

DESIGNS FOR LIFE

HOW AN AUSTRALIAN STATE IS DEALING WITH ROAD SAFETY

Victorian officials have a vested interest in maintaining the state's leading position in road safety. By investing heavily in reducing injuries and saving lives, the entire community is reaping the rewards



Victorians are incredibly proud of their road safety record – and with good reason. Although 336 people were killed on the Australian state's roads in 2006/2007, it's a road toll that has halved in the past two decades, despite a 52% increase in the vehicle fleet. But if you speak with the RACV's Peter Daly, chief engineer, Traffic and Transport, he'll insist there is still a long way to go, especially as the target set for 2017 is challenging to say the least.

But the interesting aspect of Victoria's achievements is the mechanism that has allowed the above results to be obtained. Uniquely, the state has a monopoly insurer for death or injury resulting from a crash. The Transport Accident Commission (TAC) is essentially a compensation scheme, which provides Victorians with a guarantee that they're covered in the event of a crash, regardless of fault. In addition, it allows those who can prove fault to pursue further compensation through a court process. In 2006/2007 alone, a total of AUS\$709 million was paid out in support services and benefits to over 39,000 people – which is a direct cost to the Victorian community.

THE BUSINESS PLAN

"There is clearly a business case for the TAC to invest in road safety," explains the 40-year-old Daly. "Over the years, they've researched many avenues, but investing in road safety produces a much bigger return. What they're doing is reducing their



Around 330 people die on Victoria's roads every year. Road safety officials in the state are doing all they can to ensure such losses are kept to a minimum

exposure to future claims – at the end of the day, it's a sound business decision." The philosophy is thus: by preventing accidents by investing in road safety, lives will be saved, injuries will be reduced and the Victorian community will benefit. The TAC is merely protecting its bottom line.

The financial investment over the past 10 years has been described by many as 'unprecedented'. A three-pronged attack has focused on safer drivers in safer cars on safer roads, all of which is pooled together under the umbrella Arrive Alive road safety strategy, the origins of which can be traced back to Scandinavia. "Claes Tingvall from the Swedish Road Administration is also a professor at the Monash University Accident Research Centre (MUARC) and he challenged us to start thinking about Sweden's Vision Zero," Daly says. "We call it a 'safe system' approach here, but the basic premise is that if you're in a safe, modern car, obeying the road rules, driving to the conditions, etc, the road shouldn't kill you.

"Victoria was also looking at maintaining its position in road safety. A great deal of time, effort and dollars had been spent on behavioral, enforcement and education programs and some real leaps forward in vehicle safety were starting to be made. Where we were lagging behind, though, was investing in safer infrastructure."

A direct result of that realization was the AUS\$240 million statewide Black Spot program, where the high-risk areas were pinpointed using risk mapping techniques and then dealt with accordingly. "This was a massive investment," Daly states. "To put it into context, we've just had our federal budget handed down and Victoria receives about AUS\$10 million a year to address



Run-off road crashes account for around 139 deaths every year. Installing safety barriers at the side of the road means that cars do not collide with roadside vegetation

such areas, so the TAC's AUS\$240 million a year over a four-year timeframe was as people have quite rightly said in the past 'unprecedented' – in both a national and an international sense. Safer roads have the potential to save nearly as many lives as safer vehicles and improved driver behavior combined, yet motorists' understanding of what makes a safe road is very limited."

The Black Spot program relied very heavily on research conducted at MUARC and ARRB Transport Research (the research arm of Australian road authorities) on the benefits of targeting black spots. Such was the success of the first AUS\$240 million invested between 1999 and 2004, a further AUS\$240 million was pledged between 2004 and 2007. "The Victorian government took a risk in spending that amount of money," Daly admits, "but the risk was based on some sound research and has

"The basic premise is that if you're in a safe, modern car, obeying the road rules, driving to the conditions, etc, the road shouldn't kill you"

TAKING IT SERIOUSLY



Across Australia, five people a day are killed and around 75 people seriously injured

Australians regard road safety very highly – much more so than many other countries around the world. In TV campaigns, for instance, some indigenous car-makers seem to promote a car's safety features more than the car itself – the new Holden Commodore was marketed primarily on its inclusion of ESC as standard. Serious crashes often appear on news bulletins, while bad, reckless and aggressive driving is singled out as a scourge that must be eradicated.

"The Australian view of road safety is not something I've pondered often," says Peter Daly. "It's a bit like doing the tourist thing in your home city – you don't see it from the inside, you just take it for granted."

Up until last year, Daly served a three-year stint as director, Europe, Australasia and South America, on the board of the Institute of Transportation Engineers (ITE). "As part of that, I traveled quite a bit to Europe and have been to the USA countless times, where I was surprised that road safety wasn't anywhere near as high on the agenda at the road authorities and in government as it is here in Australia," he explains. "Where I come from, we know that Victorians are more likely to die a violent death in a road crash than any other cause, so why

wouldn't you tackle it? It's the number one killer.

"I'm just over 40 and my generation has grown up in an environment where seatbelts were mandatory. I can remember that my parents wouldn't even let me ride in my grandparents' car because it didn't have seatbelts fitted. We accept seatbelts. We accept the stringent laws and enforcement relating to drink-driving and more recently, random drug testing at the roadside. We accept a lot of measures in relation to fatigue management, laws that apply particularly in the heavy truck industry. Road safety is a hot topic here."

Daly attributes Victoria's success, however, to a lot of committed people and several agencies working toward the same goal. "We've got VicRoads,

certainly paid community dividends. What we saw from the first road safety strategy was a reduction of 580 deaths in those years between 2002 and 2007 – or a reduction of about 25%. Looking across all of the treatment types, that's a benefit-cost ratio of about 3.7:4.0. In any economic analysis and to any road authority, those figures are a very good return on your dollars."

One of the key points that Daly and his colleagues have tried to emphasize to governments on many occasions is that roads are more than just a dumb piece of asphalt. "They're actually quite smart," he explains. "There's a lot of technology in roads that people don't see or appreciate – or even need to understand. That ranges from the skid resistance of the surface and what is buried under the road (vehicle sensors, etc) to lane markings. Most people don't understand the level of intelligence that lies beneath and on top of the black surface."

To perhaps increase this level of understanding, the Australian Road Assessment Program (AusRAP) initiated the Star Ratings system of scoring roads based on their safety levels – five star is best, while one star obviously denotes some urgent attention is required. "The Star Ratings measure the inherent safety of the road," Daly says. "It is a measure of those design features in a road that prevent crashes – or if they do occur, minimize the severity of the outcome. The Risk Maps show where the crashes have been – allowing you to fix any bad design faults [that's the basis of the Black Spot program] – but the Star Ratings predict where crashes will occur. We all know there isn't an unlimited supply of funds and you have to prioritize where they go, so the beauty of the Star Ratings is that



they identify those high-risk sections and treatments to be deployed to improve safety."

Consequently, the Victorian government launched what it dubbed a 'Grey Spot' program – otherwise known to VicRoads as the Safe Roads Infrastructure Program (SRIP) – which involved treating those areas where crashes were likely to occur. Where the Black Spot program was a reactive approach, SRIP is a proactive program that aims to

The challenge is to create a system that takes account of the fact that humans make mistakes

integrate safety barriers at the roadside and in the median, remove trees, improve lane markings and street lighting, include rumble strips, and so on.

LANE DEPARTURES

On average, 139 people are killed every year from run-off road crashes in Victoria – equating to almost 50% of all of the road deaths in the state. Due to the speeds involved, such crashes tend to be serious. "In Victoria, we do have a lot of roadside vegetation and from a pure safety point of

GOVERNMENTS HAVE THE POWER TO CHANGE ROADS AND SAVE LIVES

➔ According to Peter Daly, the road is the one thing that governments have complete control over. "They can't control human behavior and they can't control vehicle safety because, in the end, the consumers determine what features they want to see in their cars."

Although Daly is wary of offering advice that might not apply outside the Victorian jurisdiction, generally speaking he says if you have road users who are behaving safely and driving safer vehicles, it shouldn't be the road that kills them.

"The 'safe system' approach works well in Victoria and is something that can be applied universally," he says. "Having a system that recognizes that human beings

are imperfect and will make mistakes – and caters for those mistakes when the driver is roughly doing the right thing – is something that is achievable anywhere."

The way that you achieve that will vary from jurisdiction to jurisdiction and indeed in the different stages of a country's development. What is applicable in Australasia, particularly in the less developed parts of Southern Asia, is very different to what is being done in Victoria or the authorities in the UK would do.

But where there is a will there is a way, as Daly concludes. "I haven't met a road authority yet that wouldn't appreciate the funding to build the safest road they could possibly build."

the state roads authority, the Transport Accident Commission, the Victoria Police, the Monash University Accident Research Centre, the Australian Automobile Association, the RACV, and of course central government. All of these parties have a steadfast commitment to road safety and the relationships as stakeholders with each other are incredibly strong. I think more than anything else this is why Victoria does show innovation in the area of road safety and why we're such an attraction to road safety delegations from around the world. These different organizations aren't at war with each other – they're all pulling in the same direction. In some countries, you'll see situations where the roads authority and the police are sniping at each



other, pulling in different directions – that's not the case in Victoria. Our success is the result of us having some really wonderful road safety leaders going back many years and I must say, a courageous series of governments and ministers who were prepared to tackle those difficult decisions and invest

money into safety, while cracking down and introducing laws that, to be frank, wouldn't get past first base in other countries."

Here's a case in point. In February 2008, John Brumby, Victoria's Premier, announced a range of measures designed to further reduce the state's road toll, including tougher drinking

The Great Ocean Road is one of Victoria's most popular attractions, and where road safety has been enhanced

laws, more driver education, mandatory ESC and curtain airbags for every car registered in the state, and passenger restrictions for 'P-plate' drivers. The latter is one such example of a government taking a tough stance – and one you couldn't imagine being implemented in any other country. Research has shown the fatal crash risk for 'P-plate' drivers increases by four times when they carry two or more passengers. So, from July 2008 'P-platers' will no longer be able to carry more than one peer passenger at a time.

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The diagram shows how 700 lives could be saved every year as a result of the National Road Safety Strategy

view, that roadside vegetation is a killer. But we don't live in a world where road safety is the be-all and end-all. Improving roadside safety doesn't mean removing all of the trees – it means removing those that we can and acknowledging the biodiversity and habitat that remnant vegetation is. If we can't remove a tree for whatever reason, we simply put a guardfence around it. Removing the tree is preferable because ultimately it's safer, but it's not always a case of getting out the chainsaw. And although putting a guardfence around a tree obviously helps, you're best off putting a guardrail along the whole road, so you're not going to hit any of the trees at all."

Wire-rope fences are certainly popular with the Victorian government, despite the motorcycling fraternity not being overly enamored with them, likening them as they do to 'cheesewire'. Daly's assessment of the systems is based on research conducted around the world and on his own experience of deployments in Australia: "To be honest, if you career off the road at speed on a motorbike, any kind of barrier is going to be bad news – whether it's a wire-rope fence, a concrete barrier, steel guardrails, or even a tree, pole or steep embankment. For cars, wire-rope barriers effectively act as big shock absorbers, so if you run off the road, they bring you to a gradual stop. It's the sort of thing that you can hit at 100km/h yet still drive the vehicle away afterward.

"They are very, very effective and a relatively low-cost improvement. They don't require a huge footing, because you just secure them by putting a bit of concrete around the base of each plastic pole. Also, if a car hits a standard barrier, you might need quite a large crew – several men, a backhoe loader, dumper, etc – to repair the whole thing. With a wire-rope fence, two people can walk out with a special tool that is not too dissimilar to a shovel, lift the barrier up and slot in a new post – it's that simple. You don't need heavy equipment, you don't need to close roads for extended periods of time, and you can fix the fence extremely quickly, which is really critical. A safety fence is there for a reason, so if it's not there, it's not doing its job, which isn't good for anyone."

Daly maintains that the aim of the Star Ratings is not to ensure that every road in Victoria becomes five star. "What we want is safety features built into the roads wherever



Raising the safety standard of Victoria's roads is achievable and although much work needs to be done, the state is heading in the right direction

"In Victoria, we do have a lot of roadside vegetation and from a pure safety point of view that roadside vegetation is a killer"

possible. We believe that some of the most heavily trafficked roads should be five-star highways – for example the highest-volume roads – but across the network, five star simply isn't achievable. What we are saying, though, is that we can certainly lift our game in respect of what we already have."

The Hume Freeway – which links Melbourne with Sydney – is a prime example of where "the game" has been lifted. "The Victoria section is mostly four star," Daly says. "Some of the older sections are only three stars, but if roadside safety were to be tackled more intently, it could be a five-star motorway for the whole stretch – if, for instance, wire-rope barriers were deployed at the side and in the median."

The Calder Freeway – which links Melbourne to Kyneton – was once a two-lane, two-way road, but when it was built as a modern four-lane freeway, its rating jumped from two AusRAP stars to four, almost overnight. "The cost to the community of crashes on that road is essentially only 25% of what it used to be," Daly affirms. "The Australian Automobile Association (AAA) recently conducted some research that suggests that for every one star you move up the Star Ratings ladder, the cost to the community of crashes halves. So, if you go up two Star Ratings – as we have done with the Calder Freeway – the cost to the community of crashes will essentially be only a quarter of what it used to be, and that's a huge improvement."

CONFLICT POINTS

As well as run-off road incidents, the other major culprit to blame in the Victorian road toll is the intersection. "The idea with

Higher risk	Lower risk
<p>➤ Undivided roads with only one lane in each direction make it riskier to overtake. Freeways with wide medians and safety barriers can handle much higher traffic volumes with virtually no chance of a head-on crash</p>	
<p>➤ Roadside killers, such as trees, poles and steep embankments can turn what would be a minor crash into a severe one. If these hazards can't be removed, safety barriers can dramatically lower the risk</p>	
<p>➤ If a driver moves out of their lane, a sealed shoulder offers extra space to recover. Unsealed or narrow shoulders are unforgiving of simple mistakes and can lead to a loss of control, running off the road or head-on into traffic</p>	
<p>➤ Roads with lots of intersections are less safe because of an increased risk of brutal crashes with side-road traffic. Low-risk intersections have separate turning lanes and are clearly visible day and night. The best intersections have freeway-style on- and off-ramps</p>	



Star Ratings for Victoria's country highways (total kilometers rated = 6,847km). Note, these Star Ratings are based on road data collected in 2004, 2005 and 2006

an intersection is to minimize the conflict points," Daly advises. "It's just logical that if there are less opportunities for vehicles to run into each other, you're going to have fewer crashes. Roundabouts greatly reduce the severity of a crash and have been deployed where possible. In our rural areas, we have lots of what we call cross intersections. There are many physiological reasons that come into play here, all related to how we process visual information. You can't always see a vehicle moving at a constant speed on another road at right angles when it's maintaining a constant angle to you. What we did in Victoria was recognize that fact and change those intersections to what we call staggered 'T' intersections. So, instead of having one cross intersection, you would have a right-left stagger. That reduces the conflict."

Another conflict point in Victoria is the railway crossing, of which there are over 1,800. "When a vehicle and a train collide, the vehicle doesn't often win," Daly concedes. "Many of our railway crossings have nothing there apart from a sign saying, 'Railway Crossing - Give Way'. We're looking at how to prevent these rare but extremely serious crashes from taking place."

The issue was underscored in June 2007 when a truck slammed into a passenger train, killing 11 people. In the months since the Kerang tragedy, six more lives have been lost to level crossing accidents, most recently a mother and her daughter near Geelong. "Victoria is investigating how we improve those sorts of intersections, with lower speed limits in the vicinity of the crossings, putting in rumble strips, and so on. In the future, perhaps even GPS technology can be used to warn cars of an approaching train, or even activate the brakes on behalf of the driver."

Being the stage for so many accidents, deaths and - lest we forget - thousands of

injuries, Daly asserts that the perfect way to deal with an intersection is to remove it completely. "The safest one is what we call the interchange, where you have overpasses or underpasses - two vehicles cannot collide if they're physically separated. Of course, such infrastructure comes at a cost. In Victoria, we still have a number of motorways with at-grade intersections, which is something we at the RACV are saying needs attention. Where you can't remove the conflict points, you have to minimize the number of them or reduce the severity of the crash if it does occur."

When it comes to the techniques applied at high-risk areas, the figures speak for themselves. "There are some really significant improvements you can make, none of which are very expensive," Daly suggests. "These low-cost safety adjustments can have an enormous impact on road trauma. You get massive reductions for relatively little spend."

A large proportion of the SRIP focused on roundabouts, particularly at locations that were once home to cross intersections. In a rural location, integrating a roundabout

could reduce the number of crashes by about 85%. In urban areas, putting in new traffic signals or replacing those signals with roundabouts can result in an improvement of anywhere between 30-45%. In Australia, if you're turning right at an intersection (Australians drive on the left), more often than not you're confronted with a red, orange or green LED arrow, which controls when you're allowed to turn right. They can reduce up to 90% of right-turn-against crashes, which Daly calls a 'T-bone' crash.

Very simple measures can also be integrated, such as widening the road so the right-turning traffic and the ongoing traffic are kept further apart, thereby reducing the chances of a rear-end crash. Creating a right-turn lane at a 'T' intersection to let traffic pass on the left can reduce crashes by up to 50%. Converting a 'Y' configuration to a 'T' intersection, meanwhile - realigning one of those legs so that they come in at right angles - can provide an 85% reduction in crashes. Even improving skid resistance on bends in the road and at intersections can provide a 40% reduction in crashes.

This, Daly is keen to highlight, is where AusRAP, iRAP, EuroRAP, USRAP and KiwiRAP all make a real contribution, as they indicate the deficiencies in the network. Typically, a road with such deficiencies will rate very lowly on the Star Ratings system, but by making such simple improvements, the Star Rating can be lifted, thereby drastically impacting on the inherent safety of a road.

ENGAGING THE PUBLIC

Where AusRAP differs from other RAP programs in the developing world is that it has been developed by the RACV and the



'Don't risk it!' is a safety campaign to encourage drivers and pedestrians to think about what they are doing when approaching and using railway crossings

AAA as a language for dialog with the public about road infrastructure safety: "For many years in Victoria, we have been running advertisements to educate drivers about alcohol misuse, drugs, seatbelts, excessive speed, etc – most people know what it means to be a 'five-star driver'."

Australia also operates a New Car Assessment Program (NCAP), where vehicles receive a rating based on their safety features and crashworthiness. "Again, it's something they understand now – it's ingrained. But we've been guilty of letting the roads infrastructure side of things slip. As road safety and road traffic engineers, road design is a pretty complex subject to talk about. The Star Ratings are a very simple way of communicating what makes a road safe. At the most blatant level, it's trying to create more community pressure on governments to fund infrastructure, because we all know that this is how we're going to make the biggest difference."

Despite their critics, red light enforcement cameras have also played their part in improving safety at the intersection. "Running a red light is the most dangerous thing anyone can do when driving," Daly says. But he insists the cameras are extremely effective as a deterrent as they force motorists to think about the consequences of their actions, especially when that consequence could be having their license revoked. "You may not be able to change someone's attitude about running a red light, but you can change their behavior. Road safety is often about changing people's behavior. It'd be wonderful if you could change attitudes, but if you can't, you can still get a good safety result from influencing behavior."

COMING SOON

A further AUS\$650 million dollars will be invested throughout the 2008-2017 program, hopefully helping to reduce the road toll by another 100 or so. The strategy, on the whole, will be more of the same: a focus on the driver through continued education and enforcement and on the vehicle through improving – and mandating – safety systems. Regarding the latter, from 2011 all vehicles registered in Victoria will have to be equipped with ESC. As an incentive for the indigenous car manufacturers to accelerate the integration of ESC on all cars, the Victorian government will be upgrading its entire fleet over the course of the next three years.

Ultimately, though, to reach the next significant milestone – i.e. saving another 100 lives a year – most progress will be made by improving the roads themselves, by identifying those high-risk areas and improving their Star Ratings wherever possible. "It's not just about 100 lives a year," Daly stresses. "We also want to prevent another 2,000 serious injuries a year and importantly, reduce the severity of those injuries, which again



In the past five years, Victoria has had the five lowest road tolls in its history, reducing fatalities by 20%

has a very positive impact on the health of the community."

Sadly, albeit realistically, Daly doesn't foresee a time when Victoria will have zero deaths to report. A safe system will prevent death and injury for safe drivers in safe cars on safe roads, but there will always be people operating outside the boundaries, either through illegal or unwise behavior.

"Vision Zero doesn't preach zero deaths – it preaches achievable safety. Drivers high on drugs, not wearing a seatbelt, fatigued out of their minds and doing 180km/h, even if they're in the safest car on the safest road, could still die."

For those motorists doing the right thing, though, a 'safe system' approach should prevent death and serious injury. "If we got that far internationally, we would be talking about saving an unbelievable number of lives," he concludes. "If we achieve it, we'd be looking at the single biggest improvement to community health that's ever been made." ■

"The AAA conducted some research that says for every one star you move up the Star Ratings ladder, the cost to the community of crashes halves"



"Victoria is a state at the leading edge of world road safety, even though its population is only five million. A big reason for that focus is because the State of Victoria is also the insurer that has to pick up claims costs when people are killed or disabled for life. Those claims amount to some US\$666 million a year.

In Victoria, like almost nowhere else, proposals to save casualties can be pitched direct to financial self interest and not just community good. The result is that new research and thinking into how to save

lives is welcomed, listened to and applied vigorously. The state was an early adopter of the Swedish model for a safe systems approach: safe drivers, in safe vehicles, on safe roads. It was an early RAP program adopter that understood the value of risk mapping and road inspections to measure and improve road safety.

Victoria has invested big in safe roadsides and safe junctions, seen the bottom line high return, and pledged to invest much more over the next decade."

John Dawson, chairman, iRAP

