DARE FOR ZERO

Michael Griffiths
Road Safety Solutions

FOREWORD

This submission by long-time road safety expert and advocate Michael Griffiths to the latest review of the National Road Safety Strategy persuasively argues that Australia is losing its place as a major force and influence on road safety world wide. The targets in his submission are the nature and focus of our approaches to road safety in this country, and the way those approaches are managed within the safety system.

He proposes that Australia should keenly focus on jurisdictions that data show have recently been performing better than this country in reducing road death rates, and that the model adopted by the government in Sweden – based on "Vision Zero" – should be the basis for a new approach in Australia. As Griffiths explains, the Swedish authorities embrace reductions in deaths and injury – towards zero – as the absolute prime factor in their policy and systems, not simply one of many other influences. Australian legislation and regulations already embrace a similar concept in aviation safety, and the International Automobile Federation (FIA) and its Australian affiliate aggressively target zero deaths in one of the most hazardous sports in the world. It can be done.

I urge those experts leading the new Inquiry into the National Road Safety Strategy to take his discussion and proposals under most careful consideration. They are substantial contributors to this important and potentially life-saving debate.

Dr Michael Henderson

Michael Henderson is a Fellow of the Australian College of Road Safety, Fellow and Member Emeritus of the Association for the Advancement of Automotive Medicine, and Fellow of the FIA Institute for Motorsport Safety. He was the inaugural director of the NSW Traffic Accident Research Unit during the 1970s and leader of the State's road safety programs.

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Page
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TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

To whom it may concern

Regarding submission from Michael Griffiths – Daring for Zero, road safety solutions

Based on Vision Zero philosophy, the policy should be based on ethics, shared responsibility and scientific methods to eliminate death and serious injury in road traffic. There is a shared responsibility between the providers of the transport system and the users. The user is expected to follow the basic rules of the transport system, like staying sober, obeying speed limits and wearing a seat belt. Everything else falls on the providers, and the providers/stakeholders are a broad group: policy makers, elected officials, trucking companies, city planners, traffic engineers etc. If the road user fails to follow the rules the responsibility falls back on the stakeholders to come up with new solutions.

From my point of view, the submission from Michael Griffiths points out key parts to improve the conditions for the shared responsibility. Both by clarifying the responsibility for goal management as well as proposals for measures that more effectively support the road user to receive a safer road system.

Sincerely,

Maria Krafft
Director of Sustainability and Traffic Safety

TMALL 0490 Engelskt Brev 1.0

Swedish Road Administration
171 54 Solna
Besöksadress: Solna strandväg 98

Texttelefon: 020-600 650
Telefon: 0771 - 921 921
trafikverket@trafikverket.se
www.trafikverket.se

Maria Krafft
Strategic Development
Direkt: 010- 123 48 14
maria.krafft@trafikverket.se

DARE FOR ZERO

by
Michael Griffiths

This submission primarily addresses the 3rd and 4th Terms of Reference of the current review.

This is a personal submission based on the author's experience in developing and implementing road safety measures in Australia for 20+ years within the NSW road safety agency followed by many years of further research. Whilst the necessary development occurred in NSW, most of the measures were applied Australia wide. This inherently included extensive working with the Federal Government and other States.

I gratefully acknowledge review and input from Dr Maria Krafft and Dr Michael Henderson..

1.0 A summary of significant changes in road safety delivery and resulting outcomes

Whilst this review is primarily from the NSW perspective, it is unavoidable that NSW and Victoria have been the lead agencies in introducing new road safety policy into Australia.

If NSW or Victoria "drops the ball", it inevitably degrades Australian road safety policy and outcomes.

But first a bit of background…
Concern about an ever rising "road toll "in the 1960's resulted in the NSW Government, adopting a scientific evidence-based strategy by creating a high-profile Traffic Accident Research Unit (TARU) in 1970.

TARU's head Dr Michael Henderson had background of research into how people got injured in motor vehicle crashes. He staffed TARU with professionals in engineering and behavioural science. More than that, TARU had a Minister for Transport (Milton Morris), who saw it as part of his job to have first-hand involvement in reducing crashes and serious injury on NSW roads.

In 1989 the TARU evidence-based model got a booster shot with the appointment of Bernard Fisk as the head of the new Roads and Traffic Authority RTA NSW. He introduced flatter structures, delegating responsibility to deliver to line Managers. With this empowerment came expanded engineering interventions from Crashlab and a New Car Assessment Program for Australia. Coupling this empowerment with international networking and collaborations, the NSW road safety agency had a string of successes implementing improvements in vehicle crashworthiness and occupant protection systems.

During the 1980's NSW and Victoria both had road safety agency structures where road safety researchers were in the same agency with responsibility for implementing countermeasures. With the benefit of hindsight, this is an essential feature for delivering road safety. Those doing the research to identify countermeasures need to also have some responsibility for, and seamless access to the organisational structure to implement countermeasures.

In 1987, the Victorian State Government separated its researchers from its Government implementing body VicRoads. This withdrawal as a stakeholder was replaced partly by the

Victorian Transport Accident Commission (TAC) who recognised their role as a stakeholder and became active in the international road safety research effort more than 25 years ago.

In NSW, unfortunate structural changes to the road safety research agency occurred during a prolonged period of political distraction from 1995 to 2010. Several Ministers for NSW Transport/Roads between 1995 and 2010 ended up in front of NSW's Independent Commission Against Corruption (ICAC) the State Government's corruption watchdog. Some were under investigation themselves, whilst others describe the corrupt lobbying pressures they were under.

In 1998, a re-organisation of the NSW Government road safety agency resulted in the loss of every research Section Manager (including Vehicle Safety, Road Environment Safety, and Road User Behaviour) followed not long after by most of their experienced research staff.

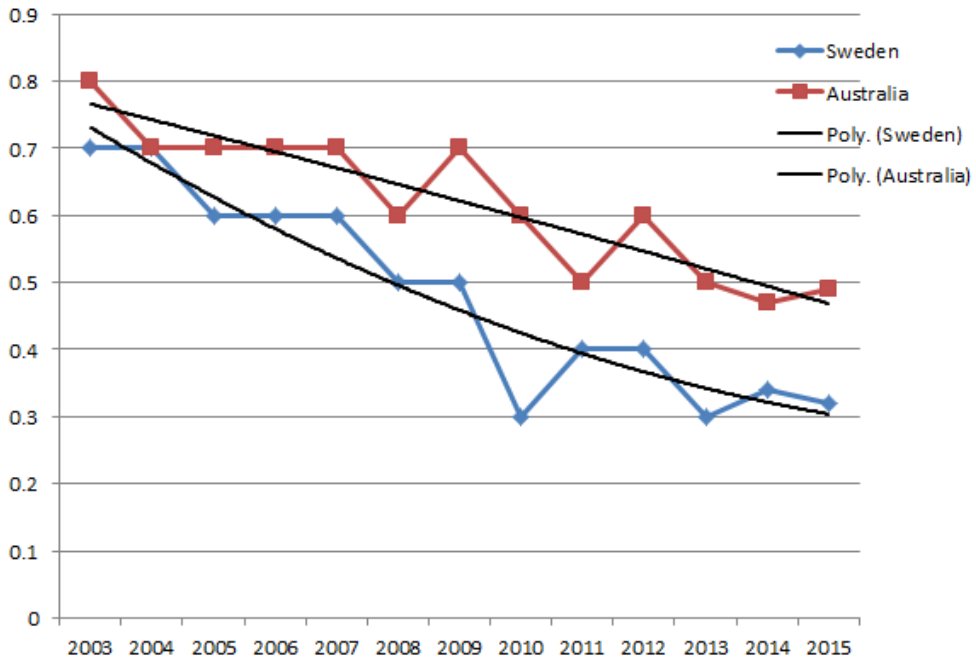
Given that NSW had the only remaining State road safety research agency still embedded within the Government implementing body, this was a major loss.

The effect of this loss of expertise on implementation of innovative engineering strategies can be seen in Appendix B which contains a summary of Australian milestones in road safety, as compiled by NSW RTA.

This "Milestones" chronological review of implementation strategies is revealing. From approximately 1970 to 1995, the implementation programs contained a continuous stream of practical engineering measures to reduce injury in crashes.

From 2000 to 2010, there were no new engineering measures, with media programs attempting to change behaviour now dominating. This was a major shift away from engineering countermeasures. The road safety agency had reverted to pre-1970 road safety strategies of attempting to change driver behaviour.

This change in strategy coincides with the period of political distraction in NSW, 1995 to 2010, and the period of time during which Australia lost parity with Sweden.



Above is a graph courtesy of Dr Michael Henderson. It depicts how Australia has lost parity with Sweden.

2.0 TERMS OF REFERENCE 4

Advise on arrangements for the management of road safety and the NRSS, looking at best co-ordination and use of the capacity and contributions of partners.

First choose a model that works …

For an effective model of how to implement road safety, look no further than the world leader in road safety, Sweden. On an exposure comparison, Sweden has approximately half the deaths and injury than Australia.

In 1996, with the assistance of Swedish Road Safety's Dr Maria Krafft, this author gave the first presentation in Australia of Dr Claes Tingvall's Zero Goal philosophy. Appendix A contains this author's understanding of Zero Goal.

Given Australia's history of leadership in road safety, it is puzzling as to why Australia later adopted a less daring version of the Swedish Zero Goal. Australia's rich history of leadership in road safety includes first country to mandate the wearing of seatbelts, first country to seriously apply random breath testing, second country in the world to adopt a new car assessment program. Sweden presented the advent of NCAP in Australia, as part of its argument as to why there should be a European NCAP (see cover page).

Why did Australia slide from being a leader to a follower?

A recent Swedish road safety publication reports: … ***Not all countries want or dare to adopt a name with the word "zero" in it. In Australia for example, they have chosen to call it "Safe Systems".***

What makes the ongoing death and disability more highly visible in Australia is that the goals of our diluted Safe Systems are not being met. We have our Safe Systems **methods**, but we are not meeting our **goals**.

A detailed account of how Zero Goal was implemented in Sweden was recently released. It describes the fundamental principles of Zero Goal, the ethics behind them, and the personal courage of individuals required to see Zero Goal into implementation. It should be compulsory reading for anyone with responsibility for implementing improvements in Road Safety. It is undeniably self-congratulatory, but then, Sweden has something to celebrate, Australia does not! The Swedish Book on Zero Goal can be downloaded from :-

www.afconsult.com/contentassets/8f0c19f4f7d24aa5bdbfd338128391ec/2017057-17_0194-rapport-nollvision-eng_lr.pdf

Some of the essential ingredients of Sweden's success include the following:-

- An ethical approach,
- Be unambiguously clear that your goal is zero,
- Bring in all the key stakeholders,
- Have the power to act/regulate,
- Have leaders who are inspirational, knowledgeable and career committed.

This author's understanding of the Zero Goal Philosophy is explained in Appendix A

As Dr Michael Henderson reports the concept is not new, what is different is the vigorous pursuit of the goal by Claes Tingvall in Sweden, particularly carefully targeted expenditure to reduce risk on two way roads without separation of opposing lanes.

Identify the Stakeholders …

The two biggest financial and social stakeholders in road safety in Australia are the compulsory third party insurers and the Government.

The equivalent to a Compulsory Third Party (CTP) insurer in Sweden is called Folksam. Folksam has its own research facility and conducts applied research to identify how to reduce injury in crashes. It has an affiliation with Chalmers University for its researchers, but more than that, Chalmers University hosts "SAFER" a collaboration of government, researchers and industry with which FOLKSAM is affiliated. (Appendix C) .

In Sweden their current leaders of Road Safety have developed from being in a research position in Folksam into the Swedish Government's Road Safety Department. In this manner, Claes Tingvall came to be the Head of Road Safety in Sweden and introduced its well-known Zero Goal philosophy (Appendix C). The current Head of Road Safety in Sweden, Maria Krafft, also worked her way up through Folksam. Other notable road safety staff in the Swedish Government had backgrounds in Folksam including Anders Lie.

Folksam is a good example of a structure where an economic stakeholder funds the research and makes the gains.

All Australian States have CTP insurers, some of them are Government monopolies, while others are operated by private insurance companies regulated by a Government department.

In Victoria, the Transport Accident Commission (TAC) has a road safety research group and allocates funds for road safety research projects. For over twenty-five years TAC's staff have been active players in road safety at an international level.

In NSW, the Government regulated Motor Accidents Authority (MAA) has funds allocated for road safety research, but to this author's observation, has had a chequered career as to its effectiveness. At one stage, MAA's road safety funds were used to sponsor the South Sydney Rugby League football team, who wore small 'stay alive' patches on their jerseys!! Sometimes, the MAA has had staff who understood the need for funding of evidence-based research, and at other times, it has had staff who allocated money where it made them "feel good". Sometimes, it has allocated large proportions of its funds for redistribution by the NSW Government's Road Safety Research Group, and at other times it has preferred to control the distribution of those funds itself.

There is, in Australia, a linking body of CTP insurers called "Heads of CTP". Heads of CTP could be the conduit Australia needs. With Heads of CTP assistance, Australia could have a similar model as Folksam. Australia could get our CTP and vehicle property damage insurers much more actively involved in research and delivery of road safety measures, and we could have inspiring experts who have done the research, not bureaucrats as managers.

Enter the Federal Government, the power to regulate …

Things are a little more complex in Australia than Sweden because we have multiple States.

How all these State bodies should come together nationally has not always been easy. Successful collaborations have been very dependent upon the individuals involved in each State. Sometimes Austroads has been a facilitator.

In Australia, our Federal bodies do not have the same ownership of the road safety problem as the States, and the sense of urgency that brings.

What is needed is a national structure to bring the States together and give them back the power to regulate, a power the States formally ceded in 1989. What the Federal Government could do is delegate the powers to regulate vehicle safety, particularly with the potential improvements for road safety associated with moves towards autonomous vehicles, to a national body where the Federal Government is represented, but cannot veto.

Inspiring leadership, knowledge, commitment …

Consider the knowledge, ethics and courage of its former head of road safety, and father of Zero Goal, Claes Tingvall. It is necessary to read his story to understand what characteristics of ethics, knowledge, commitment and perseverance are required to succeed. At one stage, Claes had to take some time out in Australia to survive the political maelstrom.

Sweden's current head of road safety, Maria Krafft has more than 25 years of research experience in key stakeholder bodies in Sweden, and has followed a similar pathway to Claes Tingvall.

If Australia is to adopt Zero Goal, it will need leaders with similar strength, knowledge and commitment, not career bureaucrats.

3.0 TERMS OF REFERENCE 3

Identify issues and priorities for consideration in development of a post 2020 National Road Safety Strategy and 2018/2020 Action Plan, focusing on how Australia can recognise and move towards a safe road transport system which minimises harm to all users.

3.1 Better Data

3.1.1 Data matching and vehicle data downloads

NSW records of road crashes are currently based on analysis of computer coded Police COPS reports, mostly prepared by general duties police. This means that assessments as to whether speed or fatigue etc were involved are made by those general duties police, coupled with a computer algorithm of the crash's characteristics.

In most States there is an unexploited data set with a much higher level of better researched information. This is the data collected by Police Crash Investigation Units. This author's knowledge of the quality and quantity of valuable information assembled by the NSW Crash Investigation Units comes from direct experience of working with the NSW Police Crash Investigation Units and their data over the past 30 years.

The current injury that is recorded for a particular crash is what the general duties police officer can ascertain from a phone call to the hospital, or from the Ambulance officer at the scene.

There are more detailed and reliable sources of injury data which could be matched to each Police crash record, including Ambulance data and hospital data. For reliable information on vehicle characteristics, the vehicle's registration number data base can provide vehicle's make and model, and then by the VIN code, the safety systems that are fitted to that vehicle.

Police Crash Investigation Units are, by their nature, limited to investigating crashes where charges of a road user may result. For example, when two buses had a head-on crash resulting in 35 deaths, that crash did not meet NSW Police Crash Investigation Unit criteria, because both drivers were dead and there would be no-one to charge. What is required is for there to be a separate source of funding from a road safety budget, to expand Police investigations to all fatal crashes. A further and highly desirable enhancement of the system would be for younger road safety research staff to work side by side with the Police so as to get a first-hand knowledge of the problem that they have the responsibility of resolving.

Another enhancement would be for the road safety authorities to fund a digital photograph filing system for the Police Crash Investigation Units, so that Police matched records could become a virtual on-scene in-depth research tool.

The other information that could be added to that pool is a routine download of the vehicle's computer, through the onboard diagnostics plug. A car computer download of that nature usually provides information on factors such as the car's speed for several seconds leading up to the impact, the car's velocity change/acceleration during any impact, the time of activation of a car's brakes, deployment of airbags and pretensioners etc.

This would require vehicle manufacturers to assist with software. However, it would take away much of the uncertainty in crash investigation and allow for the police to make a more informed decision on crash causal factors, besides adding to the value of the virtual on-scene in-depth crash studies that could derive from the compilation of all of the preceding data.

3.1.2 Exposure data

When assessing the likelihood of a crash occurring or receiving injury in a crash, it is essential to have information on "exposure", that is, what is that vehicle's involvement in crashes as a factor of distance travelled.

A currently readily available source of exposure data by kilometre travelled in NSW is the record of kilometres travelled when a vehicle owner renews a vehicle's registration each year. Other States without annual vehicle inspections may not currently have the ability to collect odometer data, however the sheer size of the NSW data base could be used nationally to better measure exposure. If that information was transferred to a computer, it would allow a direct measure of specific vehicle exposure to crashes per kilometre travelled. When linked to crash records that could provide the probability of that vehicle being involved in a crash, and also the probability of an occupant, by seating position, of receiving injury in a crash. It would also allow early identification as to whether a particular vehicle make and model was over-involved in certain types of crashes or certain types of injury.

This kind of information could be used for both research and early intervention to identify the effectiveness or scope for improvement in vehicles' crash avoidance and crashworthiness systems, that is, it could become a "blackspot" identifier for vehicles.

As the exposure data to the nearest kilometre is not required, the coding task associated with this would be entering the two or three digits recording the vehicle's travel in thousands of kilometres. This is not a major task.

Exposure data is currently measured by de facto means such as fuel sales. Given that vehicles have different fuel efficiencies, and there is no specific identification of vehicle makes, models, types or even class, for fuel consumption, the current de facto system doesn't allow any relative exposure data.

For the first three years of a vehicle's life in NSW, the odometer reading is supplied by the owner of the vehicle and is therefore potentially unreliable. However, when a vehicle comes up for its registration inspection after three years of service, the Authorised Inspection Station (AIS) is required to enter the odometer reading. At that stage, adjustments could be made, and in time algorithms would be developed which allow improved accuracy for the exposure/odometer numbers entered by vehicle owners in the vehicle's first three years.

3.2 Engineering Controls

Up until the 1960's, conventional road safety thinking was that most crashes were caused by human error, therefore countermeasure were designed to change driver behaviour. Any deficiencies in roads and vehicles were considered as something the driver needed to take into account, rather than something that could be improved.

In the 1970's, the introductions of engineering controls, like the wearing of seatbelts, meant that if there was a crash, the occupants were restrained, and the likelihood of injury was less. This led to a reduction in crashes with serious and fatal injuries.

Since then, other engineering measures such as better braking systems, electronic stability control, airbags, seatbelt pretensioners and force limiters, head restraints, have all worked to reduce the incidence of crashes, or the likelihood of injury if a crash occurs.

All cars now have computers which control engines and safety systems. The computers do such tasks as limit the upper speed of the vehicle, measure change in velocity to deploy airbags etc. Most cars are fitted with an on-board diagnostics plug/socket (OBD) which results from a mandatory Californian pollution monitoring regulation. Enquiries to the automobile industry revealed that this on-board diagnostic plug OBD can be used to access the car's computer, provided the vehicle manufacturer provides the necessary software information.

3.2.1 Speed Limiting

Nearly all cars are speed limited, with the limit being typically a factory setting. However, provided the vehicle manufacturer provides the necessary software, that upper speed limit can be reset on the move.

As all of Australia's speed zones are GPS mapped, it is feasible to have ongoing speed limiting of a car's upper speed, so that it cannot exceed the speed limit of the zone through which it is travelling.

That is, rather than a 'cat and mouse' game where a driver has the free choice to speed, and in so doing create greater risk of injury to themselves and other road users, the car's top speed could be limited to the "safe" speed determined by the road safety authorities for that section of roadway. It is accepted that if such technology was introduced, there would be a need for the car to be programmed to be able to override that for a limited access to short override durations for crash avoidance.

Besides the reduced likelihood of crashes from vehicle loss of control, and, the reduced likelihood of injury from reduced energy when crashes occurred, a further benefit is that average travel times could probably be reduced as the authorities allowed increases in speed limits, taking account of the fact that they had 100% compliance.

For heavy vehicles, the speed limiting function could be set to take account of both the speed limits for heavy vehicles which are often different, and automatically apply advisory speeds as the upper allowable speed limit.

3.2.2 Increased Mobility for Old and Young

In an effort to assist community mobility both at the younger and older end of the spectrum, authorities have graduated/conditional licensing. For younger drivers, there are graduated licensing programmes, and depending on the jurisdiction, there can be limitations on speed, number of passengers and time of travel. If vehicles had a licence recognition system, those limits could automatically be applied to the relevant drivers. This could provide near 100% compliance without the resource consuming lottery of police enforcement.

At the other end of the age spectrum, conditional licensing is available to extend or maintain aged mobility. There may be restrictions on how far or when an older driver can travel.
Some research in the US reported that it is the older drivers who do not voluntarily abide by these restrictions/conditions who are involved in the crashes which get older drivers a bad name. If engineering controls, by way of vehicle's computers, were used, then aged mobility could be extended because there was near 100% engineering control of the safety limits applied.
Maintaining aged mobility is an important quality of life issue – especially in Australia with an ageing population.

Further benefits from engineering controls include less need for police resources to enforce restrictions, and a more equitable system rather than an enforcement lottery.

It is recognised that many would see the imposition of such controls as restrictions on freedom. However, to put it in perspective, it is a much greater loss of freedom for a person to be fatally injured or severely disabled through an error of judgment or attitude of another road user.

3.3 Motorcycles – The Elephant In The Room

In road safety, motorcycles are truly the 'elephant in the room'.

In the 1990's, vehicle safety engineers in several States of Australia were approached by importers seeking to register the three-wheeled "tuk-tuks" used in India and Thailand. The Engineers were incredulous. Tuk-tuk's have grossly inferior braking and handling systems, with no prospect of fitment of crashworthiness systems. The argument of the prospective/optimistic tuk-tuk importers was, "*you register motorcycles"*.

The truth is that if the motorbike hadn't been invented and someone turned up to a road safety authority's registry office tomorrow, asking to have a two-wheeled object with powerful engine, and no crash avoidance or crashworthiness equipment, in the current environment of electronic stability control, seatbelts, airbags, side intrusion protection etc., there would be no prospect of registration.

Depending on exactly how the analysis is done, motorcycles are somewhere between 20 and 30+ times more likely to be involved in a serious injury crash per kilometre travelled. That is, if you choose to make a journey on a motorbike when you could make the same journey in a car, you are 20 to 30 times more likely to be injured.

Yet, motorcycle owners pay the same Compulsory Third Party Insurance (CTP insurance) as car owners. If it was 'user pays', motorcycle riders would pay much higher CTP insurance premium than car owners. Motorbikes are a highly-subsidised form of transport. If the 'user pays' system applied CTP premiums would be unaffordable. Not only are motor bikes more likely to be involved in a crash because of the instabilities associated with two wheels rather than four, but when they are involved in a crash, there is a far greater likelihood of injury.

Unfortunately, there is an increasing use of motorcycles by mature age riders. The suggestion that, because of their maturity, they are less involved in crashes, is not born out by the crash statistics, which indicates the opposite.

In recent times, the mature age rider phenomena has been unfortunately further supplemented by a trend towards more powerful motor scooters.

This is an area which for ethical reasons needs intervention by at least:-

- informing car owners of the extent to which they subsidize motorbike riders,

- start the discussion about the need for a staged progression of CTP premiums to a level which represents the actual societal costs of motorbikes.

There is a counter argument that motorbikes have some environmental and traffic congestion benefits. It would be useful to research to what extent this balances out. I have heard the claims, but I haven't seen the analysis.

3.4 Heavy Vehicles

A possible simple no-cost measure to improve heavy vehicle safety would be to change the regulations so that advisory speed signs for heavy vehicles were the mandated speed limit.

This is based on this author's investigation of many crashes of heavy vehicles carrying dangerous goods crashes, particularly on the South Coast road of NSW. Introduction of hard wired engineering compliance with advisory speeds would have prevented most of those crashes.

4.0 FURTHER OPPORTUNITIES

4.1 Introduction

This section contains suggestions where the pathway to implementation could be relatively short. It is not intended to be, nor is it, a comprehensive list.

4.2 Pedal Cycle Helmets

Pedal cyclists are very unprotected road users, and because of the exertion involved, it is not possible to introduce much in the way of protective clothing.

In the early 1990is NSW and Victorian Governments were gearing up for mandatory wearing of helmets on pedal cycles. A pre-requisite was to review the adequacy of the Australian Standard for Pedal Cycle Helmets, with an aim of trying to ensure that a good range of comfortable well-ventilated helmets would be available.

Significant research was conducted at Technisearch in Victoria, and NSW TARU's Crashlab. The demanding penetration test was replaced by a load distribution test to better cater for ventilated helmets. The old-style penetration test would have resulted in a cone going directly through a ventilation slot and helmets failing.

The work conducted by Technisearch and Crashlab resulted in a specification for energy and force being recommended by the Standards Committee.

At almost the eleventh hour, the committee was directed that the specification had to be set at a level which could be passed by some specific helmet models.

To do this, the energy absorption capacity of the helmets had to be reduced.

What the changes meant was that helmets with a microshell, or near to no shell, could pass the revised Standards test, that is, hard shell was not required.

All this occurred nearly thirty years ago. Interestingly, a large proportion of parents now elect to select skateboard style helmets with a hard shell for their children. Children tend to prefer to wear this style of helmet because of its peer acceptance.

Research funded by NSW MAA some years ago found that there was a considerable improvement in protection offered by hard shell skateboard helmets compared to minimalist thin shell helmets.

A suitable range of hard shell helmets is also available for adults.

This author has had the opportunity in recent years to observe the relatively low levels of protection offered by minimalist thin shell helmets in real crashes. Some of the problems include the stability that is required to keep a helmet in place during a crash.

It would be a relatively straightforward task to revise the Australian Standard so that hard shell helmets, similar to the skateboard style, were mandated as the minimum.

4.3 Pedal Cycle Night Time Conspicuity

Since bicycle riding first evolved with incandescent bulbs and rapid battery depletion, LED systems, powered by better batteries have come onto the market. It would make sense to upgrade the Lighting Standard for front bike lighting to take advantage of these new lights, and to specify a minimum mounting height equivalent to handlebar level.

4.4 Motorbike Rider Crash Protection

The benefits of full face helmets for motorbike riders have been long recognised. Given the lack of opportunity for protective equipment on a motorbike, and riders far greater vulnerability of 20 to 30 times to injury, if they are to remain on the road system, it would make sense to make what gains can be achieved in the area of changing to full face helmets.

Taking into account the large range of protective equipment for car occupants from the crashworthy monocoque shells of cars through to seatbelts, airbags, it would make sense if protective clothing was mandatory for motorbike riders.

4.5 Random Breath Testing

When random breath testing was first introduced in Victoria it was not as effective as expected.

NSW road safety behavioural scientists had the benefit of observing the Victorian initiative, and then identifying why it was not working. They deduced that there was:-

- a need to change social values, that is, it had to become socially unacceptable to drink and drive, and

- a very low perception that you would be caught. This meant that it didn't matter how draconian the penalties, people didn't think they would get caught.

Learning from this, NSW conducted media programmes designed to shift social attitudes, or at least provide a reasonable opportunity for a person wanting to not drink and drive, to be able to do so without ridicule.

To increase the perception of the likelihood that you would get caught, NSW introduced random breath testing by way of highly visible 'booze buses'. These were positioned in areas where they would get high exposure, in the evenings, when people are likely to be drinking.

Because random breath testing represented an additional enforcement burden on the police, the arrangement was that the police were paid by the RTA for this activity, and eventually it became a system where the police were paid per random breath test.

In NSW, in the last decade or so, there appears to have been a move away from high visibility 'booze buses'. This has seemingly resulted in a greater risk of injury to Police, because of the reduced conspicuity.

Whether it is intentional or not, there seems to be more random breath testing activities conducted during the day rather than the evening, with the question arising about what conditions are the road safety groups imposing on payment to the police as to when they conduct the random breath tests.

It is understood that an influencing factor as to when and where RBT is conducted is the safety of the police officers conducting the tests.

There is no doubt that community attitudes and practices have changed, yet drink drive crashes still occur. There is probably a need to better understand this recidivist group, and how to reach this group. This requires a new strategy for the conduct of RBT.

The new strategy needs to prioritise the likelihood of getting caught by the target group.

APPENDIX A AN EXPLANATION OF ZERO GOAL

AIMING FOR ZERO DEATH AND DISABILITY

In 1996 this Author gave the first presentation of Zero Goal in Australia. What follows here is how he interpreted and presented Sweden's "Zero Goal" philosophy.

Zero Goal aims to eliminate crashes which result in serious life threatening and permanently disabling injury. Minor crashes resulting in property damage and minor injuries are less important from a public health perspective, although it is acknowledged these add significantly to the overall economic costs of crashes.

From a quality of life and ethical perspective, it is the disabling injury crashes which most need to be prevented.

In 1997, Sweden's Parliament adopted 'zero goal', a philosophy promoted by Claes Tingvall and his colleagues. Zero Goal philosophy has four fundamental principles: -

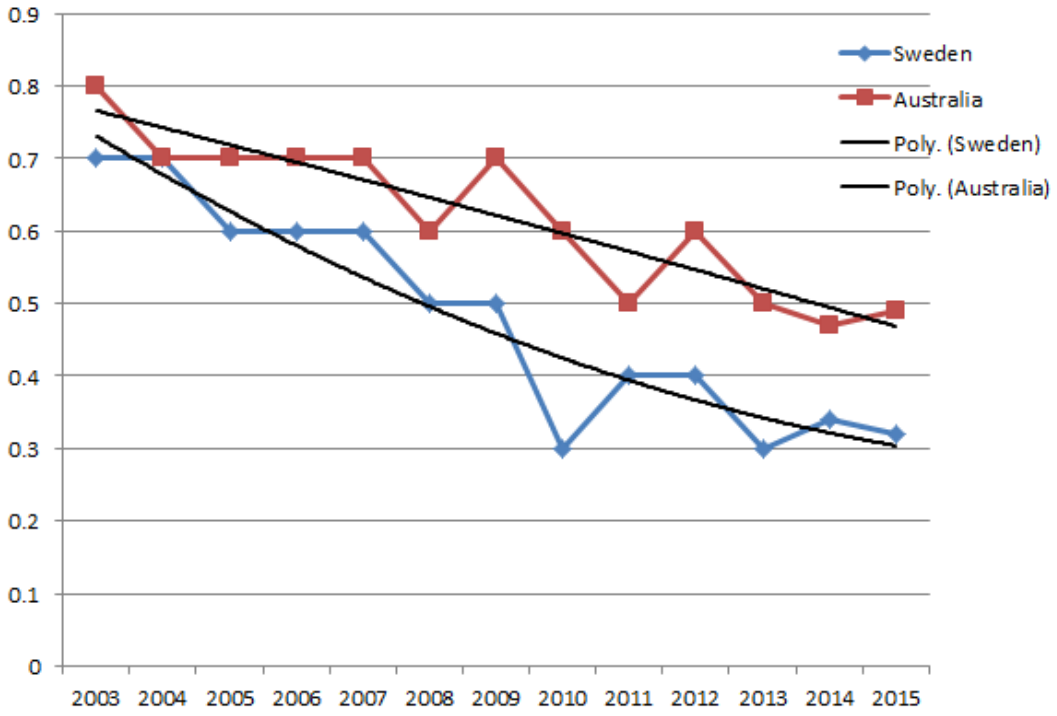
- **ethics:** the preservation of human life, good health, including quality of life without disability, is to take priority over mobility and other objectives of the road transport system,

- **responsibility and accountability:** the designers and administrators of the road and vehicle system must now share responsibility for operating the system safely along with the road users,

- **safety:** the new policy acknowledges that humans are not perfect; human road users make errors. The system design has to accept this and design the road and vehicle systems to minimise the opportunity for human error. The road transport systems should minimize the opportunity for error and the harm that can result when errors are made; and

- **mechanisms for change:** the system designers, administrators, maintainers and enforcers have been given a responsibility and an obligation to provide a fail safe road and vehicle system. The new guidelines say that they must work together as a team and recognise that flexibility and significant changes will be required to provide a fail safe system.

In 1997 when Sweden adopted Zero Goal, Australia had a not too dissimilar road toll, and Sweden was championing improvements in vehicle crashworthiness based on Australia's ANCAP program. Now, nearly twenty years later, Australia is enroute to approaching twice Sweden's road toll, and we follow the EuroNCAP which Sweden championed.

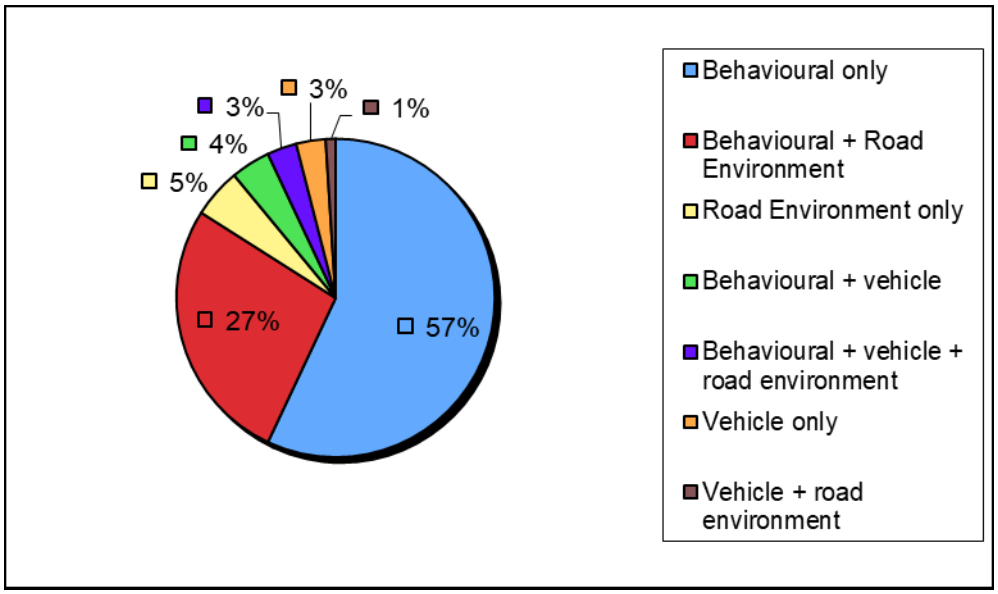


Above is a graph courtesy of Dr Michael Henderson. It depicts how Australia has lost parity with Sweden.

CHALLENGING TRADITIONAL APPROACHES

Traditionally, road users have been held mainly responsible for the safety of the road transport system. That is, when crashes occur, it is often a question of which road user is at fault, not whether it might be a road or vehicle system design deficiency. Consequently, preventive strategies are frequently directed at improving road users' behaviour and their coping skills, mostly through education, information and enforcement.

This attitude has been supported by traditional crash analysis which typically attributes road user behaviour as the overwhelming crash causal factor. It is often shown as a pie chart, where the behavioural component dominates. One of the earlier in-depth studies from Indiana University produced the adjacent chart.



There is a fundamental error in such traditional analysis because it does not consider the scope for behavioural change on the same baseline as it considers potential scope for road and vehicle systems. This traditional analysis implicitly assumes that human behaviour can be improved to avoid crashes, but the same analysis doesn't always allow equivalent scope for potential design improvement of road and vehicle systems. In other words, much of traditional analysis accepts the limitations of road; and vehicle systems the way they are currently supplied to the market, but doesn't accept humans in their current state of development with a known capacity for error, and imperfect attitudes to risk-taking. It assumes our Behavioral Scientists (Psychologists) can devise successful programs to stop road users from making mistakes, but ignores the ability to develop engineering solutions which can apply near 100% compliance with limits on the road/vehicle system.

A new systems approach to equitably address all the elements potentially contributing to road safety

Road crashes usually result from a complex combination of elements that recognizes that there are many factors beyond an average, imperfect user's control, such as insufficiently developed design or failure in the performance of vehicles or road infrastructures. When aiming for a Zero goal you need to equitably address all these elements, particularly recognizing the near 100% compliance rate which results from engineering solutions, compared to the costly uncertainty associated with attempts at behavioural change. In the traditional Haddon model Government road safety research team there are separate Sections for Behaviour, Vehicle, and Road Environment. Why does the Behaviour Section often have the biggest budget, when it is the least effective?

It is likely that Australian road safety research does not need more money, but rather, needs it better allocated to where it can do the most good.

"First, do no harm" (Hippocrates) – the underlying social values of road safety should be made explicit.

Sweden's father of Zero Goal Claes Tingvall adopted the first rule of medical practitioners' ethics.

If the measures road safety professionals are implementing are not scientifically evaluated measures, then they are probably doing harm by diverting funds and resources away from measures which could be more effective.

How successfully road safety strategies have been implemented in various societies depends not only on a society's level of economic and technical development, but also on a society's fundamental social and ethical values.

In stark contrast to our attitude to road crash injury, Australian society is not accepting of serious casualties from workplace accidents, nor from other forms of transport such as planes or trains.

To change our attitudes to road safety, an early task of road safety professionals is to design and deliver compelling presentations which jolt the community awake from its complacency. Once that is achieved, Australian society can start to:-

- accept the essential need for a road and vehicle system that recognises that human mistakes and errors in judgment will occur. As Claes Tingvall says *the penalty for making a mistake whilst on the road should not be death.*

- design a road and vehicle system which recognizes such mistakes will occur, and a road and vehicle system which has built in safeguards to minimise resulting crash and injury severity.

This requires adequate resources to be allocated to developing new vehicle and road systems with the necessary crash avoidance and injury protection built in. There is a far better prospect of building fail-safe systems for roads and vehicles, using currently achievable industry technology, than there is of changing all road users to adopt a fail-safe attitude at all times in their use of the road system.

The process towards safety as the highest priority requires society to commit to zero tolerance of disabling injury and death, and force a shared responsibility upon road and vehicle system administrators. These changes are needed to make road transport systems similar to other modes of transport. The Australian community should be able to have the same system safety expectations of road safety as it has for air and rail safety.

Despite the seeming logic of this approach, this is radically different from the traditional and current socio-economic approach, which trades off health and safety against economic objectives and reduced travel time. Under the socio-economic approach, health and safety are merely two variables in the equation to provide society with good mobility.

One of the first groups that need to experience the new road safety epiphany are politicians and administrators. They need to follow with genuine commitment, coupled with an intelligent understanding of the need to do good for the long term, not just a feel good announcement. To bring about change, Australia needs structures which encourage both the development of solutions, and an understanding and commitment to implementation of those solutions. The structures need to encourage professional development, and to reward commitment with the responsibility to implement. This is not a task for career bureaucrats passing through to the next department.

Australian States used to be able to (collectively) set their own design rules for vehicles, their own road rules etc. Whilst in theory prior to 1989 this had potential duplication of effort, in reality it allowed the States with the most commitment to set the pace in road safety and environmental issues in Australia, and sometimes the world.

A good example is Australia's world lead in the introduction of mandatory seatbelt wearing laws. These were first introduced in Victoria and quickly followed by NSW. Without State initiative Australia is likely to have been a world follower.

The 1970ies and 80ies road safety professional's recognition of the need for uniformity generally led to productive networking. The shift of road safety rulemaking from State to Federal Government has seen Australia change from having world leading standards to following world's best practice in many areas of road safety. Sounds OK if you say it quickly, but note the change from being a **leader** to been a **follower**. The justification for the change of responsibility came from the application of superficial economic rationalism concepts. That is, some possible savings on duplication of effort have resulted in much higher system costs by slowing up the introduction of injury reduction strategies on Australian road systems.

Sometimes it takes high media coverage of a tragedy to provide the political motivation to go beyond lowest common denominator (harmonization) and set a new world-leading benchmark in road user protection standards. Seat belts in coaches in Australia are an example of this.

A fundamental problem with abrogation of road safety accountabilities into the Federal political area is that the National level is too politically remote from pressure and voting influence of formal and informal road safety consumers, and simultaneously too close to vested interests of industry lobby groups whose first priority is to make money in the short term.

When the Australian States influence on vehicle Regulations waned, they moved to a State funded consumer driven program ANCAP. It started out as a world leader, however, ANCAP now follows some years behind EuroNCAP, a program initially championed by Sweden quoting the Australian initiative.(See cover Page)

"Man is the measure of all things" (Protagoras) – human tolerance of mechanical forces should be at the core of road safety.

Another building block of Claes Tingvall's 'zero goal' new thinking about road safety has been distinguishing much more critically between crashes which result in serious, disabling or life threatening injury, compared to crashes which result in minor or moderate non-disabling injury. One of the tenets of the new road safety epiphany is that it is the crashes which result in serious, life threatening or disabling injury where you either:-

- prevent, or
- use restraint or energy absorption systems to reduce the crash below this injury level.

Using this approach, you control the maximum allowable crash severity so that it is not allowed to result in life threatening or serious disabling injuries. In other words, the tolerance of the human body is not allowed to be exceeded, so that a crash event results in disabling injury or death. The components of the road transport system, including road infrastructure, vehicles and restraint systems need to be designed as a holistic system, so that they can accommodate possible mistakes of road users. When the limits of energy absorbing systems built into vehicle interiors or exteriors might be exceeded, then allowable vehicle speeds need to be reduced to a level at which serious injury cannot occur.

Some explanations of this concept are:-

- If a vehicle using currently available technology has a well-designed energy absorbing front which can impact with a pedestrian at, say, a speed of 20 km/hr without causing any significant risk of serious or life threatening or disabling injuries to the pedestrian, then that vehicle could travel relatively safely in a shared zone area with pedestrians at a speed of 20 km/hr. Another vehicle with a less 'friendly' front (possibly a four wheel drive) might be limited to travelling at speeds of 15 km/hr in the same zone. To take the human factor out of the equation and make the system fail-safe, the speed limiting may be a limit electronically communicated to the car, with the vehicle limited to a maximum velocity of 15km/hr in that zone in that vehicle.

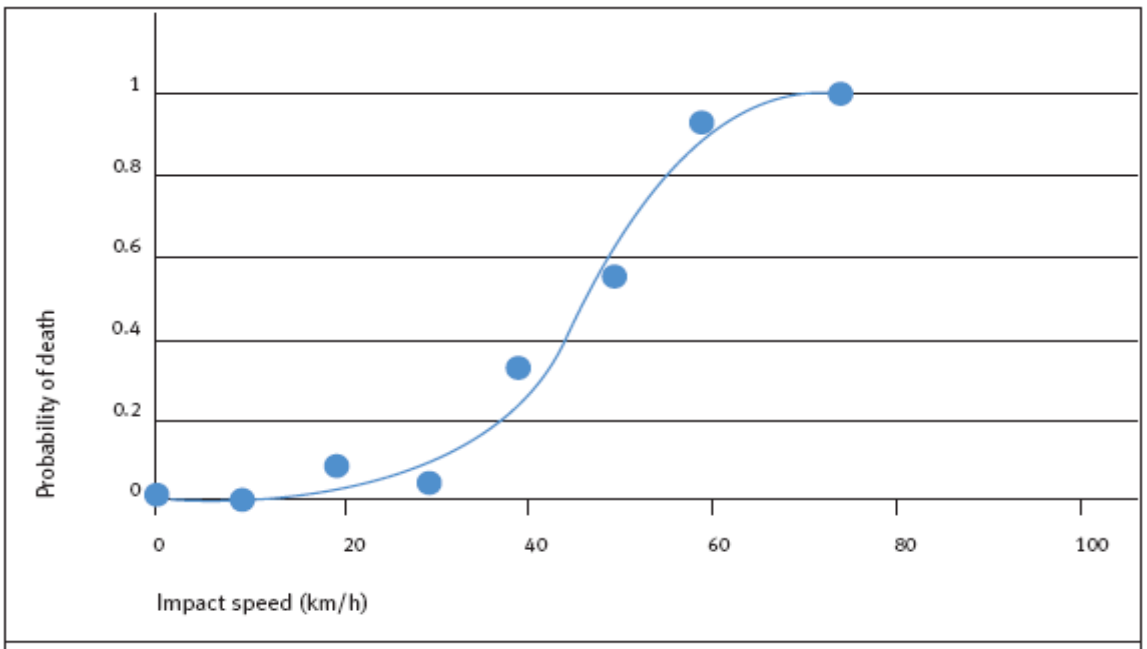
- A vehicle with all passengers properly restrained by seatbelts and child restraint systems may be able to have a frontal crash into a solid object at 50 km/hr without injury to the occupants. However, if one of the vehicle occupants is not restrained then the critical speed for serious injury to that occupant might be, say, 25 km/hr. In this instance, the vehicle road

system might electro-mechanically impose an upper vehicle speed of 25 km/hr on that vehicle in those circumstances. (seat belt interlocked to adaptive speed limiting)

Claes Tingvall describes this system design limit as a 'dose response function', where the amount of allowable injury is a result of the level of the mechanical forces and energy involved in the impacts. The 'dose' he refers to is the amount of physical force that can be applied to a human body without causing serious injury. What his new philosophy is saying is that you have to design the road/vehicle system, so that the ultimate forces applied to a human body in a crash cannot result in serious life threatening or permanently disabling injury. An example of this is the adjacent graph, which shows the probability of a pedestrian dying as a function of the impact speed of a car. To keep the probability of a pedestrian dying below 10%, the speed of the vehicle needs to be kept below 30 km/hr. The implications of this knowledge, in its road and vehicle system designed to the new philosophy, is that in any area where there could be vehicles and pedestrians present at the same time (a residential street), then the maximum allowable speed of a vehicle would need to be not greater than 30 km/hr.

In some places in Europe, 30 km/hr is the residential speed limit. Because energy is proportional to the square of the velocity, the energy in a 50km/hr impact (Australia's residential speed limit) is nearly 3 times higher than the energy in a 30km/hr impact.

FIG. 3.1. PROBABILITY OF A PEDESTRIAN DYING AS A FUNCTION OF THE IMPACT SPEED OF A CAR



Source: Pasanen (7) with the permission of the publisher.

Road transport systems should be programmed to take human mistakes into account.

Research undertaken over many years confirms that, however well-educated and trained, people are prone to make unintentional or intentional errors at the controls of a vehicle.

Thus, crashes cannot be totally avoided by behavioural means. As a consequence, the likely range of human error needs to be assessed, and design tolerances need to be applied to the road and vehicle system.

Making safety a built-in component of road transport systems is consistent with what is accepted practice in other modes of transport, such as aviation and rail systems, and in most sectors of industry, where the possible occurrence of failures of operators and users is taken into account and appropriate mechanisms are introduced to prevent failures from occurring or causing unacceptable damage. This is sometimes achieved by building in back-up, fail safe mechanical/electronic systems.

Road safety is a shared responsibility.

Accepting that the system has to be designed to be failsafe when human errors occur requires extending responsibility from the users of the road transport system to its designers and managers. In this new approach, the road user is responsible for doing their reasonable best to comply with traffic regulations, whereas the system designers and providers, which include vehicle manufacturers, government and legislative bodies, are responsible for delivering a road/vehicle system that accommodates potential mistakes by road users.

The new road safety epiphany says the responsibility for road safety in Australia needs to extend beyond the users. It needs to be shared with designers and providers of road transport systems.

This is not likely to occur unless politicians compel authorities to take this responsibility.

Develop and commit to a clear model of what are acceptable and unacceptable outcomes of crashes/failures in the road/vehicle system

The first step is to establish what is the required level of safety that you want the road transport system to provide, or, conversely, what level of crash injury is acceptable in ethical, practical and economic grounds. For example, Government workplace safety standards in Australia do not tolerate work practices which allow the possibility of incidents which result in serious, life threatening or disabling injuries. Whilst Workplace Safety has a broad aim of preventing all accidents, it is observed that for accidents resulting in life threatening injury or disabling injury there are:-

- fines or jail for the line managers of the system which allowed such a situation to occur, and

- compulsory work system redesign so that similar injury incidents cannot recur.

The new road safety philosophy requires that you apply the same style of maximum allowable injury criteria as you do in the workplace and other transport systems. By setting this maximum level of injury you have an unambiguous target. With a more clearly defined target, you can better plan and justify the resources and strategies required.

Once you have set the maximum level of allowable injury you have the beginning of new system performance expectations. You next have to identify and measure data which illustrates the difference between where you are now and where you want to be, and monitor progress towards achievement of your performance targets. In other words, this probably requires a rethink of what you measure and report in terms of road crash statistics. An example is that traditionally the number of deaths, or casualty crashes, might be measured to monitor progress, whereas we need to establish new systems to measure the likelihood and actual incidence of permanent disability from specific crash types to monitor progress towards the new goals. With linking of ambulance records, hospital records, vehicle registration records, police records now possible, this is an achievable task.

APPENDIX B MILESTONES IN ROAD SAFETY

This is a shortened version of milestones in road safety extracted from a compilation prepared by NSW RTA.

What is evident is that from approximately 1970 onwards, there was an ongoing strategy of introducing engineering measures to reduce injury in crashes. From 2000 to 2010, the engineering program stopped, and behavioural change programs were attempted.

1958 Victorian doctors call for mandatory seat belt use in vehicles.

1959 Volvo released the world's first production car with 3-point seat belts.

1961 Helmets made compulsory for motorcycle riders in Victoria

1966 Provisional licence system introduced for new drivers in NSW.

1967 The first Australian Design Rules approved, including those for seat belts and anchorages.

1968 Publication of Michael Henderson's book *Motor Racing in Safety: the Human Factors*.

1969 Three point seatbelts required in front outboard seating positions in new vehicles in NSW

1970 Traffic Accident Research Unit established in NSW and Michael Henderson appointed as first Director of Road Safety.

First Australian Standard for child restraints

Victoria creates world-first by mandating seatbelt wearing.

1971 NSW requires seatbelts for rear seating positions in new vehicles.

Motorbike riders required to wear helmets in NSW.

1972 Seat belt wearing made compulsory throughout Australia.

Head restraints required on all new vehicles in Australia.

1975 Child restraint standard updated to include a require dynamic tests and greater ease of use

1976 Top-tether anchorages for child restraints mandated in Australia.

The most comprehensive on-scene in-depth study of automobile crashes ever conducted in Australia commences in NSW by TARU

1978 Locking retractor seatbelts required in outboard seating positions in new vehicles.

USA launches world's first New Car Assessment Program

1982 Random breath testing trial commences in NSW.

1985 NSW Road Safety Bureau establishes a mobile child restraint fitting stations.

1986 NSW establishes a State-wide network of restraint fitting stations.

Collaboration established with the US Department of Transportation to enhance and expand Crashlab facilities for new crashworthiness technology such as airbags.

1987 Mobile Random Breath Testing introduced in NSW.

1989 NSW merges its Department of Main Roads, Department of Motor Transport and Traffic Authority to form the Roads & Traffic Authority

Major coach crashes at Grafton and Kempsey lead to new seatbelts in Coaches

NSW obtained funding to commence a New Car Assessment Program, and build the new crash test facility (Crashlab) required.

1990 NSW commences development of a Road Safety 2000 Strategy.

Compulsory novice motorcycle rider training introduced in NSW.

Overhead Safe-T-Cam initiated to monitor and control heavy vehicle point-to-point speeds in NSW

1991 Mandatory helmets for all pedal cycle riders in NSW.

Heavy vehicles required to have speed limiting to 100 km/hr

1992 Australian New Car Assessment Program (ANCAP) launched at NSW Crashlab.

40 km/hr school zone speed limits introduced in NSW.

1993 ANCAP commences frontal off-set program – a world first.

1994 RTA Crashlab initiates a consumer program for child restraints later known as Child Restraint Evaluation Program (CREP).

1995 Europe and the IIHS in the US follow ANCAP with a frontal off-set crash test.

1996 First presentation of Zero Goal in Australia

1997 The Swedish parliament adopts Zero Goal philosophy

1998 Introduction of 50 km/hr urban speed limit in NSW

2001 NSW launches Microsleep Driver Fatigue Campaign

2002 NSW commences sponsorship of cricket team associated with anti-speeding message!

First speed cameras in 40 km/hr school zones introduced in NSW.

2003 NSW launches Circadian Rhythms Fatigue Campaign.

Alcohol Interlock Program introduced in NSW.

2004 NSW launches of The Brain road safety campaign targeting modest alcohol consumption by young males.

2006 NSW launches the Paranoia road safety campaign, focused on the fear of getting caught by mobile RBT.

2007 NSW launches "Pinkie" campaign: "Speeding. No one thinks big of you".

2008 Australian-made cars achieve 5-star ANCAP rating for the first time.

Introduction of new restricted licensing programs for older drivers in NSW.

2009 Graduated Licensing Scheme introduced for motorcycle riders in NSW.

2010 Children below seven years of age required to travel in approved seats in NSW.

APPENDIX C RESOURCES

SAFER's website: www.saferresearch.com/about#block-aboutus

Sweden's ZERO GOAL BOOK:-

www.afconsult.com/contentassets/8f0c19f4f7d24aa5bdbfd338128391ec/2017057-17_0194-rapport-nollvision-eng_lr.pdf