Submission No 13

DRIVERLESS VEHICLES AND ROAD SAFETY

Organisation: Transurban

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15 April 2016

Mr Greg Aplin MP
Staysafe
Parliament House
Macquarie Street
Sydney NSW 2000

Dear Mr Aplin

RE: Challenges and benefits of adopting driverless vehicle technology

Transurban is pleased to provide a submission in response to the New South Wales Staysafe Committee's inquiry into driverless vehicles and the impact on road safety.

Transurban is an urban road developer and operator that currently manages 15 tolled motorways across Melbourne, Sydney and Brisbane in Australia and Northern Virginia in the United States. We use sophisiticated on-road and back-office technology to safely and efficiently managed millions of trips across our networks annually.

Advances in technology are presenting a range of new opportunities for road operators across all aspects of transportation systems including the way we interact with vehicles, roadside systems and customers. As a full or partial owner and operator of six tolled motorways in New South Wales, Transurban believes these advances present exciting prospects for our business and customers.

The introduction of driverless vehicles represents the largest opportunity in the global road operations industry. The automotive industry is confident that we are five to 10 years away from these vehicles being on the market. With increased automation and the reduction of human-operated driving, we expect significant safety benefits will be realised.

Please find enclosed Transurban's submission outlining our industry insights about the introduction of driverless vehicles.

Yours sincerely

[redacted]

Michele Huey
Group General Manager - Strategy

Submission to the New South Wales StaySafe Committee

15 April 2016

CHALLENGES AND BENEFITS OF ADOPTING DRIVERLESS VEHICLE TECHNOLOGY

Transurban welcomes the opportunity to make a submission to the New South Wales Staysafe Committee's inquiry into driverless vehicles and the impact on road safety in New South Wales.

While the terms of reference for the inquiry set out a number of areas for comment, Transurban believes its knowledge and expertise of the subject matter is best used in addressing the following issues:

1. The capacity of driverless vehicle technology to improve road safety including a lower road toll, and fewer accidents and injuries to drivers, pedestrians and other road users, and
2. The experience of other jurisdictions in Australia and overseas in adopting and adapting to driverless vehicle technology.

Transurban is an urban road developer and operator that manages 15 tolled motorways across Melbourne, Sydney and Brisbane in Australia and Northern Virginia in the United States (US), totalling 1329 lane kilometres[1] of roads, bridges and tunnels. We use sophisticated on-road and back-office technology to safely and efficiently manage hundreds of millions of trips across our networks annually.

Transurban currently has more than $11 billion of road projects either proposed or under construction. In New South Wales, Transurban and its partners in Westlink M7 will construct and operate NorthConnex, a nine kilometre twin-tunnel tolled link between the Hills M2 Motorway at Pennant Hills and the M1 Freeway at Wahroonga. It is imperative that new projects look at technology in the design of roads to ensure there is flexibility to deal with technological advances.

Advances in technology are presenting a range of new opportunities for road operators across all aspects of transportation systems including the way we interact with vehicles, roadside systems and customers. As a full or partial owner and operator of six tolled motorways in New South Wales, Transurban believes these advances present exciting prospects for our business and customers.

The imminent introduction driverless vehicles, otherwise known as connected autonomous vehicles (CAVs), represents the largest opportunity in the global road operations industry. The automotive

[1] Includes Transurban assets and projects

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industry is confident that we are five to 10 years away from these vehicles being on the market with mass adoption likely by 2040.

In considering the introduction of CAVs in New South Wales, Transurban recommends the Staysafe Committee considers:

- the development of legislation enabling driverless vehicles should include the specific requirements for and capabilities that both "connected" and "autonomous" vehicles will bring. This broad approach will ensure the realisation of greater safety and efficiency benefits.
- urban motorways as ideal locations for the early adoption of CAVs on public roads as they provide a safe, well-maintained environment with fewer complicating factors for CAVs to navigate, that is, an absence of traffic signals, pedestrians and cyclists (to name a few).
- the development of regulation that provides for the creation of dedicated CAV lanes on motorways (once penetration of CAVs reaches a critical amount to justify the action) to facilitate the safe co-existence of CAV and manually operated vehicles during the transition phase.

These recommendations are explained further throughout this submission.

Safety and lane capacity benefits

In 2015, there were more than 1200 fatalities on Australian roads[2]. Research has indicated that generally 75 per cent of all roadway crashes is attributable to human error[3]. Road fatalities and injuries are estimated to cost the economy $27 billion per year[4]. This estimate is equivalent to 2.6 per cent[5] of the national GDP and represents approximately 40 per cent of Australia's total health expenditure[6].

Transurban contends one of the most significant benefits from the introduction of CAVs and, subsequently, reducing the amount of human driving will be enhanced road safety.

[2] https://bitre.gov.au/publications/ongoing/rda/files/RDA_Feb_2016.pdf
[3] Hankey, Wiewille, Cannell, Kieliszeweski, Medina, Dingus and Cooper, 1999; cited in Salmon, Regan and Johnston 2006
[4] https://infrastructure.gov.au/roads/safety/
[5] OECD International Transport Forum, Road Safety Annual Report, 2014
[6] http://budget.gov.au/2015-16/content/bp1/html/bp1_bs5-01.htm

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Potentially the kind of safety benefits that could be realised can already be seen in the aviation industry which began introducing automation technology in the 1960s and today is heavily automated.

Modern aircraft are largely flown by a computer autopilot that tracks position using motion sensors and corrected as necessary by GPS. Software systems are also used to land commercial aircraft. In a recent survey of airline pilots, those operating Boeing 777s reported that they spent just seven minutes manually piloting their planes in a typical flight. While pilots operating Airbus planes spent half that time[7].

It has been reported that automation technology has reduced pilot-attributtable crash rate by up to 90 per cent[8]. Today automated commercial planes are considered the safest way to travel, but the human health impact of this automation is somewhat limited because flying for most individuals is an infrequent activity.

If autonomous vehicles provide similar safety benefits, the introduction of the autonomous car has the potential to be one of the great public health advances in human history.

A comparison of Google's autonomous vehicle trials and the US national accident records (adjusted for unreported crashes and accident severity) indicates a trend towards a reduction in crash rates when compared to the national average[9]. This is shown in Figure 1.

The US Department of Transportation has forecasted that as CAVs reduce the amount of human involvement in driving, the number of road crashes due to human error could be reduced by up to 90 per cent[10].

[7] http://www.nytimes.com/2015/04/07/science/planes-without-pilots.html?smid=tw-share&_r=1
[8] http://arkinv.st/1PjLFWT; http://www.planecrashinfo.com/cause.htm; http://www.boeing.com/commercial/aeromagazine/aero_08/human_textonly.html
[9] Virginia Technology Transport Institute, *Automated vehicle crash rate comparison using naturalised data*, January 2016
[10] US Department of Transportation, National Highway Traffic Safety Administration, July 2008, *National Motor Vehicle Crash Causation Survey Report to Congress* http://www.nrd.nhtsa.dot.gov/Pubs/811059.PDF

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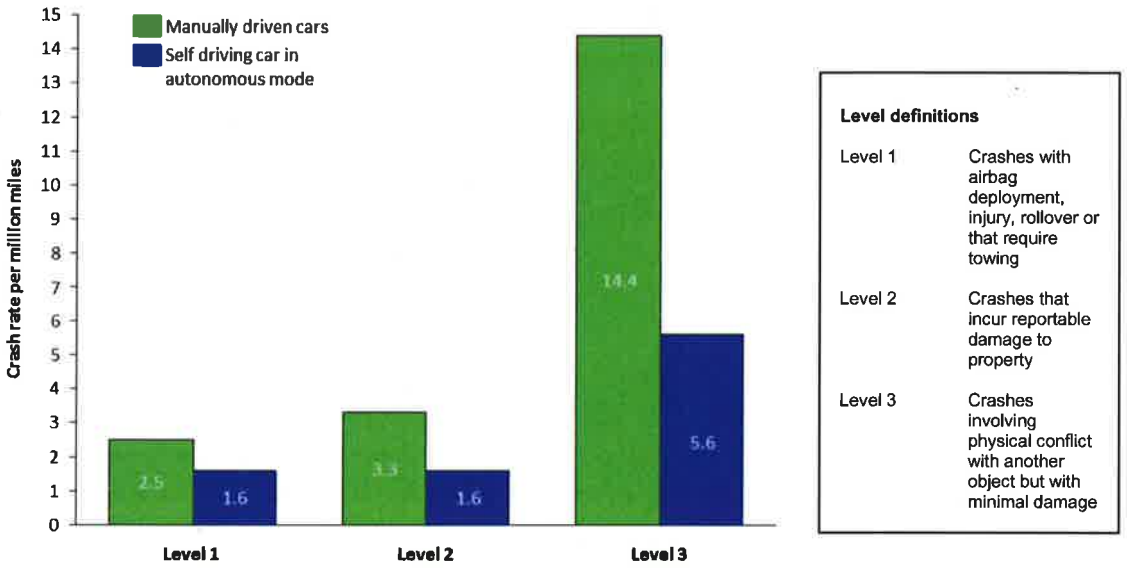
Figure 1 shows a comparison of crash rates based on Google's autonomous vehicles trials and the US national accident records



The US National Highway Traffic Safety Administration estimates[11] that by applying just two of the numerous possible vehicle-to-vehicle (V2V) safety applications - in this case, intersection movement assist and left turn assist – would (depending on the level of market penetration):

- prevent up to 592,000 crashes annually
- save up to 1,000 lives annually
- avoid up to 270,000 injuries annually
- reduce up to 728,000 property-damage-only crashes annually.

[11] Harding, J., et al, *Vehicle-to-vehicle communications: Readiness of V2V technology for application*. (Report No. DOT HS 812 014). Washington, DC: National Highway Traffic Safety Administration, August 2014

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The use of other V2V and vehicle-to-infrastructure (V2I) technologies has the potential to further increase the number of lives saved[12]. For this reason, it is important regulation enabling "autonomous" vehicles should focus on "connected autonomous" vehicles, which incorporate V2V and V2I technologies, as this will allow the greater safety benefits to be realised.

Reducing the number of road accidents would, in turn, benefit traffic flow. Currently 25 per cent of non-recurrent road congestion is attributed to traffic incidents such as vehicle crashes and breakdowns[13].

Moreover, the use of V2V communications could also allow CAVs to travel safely with much shorter distances between vehicles, allowing them to form "platoons" (ie travelling in convoys with smaller speed variance and distances between vehicles without sacrificing safety). This would bring benefits including increased traffic throughput from more vehicles being able to use the same road space, fuel efficiency[14] and safety.

Earlier this month, the European Union completed a demonstration of semi-autonomous trucks, which comprised the first cross-border truck platooning on public roads. Truck platooning is possible through the use of a combination of different technologies including radar, cameras, GPS and V2V communication to reduce the trucks' individual response time to traffic incidents to almost zero[15]. The European Automobile Manufacturers Association stated that the minimal response times, elimination of driver distraction and more predictive driving of trucks on the road would improve safety for all road users[16].

In October 2015, Rio Tinto introduced autonomous trucks in two of its mines in Western Australia and has now expanded its program to other mines. The driverless trucks are controlled from an operations centre in Perth. Rio Tinto has said the trucks can operate 24/7 and this has removed the risk of accident through employee fatigue. Haulage vehicles may prove a logical starting point for the introduction of driverless vehicles on public roads in Australia.

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[12] *Ibid*

[13] http://www.ops.fhwa.dot.gov/congestion_report_04/executive_summary.htm

[14] M. P. Lammert, A. Duran, J. Diez, K. Burton, and A. Nicholson. Effect of Platooning on Fuel Consumption of Class 8 Vehicles Over a Range of Speeds, Following Distances, and Mass. SAE International Journal of Commercial Vehicles, (30):7–9, September 2014

[15] https://www.eutruckplatooning.com/default.aspx

[16] http://arstechnica.com/cars/2016/04/europe-completes-a-demonstration-of-semi-autonomous-truck-platooning/

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Submission to the New South Wales StaySafe Committee

Virginia CAV program tests real-world conditions

In the United States, 15 states have made autonomous driving legal. While in Australia, South Australia became the first state to allow on-road driverless car trials with the passing of legislation in March 2016. Prior to this, the first CAV demonstration in Australia took place on Adelaide's Southern Expressway in November 2015.

Transurban, through its business in the United States, has partnered in a regional CAV pilot program. In November 2015, Transurban in partnership with the Virginia Department of Transportation, Virginia Tech and mapping specialist HERE, participated in the Virginia Automated Corridors initiative. This was the first test run of automated and connected vehicles in Northern Virginia and included Transurban's 95 Express Lanes.

The 95 Express Lanes were chosen due to the safe environment they could provide for the demonstration. Urban motorways in general provide ideal conditions for the early adoption of CAVs on public roads, because they are well-maintained and have fewer complicating factors for CAVs to navigate (eg traffic signals, pedestrians and cyclists).

The demonstration featured an automated vehicle performing specific driving actions such as lane changes and automated braking in response to scenarios including a simulated work zone and an approaching law enforcement vehicle.

In the simulated work zone, road workers were equipped with a transmitting device in their pocket which sent a signal to the automated vehicle which slowed down through the zone. This feature offers tangible safety benefits for road and construction works.

A connected vehicle equipped with both dedicated short-range communications and cellular technology responded to driving scenarios along the test roadway.

Under the Virginia Automated Corridors initiative, Virginian roads and state-of-the-art test facilities, including Transurban's Express Lanes, will be used for further automated-vehicle testing, certification, and migration towards deployment.

Resources such as high-definition mapping capabilities, real-time traffic and incident information, intelligent routing, location cloud technology and high-precision global navigation satellite systems will be tested and integrated.

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Video commentary about the pilot is available here:
http://www.transurban.com/community/automatedvehicles.htm

This kind of initiative gives automotive companies and suppliers of automated vehicles the ideal, real-world environments they need to test complex scenarios prior to putting their vehicles on more roadways.

Conclusion

With CAVs now in the real-world testing phase, it is important for governments and industry to consider the legislation, regulatory frameworks, industry standards and codes of practice that need to be in place to support:

1. the safe testing of CAVs; and
2. the introduction of CAVs into the market.

The suite of rules and regulations must also consider the transition phase when both manual cars and CAVs are present on the road as developing systems to ensure the roads can be shared safely will be critical. One possible approach may be the introduction of dedicated CAV lanes on motorways to allow CAVs and manual vehicles to travel safely together, while also allowing CAVs to realise their full potential. These lanes could be exclusively for suitably equipped vehicles.

The introduction of CAVs in New South Wales will provide significant safety benefits. These will be optimised by thorough and thoughtful regulation that is structured to ensure the full safety and efficiency benefits can be realised and the transition phase effectively managed.

ENDS

For all enquiries please contact:

Alison Crosweller, Government Relations Manager

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