assembled crash data for the end of 2002, which will cover vehicles manufactured from 1982 through to 2002 - and for the first time we have gone across the Tasman and injected New Zealand crash data into the system as well - ratings will be released within the next month or so and they will cover 255-odd vehicle models and, of course, being representative of crash data, they represent the vehicles that are most driven on the roads, so 255 vehicle models crashing on our roads, and it also looks at refining our market group designations based on how the Australian fleet is progressing, so for example now we have small and large classes of four-wheel drives and those ratings will have a look at trends within those market groups as well.

Thank you for listening. If you want to keep up to date with the research that is done in this area, please visit our web site and you can download reports and other information in this area. Finally, I would like to thank our generous sponsors who objectively and kindly support the work in this area that the centre does.

'Towards the Forgiving Highway' – Paul Hillier

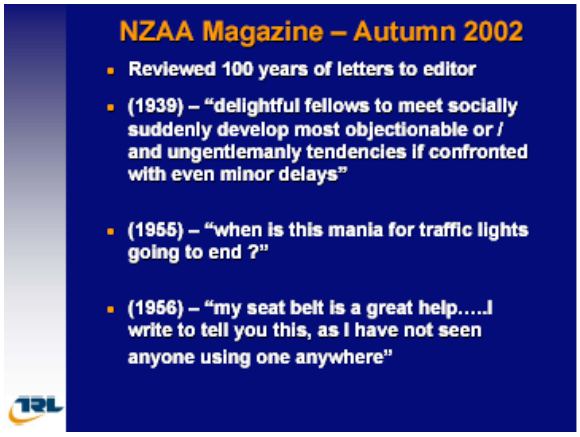
I would like to try and present a slightly different focus on some of the events from this morning, to try and put a little bit of perspective of a practitioner, someone who has come out of local authority but then gone into a research and investigative field.



What I would like to do to do that is just to tell you a little bit about my background. As Lisa said, about nine or ten years in local government and investigation sort of work but I much prefer to bring lessons back from nuances and the investigative to legislative and strategy and systems improvement, that is what we are all about.

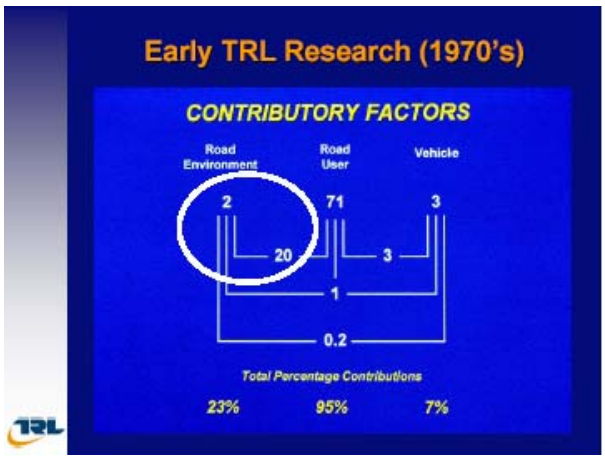
To have an overview on high risk strategies and policies I feel that I have got to get to grips with road safety and road safety issues and engineering really to have a good overview and be a good all rounder. I am not just about building, maintaining and managing roads and also I think I have got a bit of a vested interest as a road user, a tax payer and also my family, so that keeps me focused sometimes.

We have certainly come a long way. This lady here, Bridget Driscoll, was the first ever person killed in a road traffic accident anywhere in the world. She was a pedestrian who got hit by a car in 1892. At the coroner's court the coroner summed up and said "A terrible occurrence, make sure this never happens again". Now we have certainly come a long way.



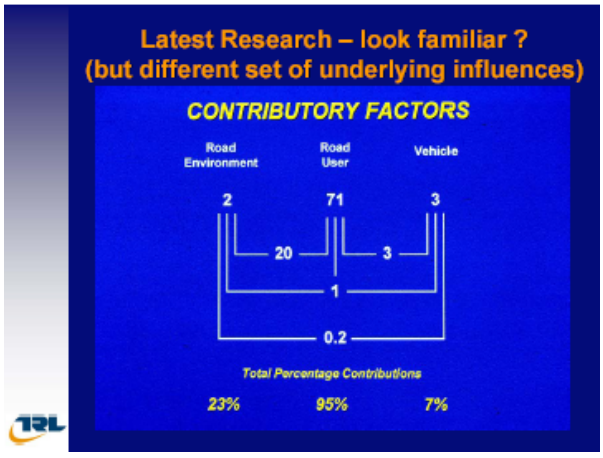
I had a few thoughts over in New Zealand, whilst I was on holidays last year. The New Zealand Automobile Association reviewed the letters to the editor in their magazine over the past 100 years. How about having a little look at some of these - talking about road users there. How about a few ideas from the fifties – Indeed a number of these initiatives have come in and have helped to drive down the road toll and we have got a global road crash problem – I will not leave that one up there too much, it has been done to death this morning by various speakers but certainly at the Transport Research Laboratory we took an interest in research in the 1960s and 1970s going out onto the scenes of accidents within a control area around the organisation—which is based about 20 miles west of Heathrow Airport for those of you who do not know where our headquarters are.

'Towards the Forgiving Highway' – Paul Hillier



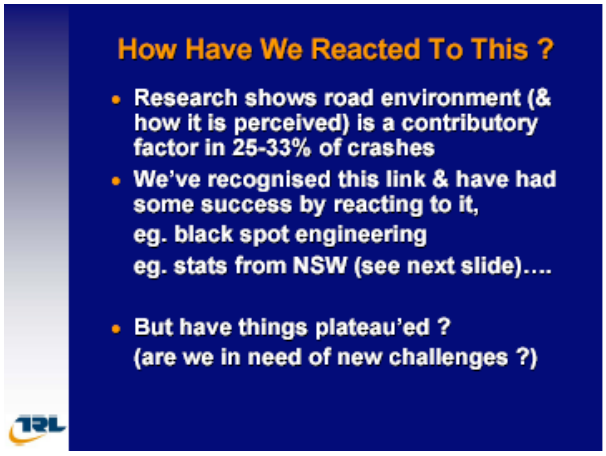
Basically they came out and were examining the road environments due to vehicle practice in accidents to look at the contributing factors and the two major studies came over with the results here, road environment alone a contributing factor in 2 per cent of accidents, road user on its own 71 per cent and vehicles, surprisingly low, 3 per cent, but then there is also double and dual factors there, so road environment and road user combined, that is the perception of the road user of the road environment, that about 20 per cent contributing factor.

As a highway engineer or highway management engineer I am interested in those two and that what I am hopefully here to pass on a few thoughts and a few issues and raise a few challenges. We have seen from an on the spot study for two years into a three year study, filming again currently, and here is the results so far. It looks surprisingly familiar but there are a whole set of different and underlying factors. That is the important point to make about it.

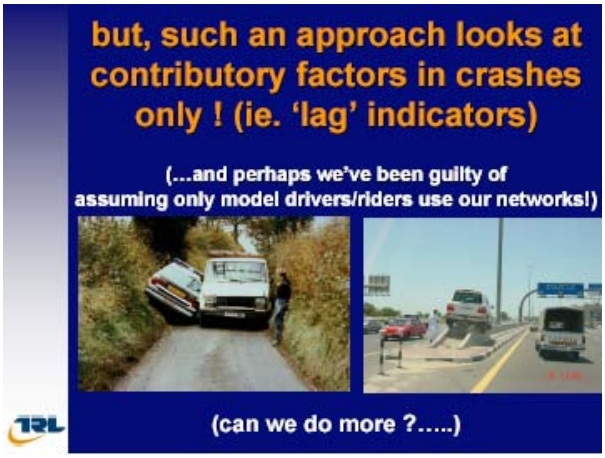


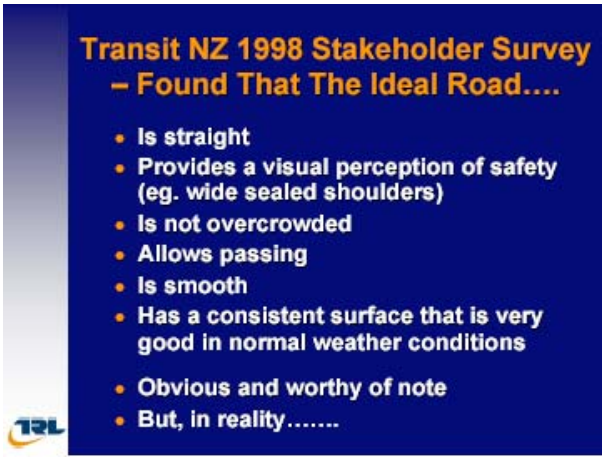
How have we traditionally reacted? Well, you go to the same studies around the world and road environment and how it is perceived, contributing factor, roughly a quarter to a third of all crashes, and that has been consistently shown in these studies in the sixties, seventies, eighties, and indeed, later.

We recognise this and we have had some great success. We have done black spot engineering or continued to do black spot engineering. We have had some great success in New South Wales but have things plateaued? Some interesting discussions this morning on whether it has or whether it has not and are we in need of a few more challenges?



Some success in New South Wales certainly since the 1960s but we are looking at things like, with black spot engineering, like what we call LAG indicators or perhaps going forward by looking in the rear view mirror. Looking at the causation and contributory factors in accidents and perhaps not looking ahead. Are there some





sort of triggers out there or pointers that we could do a bit more and also, we have heard about this morning, perhaps we have been guilty about assuming the model driver, if a vehicle can get into a place, it will.

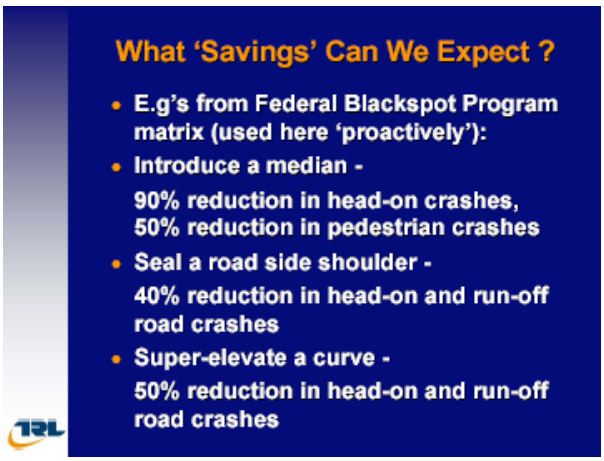
I have been asked to talk a little bit about the concept of something called the Forgiving Highway, which you may have heard something about and indeed I did a quick search trying to find out who pioneered the term, how long ago it came in and certainly references as far back as the 1990s and I am sure much before that as well.

I would like to introduce it by a slightly tenuous route, by looking at New Zealand and Transit New Zealand who manage the State road network over there, did a survey back in 1998 and got some views on what road users and stakeholders thought would be an ideal road and they came up with this list of factors. It is straight, visual perception of safety, not overcrowded, smooth and when conditions are very good, the road surface is very good.

It is obvious, it sounds pretty good and it is a good reality check for highway engineers, highway management engineers, but wouldn't it be great if all roads were like that. So a few thoughts on the Forgiving Highway. It is trying to improve safety for all road user groups, including those who make errors who are not quite the model road user. It is helping out during the incident phase and forgiving at the post incident phase but some of these things also have a double edged effect on preventing incidents in the first place.

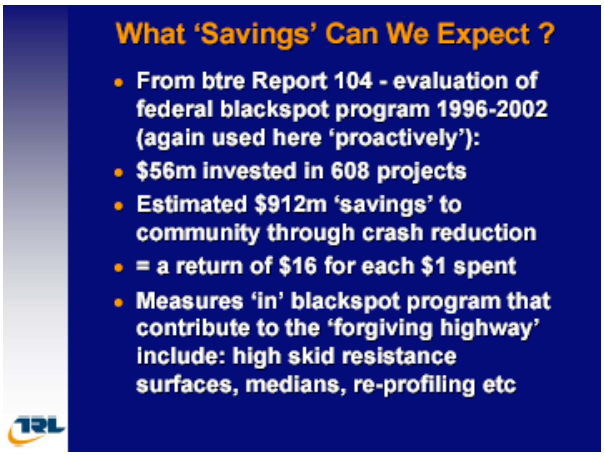
The traditional things we looked at, we looked at design, geometry and provision of things like safety fences by design, the provision of medians, dual carriageways, separating traffic flows, those sorts of issues and provision of clear zones and also a big focus of the Forgiving Highway is controlling point objects at the road side and particularly the frangible street furniture and also I think particularly important is good road surface and certainly all of these are important but just going back to point loads, here is a few hints that

certainly we have been involved with. Top left typical rural scene with vegetation, trees very very close to the road environment. Certainly top right, you see traffic incident involving a pole and again a tree related one on the bottom there.



I would like to use a few figures that a number of you in the audience will be familiar with from the Federal black spot programme matrix and what sort of savings and what sort of things happen if you look at this Forgiving Highway? Well, introducing a median, yes, 90 per cent reduction in head on crashes would be expected, 50 per cent reduction in pedestrian crashes and then other things there about a roadside shoulder and also super elevating curve.

So by doing that we have taken a figure that we are sort of traditionally pretty happy with but then applied it pro actively and said: No, let's not wait for these accidents to occur. Can we apply it or not on the highways now? Again, there is a further report shown here 1996 to 2002 evaluation in black spot programme, a few suggestions to pick out there. That is a key one and the research showed that for every pound spent on road safety and community measures and road building measures, a return of $16.



The report also picked out things like high skid resistant surfaces, medians and re-profiling of the highway. Isn't there more to it than just about design? It is not just about having a pristine highway. It is also tackling us as engineers and things to do with wider engineering pictures, road safety, having awareness of people in the organisation in different roles having different targets and common goals. One of the reasons that I called my talk this afternoon Towards the Forgiving Highway is I think we have got a lot of work to do but it is a worthy challenge and I think we need to tackle it head on.

We have inherited an involved road network. How many people are familiar with roads around those? Certainly the Forgiving Highway is a much easier concept when you are building a

new section of road. On the bottom one there, that is an interesting investigation we got called into. It is the Selby Road rail crash in the United Kingdom where a car towing a trailer left the highway and then went onto the railway tracks. A passenger train collided with the vehicle combination, and then hit a goods train. As part of the investigation into that we looked at the role of the safety fence and its position and whether it should have been longer or differently placed, or built of a different type. We found an interesting thing was that the safety fence was compliant with the standard, it was 30 metres long and we said, "Okay, let's question the standard rule then. How did we get to a figure of 30 metres?" Somebody said, "Well, we think it is because it is a conversion to the metric from 100 feet." We said, "Okay, how did you get 100 feet?" The answer was "Well, safety fences used to come in ten feet sections, we put ten together and we thought that was a reasonable length."

There are many, many examples of that sort of thing out there. Which as engineers, as much as we respect things that have happened in the past or whatever, there are times when we question some of these things and one of the points made this morning was about research led, where things and ideas and initiatives that we are getting up to.

Without stealing too much of Raphael Grzbieta's thunder, certainly top left, please be aware that with every road safety engineering or counter measure you put in, there can be some potential disbenefits there. Top left is a ramp and safety fence, so as good a job as it will do, there could be situations where a car hits the end of the ramp and the safety fence and glides up it.

The top right is an interesting one because typically we design our safety fences for a 20 degree angle of impact, 113 km/h, 1.5 tonne standard saloon car and we go along and we provide those out there on the network. That cannot reasonably be expected to contain something like a heavy goods vehicle. They do in certain situations and they are very good.

About the Forgiving Highway, we decided to turn it on its head and say we want to start protecting trucks, et cetera from going across the median or going across the highway. We have needed to think about the design of some of these design criteria, thresholds and acceptance criteria we are putting on products that are out there.

I have included skid resistance as well because I think this is an interesting one which could certainly be done better in Australia from experience in the United Kingdom and certainly in New Zealand. I am currently involved with Project Crossroads which is developing guidelines for measuring skid resistance on road networks and it is not just about routine manoeuvres, we are also thinking there about drivers who are getting themselves into trouble or had to react to certain situations on the road network and need a

bit of help with the road surface to successfully complete the manoeuvre or emergency manoeuvre.

What about retrofitting, I guess it is linked to this evolved network. One of the huge challenges of providing a Forgiving Highway is we have to go back and retrofit. What do you retrofit? Retrofitting is horrifically expensive and again it is a funding issue and there is no easy answer, we heard this this morning, but there is also a few more, what about land take. If you go from a single lane carriageway to two, and three, four lanes, if you go to at grey junctions or grey separated junctions, it all takes land.

What about thinking ahead in the future as well? We could provide a Forgiving Highway now but what about the trends that are coming? Who could foresee about ten or fifteen years ago the influx of 4x4 vehicles? We have provided safety fences which did very well for a saloon car, but a 4x4 vehicle – and then reacting smartly to emergency safety issues, we use a particular type of safety pole which we found from investigation in four or five accidents was suddenly starting to fracture and then we had a number of accidents where it was coming in underneath the floor pan.

So we set out what makes a Forgiving Highway. We have also then got to be prepared to react if something happens and we get emerging trends, so we have got to react to that. It is also about education of individuals and achieving higher common goals. As I said, as a highway management practitioner I also want to know how I am contributing to reducing the road toll and that must be a focus. Not only have I done my job but I am also contributing to the organisation's common goals.

What about road safety auditing, something that has come in I would say in the last ten or fifteen years, very laudable. Just a few things there where it has not quite gone so well. The top photo shows several signs, one in front, one in behind a safety fence and also on the bottom you see an example here from Thailand where it is a three lane road and it looks like the right filter lane, you can just about see the double lines there, it is actually guiding you to turn right to go into the opposing traffic flow. So all those sorts of things literally dissolve.

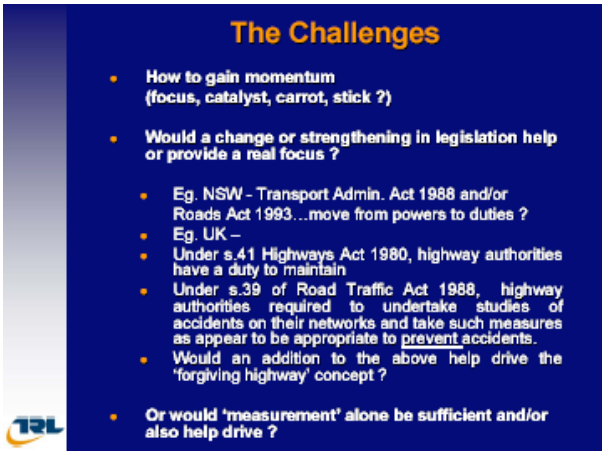
Here is a fairly new concept that I want to introduce, virtual road safety auditing. This is not an animation, I make it perfectly clear, it is a 3-D accurate model of a scene. If I clicked on say the top of that red post box there, the top of that bollard, it would give you an exact distance.

The reason that we go to that much detail is that before something is actually built on the network we can have a look at some of the safety issues

and pick some of them up a lot easier than we could perhaps do from a plan. The main advantage of that is (a) you can spot them earlier and (b) you avoid the political backlash of going back and doing a knee jerk or a possible problem.

Perhaps not applicable to low value schemes so much but certainly big ones, high value and/or politically sensitive, why not give it a go? What we can do there is we can model it, we can put cars on there, you can become anywhere in that particular scene. You can say, right we want a view as the driver of the blue car or you can say on this other one here, on the bottom right, you could be a pedestrian standing at the bus stop. You can put yourself in any position. You can have a view round the sweep, you can do a plan and you can pick up some of these obstructions, the visual things. Can the car driver particularly see from that particular road junction? Is it being blocked by signs? Is it being blocked by a piece of furniture from somebody else?

We are also talking about communications. For so many people communications change these days, contractors, consultants, road authorities, responsibilities and contractual arrangements. What is happening in the top left is in the distance there is a safety fence being constructed to protect an embankment, there is a tree near the side, which is the provision for a safety fence in front of an embankment. In the front of it there is a safety barrier protecting a sign that has been put in there. Done by two different contractors, you have ended up with a gap in there. One contractor has obviously come along after the other one. I don't want to work with that sort of contractor and I shouldn't be expected to work with that sort of contractor, because they are just interested in coming in and doing their job. They should be clued in enough to say This isn't right. Get on board. Get onto the other people. Who needs to know about this problem?



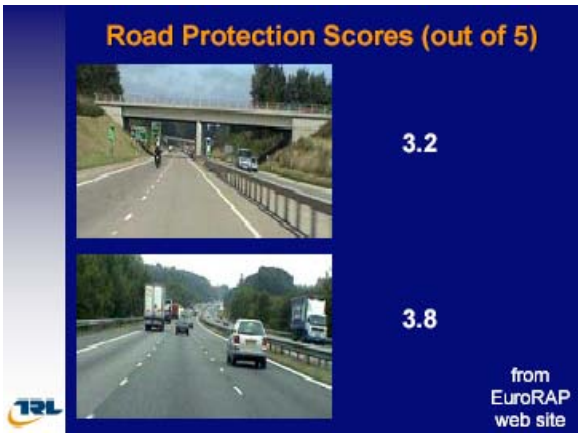
What challenges? How are we going to gain some momentum for this Forgiving Highway? How about something like a change in legislation? The one I am particularly familiar with in the UK, we have a duty to maintain and we have also go a duty to do some things in respect of road safety engineering and its talking about preventing accidents. How about a slight change in the legislation to make it that if an accident occurs you have got to have a Forgiving Highway? Or perhaps with measurement alone, something about measurement, would that be

sufficient to help us?

Just very quickly I want to cover something called a road assessment programme which some of you will be aware of. Perhaps the most advanced one so far is EuroRAP and what it does it is builds on the incredible success of NCAP ratings, AusCAP, Euro NCAP and tries to rate highways for safety. It has been going on for sometime now, since around about 2000 and we are involved as a partner in it.

Two protocols in respect of road safety features and also crash rates. It has kind of focused on crash rates a little bit up until now but we have been fairly involved in respect of safety features and it goes from 0 to 5, low to high and could be used as a name and shame, well, that is one of the criticisms levelled at it so far but I think there is a better option. Watch this space. Certainly there has been some embryonic interest in Australia, we have just been asked to provide a proposal for New Zealand as well, the New Zealand RAP.

The principle behind it is you have got four or five star cars now on some one star roads and you have got some solid unprotected roadside hazards and it is all about reducing severity of injury and creating this Forgiving Highway. The road protection score and it assesses the safety features, primary and secondary and the important thing about EuroRap is it looks at routes as a whole rather than specific sites along those routes. There is a long way to go, it is not there yet but a lot of work has been done on it. In my view, and it is a difficult one as an employer of TRL, we were asked what we knew about EuroRAP, I think we can do a whole lot better and it is linked into the fact of who was commissioning the work, et cetera, in the first place. But I think if there is a multi agency sign up something that, for example, NRMA are happy with, the RTA are happy with, Staysafe are happy with, getting a common goal, something that is fair to everybody and getting something up there as a focus, I think that could be a guideline towards the Forgiving Highway.



Here is an idea, just four quick examples of road protection score, the top one scored badly because of the lack of clear zone, width and also vegetation. The second one, slightly better, you have got a median strip there on the edge and also vegetation away from it. These are just taken from EuroRAP roadside. Slightly improving towards the score of around about four for the bottom one, which is actually, you know, it is not very clear from that photograph but in fact you see the segregated road use, cyclists and pedestrians away from the road. It has also got at grey junctions and three lanes, crash barriers inside and outside.

A few closing thoughts and a couple of questions. We found that research is consistent, road environment and how it is perceived is a major contributing factor in crashes, 25 to 33 per cent, depending on which study you look at. Changes in road involvement will undoubtedly contribute in bringing the road toll down, I am convinced of that and I think it is worth the challenge, but it is not just about design and it is not just about roadside objects, some of the cultural organisational issues as well, getting everybody sitting on the same side, it doesn't matter if they are a highway inspector, road safety engineer, AIP engineer or work in highway management enforcement, whatever, driving towards a common goal.

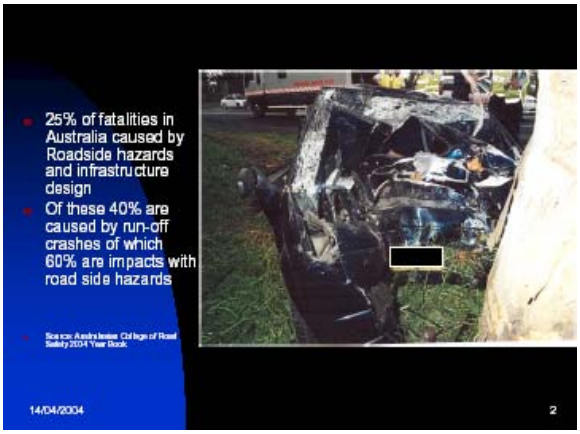
We need long term commitment because it is not going to happen overnight and I will just leave you with a few final questions, can we or should we be looking to address all sides? Would it be aiming too high to say we are going to create a Forgiving Highway all over the State or should we confine it to certain types of road? How are we going to get some additional funding and do we need a clear focus or catalyst? Could it be in legislation? Could it be an assessment programme? Thank you very much.

'A Crash investigators perspective on road side environments' – Senior Sergeant Peter Jenkins

The aspect of motor vehicle collisions and the associated road trauma does not appeal to everyone. The field of crash investigation is certainly a task that you must want to do. The notion of crashes, however, does present some fascination to the majority of the population. If this was not the case then why are reality shows portraying to us bad drivers, police pursuits and other driving incidents on our television screens and now readily available on video?

It is certainly a fascination with the dynamics involved and the investigative nature of crash investigation that has kept me not only interested but I believe hopefully dedicated to this specialist field for over 17 years of my almost 20 years' policing career.

Today I have been asked to speak to you, however, regarding a particular aspect of crash investigation and that is my perspective as a crash investigator on the roadside environment. My presentation therefore is my perspective. I am not a traffic engineer and I am not a road safety researcher, I am purely and simply a crash investigator who attends the scenes, interviews the parties involved and, if warranted, charges drivers with criminal and/or traffic related charges arising from those instances.

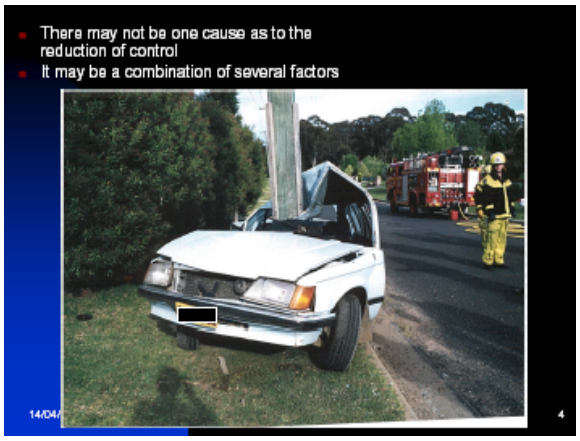


The 2004 yearbook of the Australasian College of Road Safety provides a figure of 25 percent of fatalities in Australia which are caused by roadside hazards and infrastructure design. This is further expanded where approximately 40 percent of fatalities are caused by run-off-the-road crashes of which about 60 percent are impacts with roadside hazards.

In delivering this perspective to you on the roadside environment I have split the subject into two areas: Firstly, what in relation to the roadside environment helps cause a loss of control and, secondly, what roadside objects cause the most damage? Firstly, what in relation to roadside environment helps cause a loss of control? I don't like "loss of control", so let's call it a reduction of control. When you attend the scene of a serious or fatal collision where the vehicle has left the roadway and either struck an object or has rolled, one aspect that you have in the back of your mind to answer is: How did the vehicle get into this situation? I need that answer; the family needs that answer. There are several factors that must be considered: Has the road contributed by its design; the weather conditions; the vehicle; the location of the roadside object and of course - and probably foremost - the driver?

Ogden (1996) in a text that he wrote provides possible contributing factors to the above situations and he states:

> "Vehicles can and do leave the roadway for a variety of reasons associated with the driver (e.g. fatigue, inattention, distraction by a passenger), the vehicle (e.g. tyre or steering failure, truck load instability), traffic conditions (e.g. another accident, animal or pedestrian on the road), the road environment itself (e.g. weather) or a combination of these."



It is the final portion of the quotation that I believe is the most important: "or a combination of these". In the vast majority of collisions that I have attended and investigated the cause for the vehicle leaving the road and/or colliding with a roadside object has been due to a combination of factors: Travelling too fast for the prevailing conditions and side-slipping through a bend resulting in an impact with a tree or a pole, the factors being weather, inappropriate speed and the driver.

What factors can assist in a reduction of control? Certainly gravel or bad shoulders, potholes, the road surface itself, the design of kerbs and location of culverts, can play a role in the reduction of control experienced by a driver.

When a vehicle leaves the road in the initial stages, gravel shoulders do not provide the friction that is required to assist in the vehicle being steered back on to the road surface. The driver usually over-corrects the steering due to the limited response and in essence heightens the situation. If the incident is on a bend it is usually the rear wheels that will come off the sealed surface and the lack of friction will cause the rear wheels to continue sliding. The vehicle is then travelling in what is termed a yaw. At this stage the vehicle is beyond the point of no return.

The same can apply with raised shoulders where the vehicle may travel off the road due to rounding a bend too fast or other driver action (e.g. fatigue or swerving to avoid an object). The sudden drop or change in a surface not only alerts the driver, who immediately tries to correct the action, but the lip can, in extreme cases, act as a barrier preventing the vehicle responding to the steering input, especially if the vehicle has already commenced to rotate. This can have a similar effect with the vehicle entering into a yawing motion.

Potholes can play a part in the reduction of control of a vehicle; however, in my experience, this has been rare in relation to the matters that I personally have attended. In fact I cannot

place one collision down to the reduction of control due to a pothole. While I am sure some drivers will use this as an excuse, it would completely relate to the size not only in length but also in depth of the pothole and, of course, the actions of the driver in relation to speed and avoidance of the hole. I have no doubt that some instances have been contributed to by potholes, especially where there may be a collision with one and a tyre has failed or steering mechanism has been damaged; however, if the driver is aware of the pothole, it is more probable that the reduction in control was caused by avoidance attempts on the driver's behalf (e.g. excessive swerving).

The road surface is probably the most important aspect of collision investigation, especially where a reduction of control is encountered. Potholes do form part of this category, however we are more concerned with the actual road surface. Any moving object requires friction to be present for it to move. Motor vehicles are no exception with the friction provided through the interaction of the tyre and the road surface.

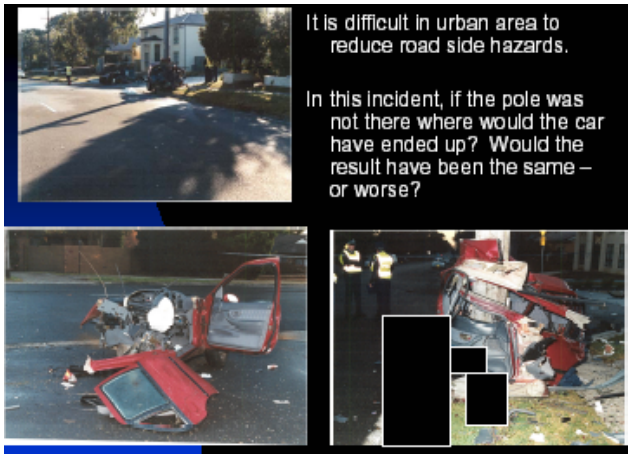
The condition of the road surface is therefore vital in establishing a frictional value for use in collision analysis for the calculation of speeds. Inspecting the road surface for oil deposits, wear, which is the smoothing of the surface, or other lubricants is just as important in dry conditions as in wet conditions. The road surface category is probably the most blamed by drivers for the cause of collisions. As we all know, it is never the driver's fault but some other aspect such as the road and weather conditions.

Once again, a combination of effects comes into play. A common scenario: A vehicle travelling for all intents and purposes at the speed limit in drenching rain. The roads are wet and naturally slippery. The driver fails to compensate for the conditions and, on rounding a bend, the vehicle starts to side-slip. The driver tries to correct; however, the vehicle - depending on the area - impacts with the kerb, maybe mounting the kerb and impacting with a roadside object or, if no kerb is present, sliding into the gravel making recovery virtually impossible.

This brings us to the final area of causes for today's discussion being concrete kerb and guttering. In the majority of older developments and road networks, the common kerb and guttering is at around a 90 degree angle to the road. In instances where a vehicle is commencing to or is travelling sideways during a reduction of control, the kerb can act as a tripping mechanism due to its height and angle causing the vehicle to flip and commence to roll. This can also be the case with culvert ends and drainage ditches.

'A Crash investigators perspective on road side environments' – Senior Sergeant Peter Jenkins

The second part of our discussion today is on the question of which roadside environment feature causes the most damage. This is indeed a difficult question to answer as there are so many variables and is certainly related to the individual collision. Certainly trees and poles are unforgiving and can take a sufficient amount of force associated with impacts. I have investigated a collision which will stay with me forever where a power pole was snapped three metres down from the top of the pole, actually sitting on the road - fortunately there was an ambulance underneath it because it stopped it hitting all the other operatives who were there - due to the forces involved in that specific collision with a trail bike. A trail bike snapped a pole.



Certainly impacts with objects such as trees and poles produce some of the most dramatic collision impacts I have ever seen. The effects of rolling from tripping on a kerb or culvert are just as devastating. One roadside environment feature that we have not mentioned, but which can produce dramatic impacts, is impact between vehicles and steel Armco railings and other barriers, as we saw in the previous photo. These are particularly topical amongst motor cycle groups due to their destructive effect on riders. The main aim of these barriers is to assist in the prevention of collisions in instances of curves, crossing onto the wrong side of the road and so on, yet there have been instances due to the nature of impacts where the railing has intruded into the vehicle.

I do not believe an impact with one environmental factor can be attributed to causing more damage than another in a general category. The impact must be looked at in the circumstances of the collision. Damage occasioned in a low speed impact between a car and a road sign, for example impact with a parking sign, may cause minimal panel damage, yet the sign may fall and strike a pedestrian causing a fatality. Compared to a vehicle travelling at high speed and impacting with a power pole, the result may be the same, however the damage occasioned to the vehicles is totally at opposite ends of the scale.

I think that we should acknowledge that all roadside environment factors could have the potential to cause not only devastating damage but also injury and death to road users. I am aware of several areas of research into making these environmental factors safer with such developments as slip base poles and impact absorbing poles, wire fences to limit the amount of intrusion on to the incorrect side of the roadway thereby reducing the risk of head-on collisions, creating of clear zones and recovery areas on our road systems and the implementation of roadside hazard management.

The Roads and Traffic Authority statistical statement for the year ended 31 December 2001 in the Accidents, Object hit in First Impact, Degree of Accident category showed that the main object or roadside hazard that is impacted with is the humble tree. Whilst in the perfect world we would have sufficient space to put in place recovery areas and clear zones, this is not always practical in all circumstances. The distance for a vehicle to come to a safe stop after leaving the roadway is certainly dependent on a number of factors, speed of the

vehicle being on the top of the list. Where technology and engineering designs are not able to eliminate the roadside hazards then they must be used to reduce or manage the hazard.

Not one solution is the answer and it should be remembered that not all solutions, no matter how feasible they seem in theory, are practicable. We have to try to find a balance to reduce the roadside hazards and manage the hazards that we cannot eliminate.

Be assured, only so much can be done by authorities and road safety practitioners to reduce hazards. The biggest challenge facing road safety practitioners, be they engineers, police or other authorities, is the most challenging, one where slow progress is being made, yet remains the greatest hazard and contributor to road trauma: The driver.

'It's time – Let's get really serious and get rid of the road toll' – Professor Raphael Grzebieta

171,000 road fatalities since 1925. 104,000 fatalities from all the wars and disasters. 34 since data was taken, 746 fatalities from natural and man made disasters, which consists of Cyclone Tracey, fires from Canberra, New South Wales, Ash Wednesday, Thredbo, Bali bombing, you all them all up, it is 746, so when we talk about road fatalities, all the other pale into insignificance and yet we have a problem in terms of trying to get the message across.

Of course, the safer roads campaign road is starting to do that. Today, from midnight last night to midnight tonight, five will die. Sixty will be seriously injured. Today, death or severe injury from road crashes will affect 60 families and as we keep on going into the week we get more. Is this is not a war or a disaster? It is a disaster of huge proportions. Civilised countries should not accept it as inevitable. We need to be more compassionate here.

In Spain we had the protest against the bombings in March 2004; against the terrorism that occurred there. As a result of the bombings there were 200 fatalities, 1500 injured. Here in Australia, we had a statement made by our Attorney General that the police would have greatly increased powers to arrest suspected terrorists. Laws were going to be changed—and the event did not even happen in Australia—but laws were going to be changed. I point to the statement that, "This is not a traditional war, it is a war in which people pose a threat to the life and liberty and safety of the Australian community". Is that not what we are confronted with when we look at road trauma?

Australian Design Rules for seatbelt reminders. We tried to get that past the Department of Transport and Regional Services. A seatbelt reminder Australian Design Rule, but we cannot get it through. What have we resorted to? Consumer testing—We have the Australian New Car Assessment Program putting a tick next to a box if a manufacturer has put a seatbelt reminder system in a vehicle.

With road safety, you are talking about the three areas: human factors, vehicle factors and road factors. Reducing speed alone without addressing vehicle crashworthiness and crash compatibility with regard to the road system and other vehicles may not provide the crash severity reductions that potentially could be achieved if all three facets of the problem are put together and looked at together. We have to look at them together and we are talking about sustainable road safety and injury reduction. So if we suddenly drop enforcement it is still there. It is still holding that certain amount that we are trying to find.

This is controversial. Characteristics analogous to land mines. It is no different, look at the effects. They kill and injure people. Similar biomechanical outcomes. The same biomechanical outcomes in terms of damage. Priming, they are always primed and ready to kill or injure. They are there. It is out there. We drive around, we know that they are there.

Lifespan, lasts many years, we cannot get rid of them, degradation sometimes affects it. If we have degradation in a certain safety system then we have got a problem.

Visibility, they blend into the environment, even for experts, sometimes I have presented throughout a seminar around Australia on road safety barriers and I have presented information to designers of roads who are shocked at what they see. So they are experts themselves and yet they themselves have things to learn.

Ease of avoidance, difficult because of the proliferation, there is a huge number and the camouflage and detection, we need skill, patience and persistence to get rid of them. Prevention of proliferation, it is political. Let's face it, it really is.

Cost, inexpensive, they are out there, it has not cost us much to have that presence of the hazard. Removal, difficult, costly and requires considerable skill and sometimes courage and I say not courage in terms of land mines, of course courage to go up and diffuse it, but in terms of our hazards we have got a problem.

So road safety hazards have similar characteristics to land mines and we should think of them in those terms. Road safety hazards are being created by well meaning and responsible practitioners. Let's look at the Stogy pole, it is a classic. Hailed as the great new invention for Adelaide, saving trees. However, it has killed more people in Adelaide than I would want to hear about. It is a killing machine.

A multi facet approach is needed to prevent the proliferation and blame denying grandstanding and power playing are just counter productive. We have got to make this politically independent. It really has to be if we want to get any gains.

I will talk about some of the things that I see in terms of some of the problems. Frontal aggressivity, Stuart spoke about that and thank you for that because it is interesting in that the aggressivity has not been addressed in terms of our design rules. We do not have any rules to protect us against this. Here is a truck that has crashed into this particular vehicle and two of the occupants inside died. Now you can see that the mismatch is huge and yet we do not have any regulations that control this. Tram, this crash happened at 35 kilometres per hour. The person died. 35 kilometres per hour, both doing the correct speed limit. Once again we have a problem in terms of compatibility with the vehicles. Here is the four-wheel drive, which I will show you, this is the reason why from a physics perspective why this occurs.

When Klaus Tingell was the head of the Accident Research Centre at Monash we worked together on putting this particular test together. Watch the head of the dummy. Once again the head of the dummy strikes the bonnet, this bonnet here. The head comes in and it hits that. Now if you have a bull bar on there it makes it even worse. Here it is again and it strikes that bonnet.

These two vehicles have the same mass, they are just different geometries. Here is the vehicle crashing, the four-wheel drive, a different shape crashing into the side and it is no wonder that we have those sorts of fatalities occurring.

Bull bar terrorism. I notice Harold is not in the audience here today but I thought I would push a little bit of that and I find this extraordinary. Here we are talking about terrorism, well gee, these are loaded guns aren't they? If you think about the previous image that we

saw, we have an ADR, 42.9 and we have a standard. Yet they are not being enforced and we need to do something about this, we really do. Either educate these people or change it.

Over ride protection is fairly straight forward, we can put protectors on for frontal aggressivity. I would like to see a test, I know it will never come in my life time but this is what I would say would be required, a struck vehicle, have the T-bone test, have the struck vehicle, small compact vehicle, any one of the four top selling vehicles for the given year of manufacture, cannot be any older than five years, without side bags unless standard in all four top selling vehicles. Driver and rear nearside passenger dummy instrumented head and chest, 90 degrees strike at 50 kilometres per hour, centre of the B pillar of the vehicle that is being developed. In other words a truck that is hitting it or four-wheel drive and have a head injury criteria of 600 and a chest 66, I guarantee you if we introduced that tomorrow we would start seeing some lives being saved.

Here is the under arm, as I said, how many more decades and deaths before this ADR and Stuart's graph of the ADRs is a beautiful piece of information that we need to go away with. Darren Millaine, Collingwood football star – I barrack for Collingwood – but anyway, Jane Mansfield also died this way. Man landed on the moon since we asked for an under arm rule. It negates everything about crashworthiness that we can think of.

Here was a 75 kilometre per hour system developed by George Kreknikser when he was at the Accident Research Centre, I was his supervisor on his PhD and it is a survival crash at 75. That is quite a high speed.

Pole crashes, we are hearing about pole crashes. Here is my contribution Peter. Look at this, 80 kilometres per hour zone, we know cars cannot – you cannot survive in a car that crashes into a pole in an 80 kilometre per hour zone yet here we are close to this and they have even put flowers up on there. If I was the design engineer or engineer responsible for this road, I would say that is a slap in the face.

This is the reason why I have pinched this off the Insurance Institute for Highway Safety and if you look inside here you will see that the head strikes the pole and this is at a slow speed. This is only about 27 or something, or 30 kilometres per hour and you will see inside the benefits of the air bag.

I think the air bag should be compulsory. There is the mark on the pole and then when the side air bag comes up you see the occupant. However, we need to introduce legislation that stops manufacturers de-specifying vehicles. They have got these bags in Europe and in the US yet when they import them here we lose them. Why are we treated as a lesser citizen than other civilised countries? We need to consider that.

Rollover is an area that I am really quite perturbed about. One in every fatality run off single vehicle is a rollover. There is no design rule. There is no consumer testing for this type of crash. How it works is you are driving along, you fall asleep, you suddenly wake up, you are up on the side of the road and then you jerk the wheel and then of course the difference in the calciture and friction between the gravel and the bitumen, you wind up rolling the car.

This has our rollover roof protective structure in all the Perentie that have gone overseas. What was bizarre was that they developed the system to protect the soldiers with a large plate underneath the vehicle for a land mine explosion and when the explosion occurred it rolled the vehicle and they were killed by the lack of a rollover bar.

This is the – actually, I might skip this because we are running out of time here. This is how actually Jack Hamilton died. He hit one of the end terminals of a tram terminal that protects pedestrians and the vehicle rolled over and this is how he broke his neck. This is what happens in such a rollover. This car is rolling over, it is upside down, there is the ground going in the background and you will notice the roof will crush in, and watch the neck of the dummy here. There it is. That is what causes the paraplegia, quadriplegia or fatality, is that roof crush coming in.

Now Murray McCain may dispute me on this one, the other, what I call smokescreen is that you come out of your seatbelt and dive into the roof. However, I think we need to strengthen those roofs and put in proper restraint.

Roadside hazards, likewise, I will talk about, so they are attributed also to freeway crossovers but one of the classics ones is the Diana crash. It is obvious how she died. This vehicle was the safest vehicle in the world crashing at about 80 or 90 kilometres per hour into a pole. Nothing will save you. However, this is what we see around our streets. I have shown this down in Victoria and of course they put the barrier in, which is great. That is terrific. I like those sorts of responses.

This was another one, I put this one up because this looks very much like one of my sons and fortunately my sons have lived to the age of 22 so I am hoping that they will continue on and that they will not find themselves in this position.

This satisfied the clear zone rule and this is what we need to think about, this clear zone rule. We have now since implemented wire rope barriers down the middle. We avoid roughly I think about a couple of fatalities a year at crossover, but also striking this pole.

Since wire rope barriers have been installed, now this I got from Nicholas Ferd from VicRoads, that this gives you the length, total length and the total years that are looked at and how many fatalities that you had, 75, now if you halve this you will get 18 roughly. I am not a statistician here Stuart and I hope you don't hold it against me, but you can see the drop.

Wherever these barriers have been installed, about 90 per cent drop in fatalities and so these wide sort of open expanses, we need to put these median barriers in there.

The other thing is these signs which are satisfying the clear zone rule. The problem with this is that if you hit some of these blunt objects you have got a real problem, in that it will certainly do a lot of damage to your vehicle. This is a brand new freeway, this was gone through and upgraded. Here is a blunt end terminal, it is outside of the clear zone, so it just meets the clear zone rule, but someone has already struck it, just a few metres up ahead.

Now on the other side of this road, this is an interesting road, up here wire rope barriers start and of course ahead of this, about 200 metres up, wire barriers end. They did not continue it all the way through. This is passed the road safety audit by the way and it is a curve that is going to the left so if you fall asleep or have a heart attack or whatever, you straight line, you go down the embankment and you either hit oncoming traffic or you will hit this other blunt end.

This is what happens when you hit blunt ends of course and so the physics shows us that we have a horrific crash. I will show this one – I know the other one was shown here from Crash Lab, this has been doing the circuits and thank you very much to Crash Lab – this shows you a 56 kilometre per hour, this is 100. Now on freeways there is just no way we can design for this. This does not happen, so what we have to do – and here are these ramps. These ramps are classic. Where I see them everywhere around. We chuck rocks but in Melbourne we have got them too and here is what a ramp does. This is courtesy of Rob Troutbeck this one.

So the ramp just launches the vehicle into the air. This is at 100 kilometres per hour. It just keeps going, and going and going. It does not stop.

Spearing is an issue. We have talked about spearing. This is an old one, you will see this one, this is from the States, I think it is from A & M College and there is the barrier coming in. That is quite bad. This is another one which is the Mazda coming up against it, a bit dark there but you will see it as it comes in and it just about takes the roof off. It sort of works but we need to do more work in this area. Here it is, and that is the problem, we have these vehicles which are getting softer in the front and snoutier and we have got to be smarter. We cannot use the technology that was developed back in the sixties and seventies.

This was a particularly nasty one. Mum turning around, cautioning her kids. This was investigated by George Wreck, the State Coroner of Victoria, unfortunately she is alive and her kids are dead and she is living with this pain because we have a problem with these end terminals.

There was a solution, put slits in them. However, these were installed without testing. I find that extraordinary. Before I do anything with any sort of product I would test it.

What we are talking about is safer vehicles and safer roads. Vehicle and occupants cannot be considered in isolation. We cannot do that and likewise they are a sub-system of the road environment. We have heard about that the whole day today, we have got to address all three.

When we are talking about funding authorities and designers of systems, they are ultimately responsible. I also have another hat on and which is representing the Institution of Engineers. I am their road safety representative on that National Committee for Transport and I need to educate engineers who are designing these systems every day in a continuous way and I encourage you to do the same, so that they learn a bit more about this.

Regulations, introduce mandate and of course ADRs, Australian standards that acknowledge and address – I will use the words of the Attorney General – the threat of hazardous road systems to the wide liberty and safety of the Australian community.

I need to also thank the Australian Research Council because if it were not for them I would not be presenting up here. I am an independent person. They have sent letters to the Vice Chancellor demanding my resignation. It has not worked. I will continue lobbying for changes. I am hoping that I can continue getting the fund sources. It has been difficult, but the Australian Research Council has certainly helped and also some of the insurance companies. Funnily enough, a lot of moneys come from Sweden of all places.

So we need to research priorities here to investigate what systems work and how best we can use them in the system so that we can have sustainable road safety. We need to test all these products that we are using out there. Thank you very much.

Extracts from the Minutes of the STAYSAFE Committee regarding World Health Day 2004 — "Road safety is no accident"

This appendix contains relevant extracts from the minutes of ICAC Committee meetings of:

- 19 February 2004
- 1 April 2004
- 13 May 2004
- 23 September 2003

regarding the inquiry into car surfing and the carriage of unprotected passengers on motor vehicles.

Extracts from the Minutes of the STAYSAFE Committee regarding World Health Day 2004

No. 53/10

STAYSAFE

PROCEEDINGS OF THE JOINT STANDING COMMITTEE ON ROAD SAFETY

10:30 A.M., THURSDAY 19 FEBRUARY 2004 AT PARLIAMENT HOUSE, SYDNEY

MEMBERS PRESENT

Legislative Council	*Legislative Assembly*
Mr Colless	Mr Gibson
	Mr Souris
	Mr Barr
	Mr Hunter

Also in attendance: Mr Faulks, Manager of the Committee.

The Chairman presiding.

1. Apologies

Apologies were received from Mr Tingle, Mr West, Mr Bartlett, Mr Maguire and Ms Saliba.

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3. Chairman's report

World Health Day, 7 April 2004

The Chairman reported that planning is well underway for the launch of the World Health Organisation's global report on road traffic deaths and injuries and a general road safety forum on Wednesday 7 April 2004 in the Parliament House Theatrette. The activity involves STAYSAFE, the Australian College of Road Safety, and the National Roads and Motorists Association. It was agreed that an invitation to attend would be forwarded to the Travelsafe Committee (Queensland Parliament), the Road Safety Committee (Victorian Parliament), and Standing Committee on Transport and Regional Affairs (House of Representatives).

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10. General business

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There being no further business, the Committee adjourned at 11:10 a.m..

Chairman **Committee Manager**

Extracts from the Minutes of the STAYSAFE Committee regarding World Health Day 2004

No. 53/13

STAYSAFE

PROCEEDINGS OF THE JOINT STANDING COMMITTEE ON ROAD SAFETY

10:00 A.M., THURSDAY 1 APRIL 2004 AT PARLIAMENT HOUSE, SYDNEY

MEMBERS PRESENT

Legislative Council	*Legislative Assembly*
Mr West	Mr Gibson
Mr Tingle	Mr Barr
Mr Colless	Mr Souris

Also in attendance: Mr Faulks, Manager of the Committee, Ms Yeoh and Ms Cyril, Assistant Committee Officers.

The Chairman presiding.

1. Apologies

Apologies were received from Mr Bartlett, Mr Maguire, Mr Hunter and Ms Saliba.

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5. World Health Day road safety forum, 7 April 2004

The Chairman confirmed that arrangements were in place for World Health Day, 7 April 2004, which would feature the launch of the World Health Organisation's global report into road crash injury prevention and a forum examining current and future road safety polices and programs in New South Wales. The road safety forum is a partnership between STAYSAFE, the National Roads and Motorists' Association, and the Australasian College of Road Safety.

The program for the road safety forum features presentations from:

- Official welcome: Mr Ross Turnbull, NRMA Motoring & Services
- Opening Remarks: Hon. Carl Scully MP, Minister for Roads
- World Health Day – Road Safety is No Accident: Professor Mark Stevenson, Australasian College of Road Safety
- Lessons from history: The road ahead: Dr Michael Henderson
- 2005, 2010, 2020—Where shall the road take us?: Mr Paul Gibson MP, STAYSAFE
- Speeding behaviour: Dr Soames Job, Roads and Traffic Authority
- Medical perspective – reflections on road trauma: Dr Danny Cass, Westmead Hospital

- New Technology + old ideas = crash reduction: Mr Michael Paine, Vehicle Design & Research
- Vehicle safety insights from analysis of police reported crash data: Mr Stuart Newstead, Monash University Accident Research Centre
- Towards the forgiving highway: Mr Paul Hillier, Transport Research Laboratory
- Crash Investigation Units: Lessons arising from vehicle-road crash investigations: Senior Sergeant Peter Jenkins, New South Wales Police
- It's time – Let's get really serious and get rid of the road toll: Associate Professor Raphael Grzebieta, department of Civil Engineering, Monash University and a workshop and panel discussion involving:
- Parliament – Mr Paul Gibson MP
- Police – Chief Superintendent John Hartley
- Road Authority – Dr Soames Job
- Media – Mr Will Hagon
- Health – Dr Danny Cass
- Academia – Associate Professor Raphael Grizebieta

The Chairman indicated that part of his presentation, "2005, 2010, 2020—Where shall the road take us?" would deal with issues relating to road safety administration in New South Wales, including consideration of the issue of where is the best location of the road safety organisation within the State bureaucracy.

7. General business

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There being no further business, the Committee adjourned at 10:40 a.m..

Chairman **Committee Manager**

Extracts from the Minutes of the STAYSAFE Committee regarding World Health Day 2004

No. 53/14

STAYSAFE

PROCEEDINGS OF THE JOINT STANDING COMMITTEE ON ROAD SAFETY

10:30 A.M., THURSDAY 13 MAY 2004 AT PARLIAMENT HOUSE, SYDNEY

MEMBERS PRESENT

Legislative Council	*Legislative Assembly*
Mr West	Mr Gibson
Mr Tingle	Mr Barr
Mr Colless	Mr Souris
	Mr Bartlett
	Mr Hunter
	Mr Maguire

Also in attendance: Mr Faulks, Manager of the Committee, Mr Jefferis, Project Officer, and Ms Yeoh and Ms Cyril, Assistant Committee Officers.

The Chairman presiding.

1. Apologies

Apologies were received from Ms Saliba.

2. Previous Minutes

On the motion of Mr Colless, seconded Mr Bartlett, the minutes of Meeting No. 13 of 1 April 2004 were accepted as a true and accurate record.

3. Chairman's report

World Health Day, 7 April 2004
The Chairman reported that the Committee had held a successful road safety forum, in partnership with NRMA Motoring & Services and the Australasian College of Road Safety, for World Health Day, Wednesday 7 April 2004. The forum saw the launch of the World Health Organisation's global report into road crash injury prevention as well as a number of papers examining current and future road safety polices and programs in New South Wales. The Chairman indicated that the papers presented at the forum will be collated, edited, and presented as a report of the STAYSAFE Committee.

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7. General business

...

There being no further business, the Committee adjourned at 11:10 a.m..

Chairman Committee Manager

Extracts from the Minutes of the STAYSAFE Committee regarding World Health Day 2004

No. 53/20

STAYSAFE

PROCEEDINGS OF THE JOINT STANDING COMMITTEE ON ROAD SAFETY

10:00 A.M., THURSDAY 23 SEPTEMBER 2004 AT PARLIAMENT HOUSE, SYDNEY

MEMBERS PRESENT

Legislative Council	*Legislative Assembly*
Mr West	Mr Gibson
Mr Tingle	Mr Maguire
Mr Colless	Mr Souris
	Mr Bartlett

Also in attendance: Mr Faulks, Manager of the Committee, Mr Jim Jefferis, Project Officer, and Ms Yeoh and Ms Cyril, Assistant Committee Officers.

The Chairman presiding.

1. Apologies

Apologies were received from Mr Barr, Ms Saliba and Mr Hunter.

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6. Report on World Health Day 2004—"Road safety is no accident"

The Chairman presented the draft report: "Report on World Health Day 2004—"Road safety is no accident"". (Report 3/53).

The draft report was accepted as being read.

The Committee proceeded to deliberate on the draft report in globo:

2005, 2010 and 2020: Where will the road take us? Paul Gibson MP

Lessons from History: The road ahead –Michael Henderson

'Road Safety is No Accident' - Mark Stevenson

Speed Management in New South Wales - Soames Job

'Medical Perspective - Reflections on Road trauma' - Danny Cass

Old Ideas + New Technology = Crash Saving – Michael Paine

Vehicle Safety Research in Australia based on analysis of Police Crash Reports – Stuart Newstead and Max Cameron

'Towards the Forgiving Highway' - Paul Hillier

"A Crash investigators perspective on road side environments' - Peter Jenkins

'It's time - Let's get really serious and get rid of the road toll' - Raphael Grzebieta

Read and agreed to

On the motion of Mr Bartlett, seconded Mr Colless:

That the draft report: "Report on World Health Day 2004—"Road safety is no accident"", be read and agreed to.

Passed unanimously.

On the motion of Mr Bartlett, seconded Mr Colless:

That the draft report: "Report on World Health Day 2004—"Road safety is no accident"" be accepted as a report of the STAYSAFE Committee, and that it be signed by the Chairman and presented to the House.

Passed unanimously.

On the motion of Mr Bartlett, seconded Mr Colless:

That the Chairman and Director be permitted to correct any stylistic, typographical and grammatical errors in the report.

Passed unanimously.

7. General business

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There being no further business, the Committee adjourned at 10:30 a.m..

Chairman Committee Manager