REPORT ON PROCEEDINGS BEFORE

STAYSAFE (JOINT STANDING COMMITTEE ON ROAD SAFETY)

DRIVERLESS VEHICLES AND ROAD SAFETY IN NEW SOUTH WALES

At Macquarie Room, Parliament House, Sydney on Monday, 20 June 2016

The Committee met at 9:00 am

PRESENT

Mr G. Aplin (Chair)

Mr A. Crouch
Dr M. Faruqi
Mr N. Lalich
Mr S. MacDonald
Ms E. Petinos

WITNESSES

BRIAN WOOD, Secretary, Motorcycle Council of NSW, affirmed and examined 40

CHRIS SIOROKOS, General Manager, Advocacy and Media, NRMA, affirmed and examined: 1

GUY STANFORD, Delegate, Motorcycle Council of NSW, affirmed and examined 40

IAN FAULKS, Private citizen, affirmed and examined 31

JOHN ROYDHOUSE, Chief Executive Officer, Institute of Public Works Engineering Australasia, NSW Division, affirmed and examined 28

KIERAN TRANTER, Associate Professor, Law Futures Centre and Urban Research Program, Griffith University, sworn and examined 11

MARK ALBERT CHRISTOPHER BRADY, Solicitor and PhD candidate, Law Futures Centre, Griffith University, sworn and examined 11

MICK SAVAGE, Manager, Roads and Transport Directorate, Institute of Public Works Engineering Australasia, NSW Division, affirmed and examined 28

RAY RICE, Chief Executive Officer, Bicycle NSW, sworn and examined 36

RODERICK KATZ, Director, Amy Gillett Foundation, affirmed and examined 20

STEVEN PEARCE, Treasurer, Motorcycle Council of NSW, affirmed and examined 40

TOBY WALSH, Professor of Artificial Intelligence, University of New South Wales, and Research Group Leader, Data61, before the Committee via Skype 7

CHRIS SIOROKOS, General Manager, Advocacy and Media, NRMA, affirmed and examined:

The CHAIR: Today the Joint Standing Committee on Road Safety, also known as the Staysafe Committee, will hear from a range of stakeholders on the issue of driverless vehicles and road safety in New South Wales. Evidence presented at today's hearing will allow the Committee to examine in detail improved road safety benefits associated with the introduction of driverless vehicle technology and make a contribution towards preparing New South Wales to maximise the benefits and meet the challenges brought by these technologies. Mr Chris Siorokos from the NRMA is our first witness. Do you have any questions concerning the procedural information sent to you in relation to witnesses and the hearing process?

Mr SIOROKOS: No.

The CHAIR: May I just confirm that you would be happy to provide a written reply within 10 business days to any questions taken on notice and any supplementary questions the Committee may have?

Mr SIOROKOS: That is fine.

The CHAIR: Would you like to make a brief opening statement?

Mr SIOROKOS: It is important to note that much of the technology that we are talking about in relation to autonomous cars already exists and is already in the market in cars on our roads—things like adaptive cruise control, lane-keeping technology, autonomous emergency braking—and already taking some control away from drivers. We are not talking about something that is going to be happening in the future; these things are happening now. It is really important that governments across the country understand that; they should start thinking about and acting on what regulatory arrangements need to change.

Other jurisdictions around the world, principally in Europe and the United States, are far more advanced than Australia when it comes to looking at a regulatory framework required for driverless cars, and they are also much more advanced in terms of trials—even Greece, a country that runs on the smell of an oily rag, is doing an autonomous bus trial. So around the world these things are happening and it is important for policy makers across the country to understand that the pace of technology is moving very quickly. Initially when people were talking about autonomous cars, most car makers were saying they were decades off, now people are talking about 2020 for fully autonomous vehicles. The NRMA is pleased that this inquiry is taking place and we are very pleased to be participating in it.

The CHAIR: In your submission you have calculated the base of the figure of 90 per cent of road accidents being caused by human error, and using those 2008 to 2013 statistics it was estimated that autonomous vehicles could save the New South Wales economy approximately $13.5 billion. Could you elaborate on those findings?

Mr SIOROKOS: Some years ago we did some work on the cost of crashes—human cost as well as financial. We looked at those numbers and then hypothecated what would happen if we did receive that 90 per cent reduction. Most crashes, as the submission points out, are caused by human error, whether inattention or distraction, and many studies from around the world show that as a vastly under-reported cause of crashes—impairment through drugs or alcohol, tiredness and a whole range of human factors. We looked at crashes to date. We did some analysis and, as I said, about 90 per cent were caused by human error, and then we calculated the potential lives saved against the cost of crashes work that we did some years ago. I do not have those numbers to hand but I am more than happy to make them available to the Committee should the Committee wish to have a copy of that report on the cost of crashes.

The CHAIR: We have received quite a significant amount of detail in that respect but if we need more thank you for the offer. One submission received outlined that the estimated 90 per cent reduction in road accidents and associated costs is optimistic. Do you see any preconditions that need to be in place for that reduction to be realised?

Mr SIOROKOS: We mentioned in our submission that it was a hypothetical number but we do think there will be very significant improvements. If you look at the Google car in the United States, over the past few years it has done more than 1.5 million miles of travel. At the beginning of this year it was involved in 17 crashes and all bar one was caused by another vehicle or some sort of human error not to do with the car. When you look at all sorts of automation you do see that there are significant reductions in human error—whether it be on production lines or in the use of any kind of autonomous navigation system. When you look at reports, for example, about plane crashes and the importance of autopilot there is a body of evidence that shows that autopilot is far safer than a human pilot. In fact, in many instances when humans intervene, take control and override the autopilot that is when errors and catastrophic results occur. We cannot say for certain that the

90 per cent is right but we do think that it will be a significant improvement in the current state of play because most crashes are caused by human error and that machine to roadside equipment interface removes a lot of that human error—in fact, we would argue that it would remove most.

Mr ADAM CROUCH: The submission from the NRMA suggests that New South Wales could increase the uptake of technology in order to address road and transport problems that face New South Wales road users. Could you elaborate on that?

Mr SIOROKOS: I guess we can split it into road safety and congestion. I have talked a bit about what we think are the road safety benefits of technology; when it comes to the use of technology there are also congestion benefits. A number of studies have been done—for example, one study looked at what the uptake of fully autonomous cars would mean for the city of Singapore. Singapore is a special case because of its size and the nature of its government. That study suggested that up to one-third of cars could be taken off Singapore roads if you had an efficient autonomous car network where people hailed cars as they needed them.

There has also been some work done on things like keeping consistent speeds on motorways. One of the challenges with motorways is that people do not travel at consistent speeds and when they merge not everyone is an expert merger, which slows down traffic. If you had autonomous or semi-autonomous vehicles that could regulate the speed safely and do it in a way that eliminated not necessarily human error but some human trepidation, then the traffic flow could move more fluidly. There are also issues when people stop at traffic lights. For example—cars do not all start synchronously. The first car moves, then the second car moves and so on, which results in congestion around intersections. If you could get rid of that, with all cars starting off at the same time, you could make traffic flow much better and you could use road space more efficiently.

I heard a figure at a seminar, and I cannot vouch for its veracity, from somebody at a technology company. They said that at any one time on a motorway only about 25 per cent of the road space is being used. So if we could get cars closer together in a safe way and get them moving at a consistent speed then it would mean that we would not have to spend as much in future augmenting motorways. If we had an on-demand autonomous car service where the car came and picked you up, dropped you off and then went away, we would not need to take up valuable road space with parking. These are all the sorts of things that people are looking at. For a number of the things I talked about—the merging and the synchronous starting, for example—you do not even need fully autonomous cars; you just need to tweak the technology that is already in cars, like adaptive cruise control and other things, to get those benefits and gains.

Mr ADAM CROUCH: On Friday we heard from many witnesses, and we have also had many written submissions, that recommended the approach to driverless vehicles be a national one rather than a State based approach. What would the view of the NRMA be on that?

Mr SIOROKOS: We think that makes sense. We do not want another railway gauge situation where once you hit the Victorian-Queensland border you have to jump out of your car and switch to a different one because the standards are different. A lot of the technology in these cars is essentially mobile phone technology. Given that the Commonwealth Government controls the spectrum and the radio frequencies it kind of makes sense, and given that these cars are communicating with each other, for there to be some Commonwealth oversight. Also, as I said, it would be a mistake to have a hodgepodge of laws where it depends on which State you are in as to what is allowed, and what is allowed in one State may not be allowed in another.

For example, there are already cars on the road with adaptive cruise control. If you have a divided dual carriageway, as we do from Sydney to Melbourne, almost, then you could theoretically run a car there now—if you turn on adaptive cruise control, lane keeping technology and autonomous emergency braking—with very minimal human interference. So it could already happen and that car could travel between States on good quality roads. You could not do it on town roads or city roads. So it makes sense that we have national standards. I just cannot see how it could work otherwise. I do not know what you would do—you would probably need some sort of checks at borders to say, "Turn all these features off." I just do not know what you would do there.

Mr SCOT MacDONALD: You have mentioned a couple of times trials going on in places like Milton Keynes, Coventry and Singapore, and you mentioned that trials could be conducted in places like Newcastle, Wollongong, Sydney, Olympic Park or regional New South Wales. I guess one of the questions in the minds of a few of us is whether driverless technology is more suited and adapted to certain areas. For example, regional New South Wales might struggle with mobile phone coverage and things like that. I have heard in particular people from Newcastle say that as that area is small and compact it could be well suited to this. I wonder whether you have any thoughts on its suitability and whether we should be kicking off this technology in defined areas like that.

Mr SIOROKOS: We certainly think that should be the case. We are talking about a major step-change in community attitudes as well as in bureaucratic and regulatory frameworks. I think it would make sense to have a trial in a contained area. We mentioned Sydney Olympic Park, for example, because most days there is not a huge amount of traffic running through there. It has very wide streets and they are relatively straight so you could closely control a trial. Newcastle is the same so it could be done there. Mr MacDonald mentioned country towns. Country towns are one of the areas that might potentially have the greatest demand for autonomous cars. People often do the seachange or treechange thing and retire to a country town. They move there when they are fit and healthy and they do not think about what will happen when they lose their licence. It is something that has been taxing the NRMA for a while.

Mr SCOT MacDONALD: So you are talking about public transport issues?

Mr SIOROKOS: Yes, public transport services are few and far between in some places. People still need to get to the doctor. People still need to get to the shops to do their shopping and they still need to get out and visit friends for social reasons. The Automobile Association of America did a very good study, which it released last year, which showed that when older people lose their licence their health declines really rapidly. So if you are in a country town, and you moved there when you were fit and healthy, as you get older driving becomes difficult—until the doctor says, "Look, you really cannot drive any more." At that point your options are severely limited.

I suspect that will be the kind of situation that may make someone think, "You know what, I'm happy to jump into an autonomous car or almost autonomous car, or a shared car or whatever it is. Sure, it might only be allowed to travel outside of peak hours or on certain roads. But it means I can still get around." So I think you are right, there are issues in the country. But I think it might be in certain parts of country and regional New South Wales where the need may become quite acute as they struggle with an ageing population.

Mr NICK LALICH: I have to say that I agree with much of what has been stated in your submission. It notes that:

> Restricting innovation and taking a reactive approach to driverless vehicle technologies will place NSW at a disadvantage and potentially stall any road safety benefits associated with a driverless vehicle future.

Mr Siorokos, could you please expand on this? Could you identify where regulations could restrict innovation? What advantages are you referring to? Where do you see the risk of a reactive approach to technology stalling road safety benefits?

Mr SIOROKOS: I think the Chair mentioned earlier that that there are many trials going on around the world. The United Kingdom is doing a root and branch review of its regulations around driving to make sure that they can accommodate autonomous cars. I know that California has passed laws to allow autonomous cars on its roads for testing purposes. Nevada has also. At last look I think there were about seven or eight states in the United States that have passed laws and changed their regulations to allow for autonomous cars.

The South Australian Government is conducting a trial and is looking at its legislative framework. The Royal Automobile Club [RAC] in Western Australia, which is an organisation similar to the NRMA, is also conducting a trial with the support of the Western Australian Government. So we think that New South Wales should be looking at doing those sorts of things as well—doing a comprehensive review of its regulations and also feeding into the National Transport Commission process that is going on at the moment looking at autonomous vehicles. I am sure that is happening, but we think it would be good for there to be some sort of outward demonstration of that as well with some sort of trial.

There are over 600 pieces of legislation or regulation nationally that affect how people drive and what drivers are responsible for. So there needs to be a comprehensive look taken by the Government of what laws in New South Wales relate to those things, because, as I have said, I think it is important to point out that if I bought a top of the line European car tomorrow then I could drive on a motorway while barely touching the steering wheel. I could do that. I was in Europe last year and I got to sit in a car where the driver basically just pressed three buttons. We were on a freeway and we were just going. So these things are happening now. The sorts of questions they raise are questions that could be raised right now—not in 2020 or 2030. So we think it is really important that the Government starts to publicly look at them, and that is why we commend this Committee and this inquiry.

Mr NICK LALICH: I agree. The Government does not interfere with the technology as far as mobile phones goes and it does not interfere with computer programs. We allow companies to do what they wish there. There are some regulations of course around packaging and stuff like that. But I agree with what the witnesses are saying about driverless vehicles. We should let companies, whether they want to do it nationally or statewide, across the board to do what they feel they have to do to bring the technology into production.

I also think that the sooner we allow them to do that without regulating—except of course, like you said, in relation to where they can operate their trials, how they highlight the vehicle so that people know it is a test vehicle, all of which we could regulate—but as far as technology goes, we should let companies go ahead and do what they wish. If overwhelming technology comes out of that, then we could mandate that to be installed on all vehicles; otherwise, just let them do what they wish. That is my belief.

Mr SIOROKOS: They are kind of already doing that, to a degree. What they do has to fit within the Australian design rules, but they are not as prescriptive as they used to be. The risk we run here in New South Wales is if we do not do what the South Australians and Western Australians are doing. There is also some sort of an economic upside too if you can test and prove technology and perhaps create a local economy or industry in building this technology. The thing is that most of the smarts in cars in the future will be in the technology, not necessarily in the body. You do not necessarily need to have an automotive industry in this country to benefit from autonomous cars. Everyone raises the issue of Google maps. Google maps was conceived in Australia. Most of the work that is still done on Google maps is done out of an office in Sydney, I understand. We can take advantage of these things.

Dr MEHREEN FARUQI: Thank you very much for coming in to provide evidence. I want to go back to that 90 per cent reduction figure for a minute. Do you know what sort of assumption is behind that? Does it assume that 100 per cent of the cars will be autonomous and to what level might they be autonomous?

Mr SIOROKOS: Yes, I think it does. I think we make a point in our submission that it is a purely hypothetical number and we assume an autonomous fleet. But the important thing to remember is that when you look at the crash statistics, most crashes and most fatalities are caused by people in a car and they are caused by things like impairment, tiredness, which I guess is a form of impairment—tiredness and fatigue—inattention and speed. I mentioned that inattention is a very big issue—bigger than most people anticipate. We want to eliminate those things if we can. Everyone has done it: Sometimes you get home and you think, "Gee, I just can't remember the drive", because you had other things going on in your head. All sorts of things happen. If you can eliminate those kinds of risks, then you can have significant road safety outcomes and benefits.

You are right: Yes, it is a hypothetical number, but we think that when you look at what the Google car has done and its safety record—one and a half million miles and only one crash that we know of that was caused by the car, not by other factors—we think that is a pretty good outcome. But you would need to have a critical mass of cars on the road to actually get a demonstrable benefit.

Dr MEHREEN FARUQI: A couple of submissions raised the issue that when we go to autonomous cars, we lose that eye-to-eye contact that people might have with vulnerable road users, especially. That has been an issue raised by a number of submissions as well. In your view, what are the risks for vulnerable road users, such as pedestrians, motorcyclists and cyclists, if any?

Mr SIOROKOS: Again I would say that it is our view that the risks are reduced for the reasons I mentioned earlier. Even with pedestrians, we know that we see a spike of pedestrian deaths towards the back end of the week. You can assume that they are impaired in some way. The evidence we have seen suggests that—and there is still a bit of work to do—autonomous cars and the technology in them, particularly the radars and the cameras, have the capacity to identify vulnerable road users. This technology does not work perfectly. At the moment it does not work well at night and it does not work well in wet weather, but these things will get better over time.

But when you look at what causes most deaths, it is in car impairment or inattention. If you can eliminate that in a large way, you can eliminate a large number of crashes. I do think that the technology will get to such a point where you can also eliminate a lot of vulnerable road user deaths. One of the things that we know is happening overseas—for example, for cyclists, who are a vulnerable group—is that there is some technology we can put a little transponder on a bike and a receiver on a truck so that truck drivers know that there are cyclists about. If you take that out a bit, you could ensure that over time this would become standard on all bikes, or it may well just happen because the market dictates that it happens. If the receiver becomes standard on all cars, then you will significantly reduce the risk of cycling injury and fatalities. There are ways you can manage this stuff.

Dr MEHREEN FARUQI: This is a bit like the vehicle-to-vehicle communication.

Mr SIOROKOS: Yes.

Dr MEHREEN FARUQI: Which could extend to cyclists and motorcyclists.

Mr SIOROKOS: Absolutely. There are trials going on around the world with this sort of technology right now.

Dr MEHREEN FARUQI: One or two submissions have actually pointed out that there will be changes required to how drivers are trained and how licences are given out. I am interested in your view on that and how you think that might change.

Mr SIOROKOS: I guess no-one really knows how it might change because the technology is moving very quickly. I read a report recently that the United Kingdom Government review is looking at everything from minimum ages to blood alcohol levels in an autonomous car environment because what relevance does a minimum age have if the car is fully in charge? Obviously, in a semi-autonomous car, that would not be on, but in a world where there are fully autonomous vehicles these are things that will need to be considered. My argument would be that you move very slowly in those areas.

In terms of driver training, I guess it would be the same as looking at, I presume, over time the way that pilots have been trained, which has changed quite considerably to rely more on the machine and its technology than yanking the stick to do all sorts of weird and wonderful manoeuvres. I presume that as technology progresses the nature of the training will progress, but it is hard to say what that will look like.

Dr MEHREEN FARUQI: And in the interim, when we have level two or three, it is even harder because drivers to sometimes take control.

Mr SIOROKOS: Yes. That is right, absolutely.

Dr MEHREEN FARUQI: And when to do that, or when not to do that?

Mr SIOROKOS: Yes, but I guess drivers already have to make those decisions, even with things like standard cruise control. When do they hit the accelerator?

Dr MEHREEN FARUQI: My last question relates to liability, given that cars might be fully in control at some point in time. Where do you think liability should be worked out in the case of accidents? How do you think that should be worked out? I am sure your organisation has given some thought to at-fault, CTP, and all that sort of stuff. Where do you see that going?

Mr SIOROKOS: Sure. I should make clear that I represent the motoring side of the NRMA, not the insurance side, but we have looked at those issues. Again, our argument would be that these are questions that already need to be answered with the technology that already is in cars. Cars can take control and do take control, and that can lead to consequences. So far there have not been that many, but it can happen. But it is not something that we need to focus on in the future; it is something we need to focus on now. But again we will have driverless trains in Sydney very soon and the same questions will arise about what would happen if something goes wrong with the system. That is unlikely because the experience around the world with driverless trains is that they are relatively safe, but you cannot program out everything.

In terms of the liability, I suspect that that will be worked out as this technology becomes more and more ubiquitous, but there are other industries—airlines, for example—where a pilot is effectively in control for only 15 minutes, they say, these days on the plane. Those liability questions arise. Those massive trucks on mine sites that might be in the Pilbara but are controlled from Perth, these things are already here and they are already happening, and no doubt they are insured. Someone has figured out where the appropriate liability should sit and what the appropriate weightings are.

Ms ELENI PETINOS: Professor Toby Walsh from the University of New South Wales suggested that automated vehicles should be visually distinctive and easily identifiable. He further suggests that this could be done with plates similar to those for learner drivers. Do you consider that that would enhance road safety and, in particular, benefit vulnerable road users?

Mr SIOROKOS: It is not a question we have given much thought to, but I guess that in a trial phase, if you were to trial autonomous vehicles, then it would absolutely make sense to have them clearly marked so that people knew what they were and knew that they may need to behave differently around them. I suspect over time, as I said as technology becomes more and more ubiquitous and commonplace, any kind of special markings would not be needed. I cannot really see what benefit such a scheme would deliver in the long term—given that most crashes are caused by human factors—what marking a vehicle differently would deliver when these things are all over the road, for example.

Mr NICK LALICH: But you indicate that in the short term it would be advisable to mark the cars over the test periods.

Mr SIOROKOS: Absolutely.

Mr NICK LALICH: But in the long term we understand that when everybody has got them it is pointless because we have all got the same—

Mr SIOROKOS: Yes, and it may well be necessary, for example, if you are testing, to have a lead car in front and all that sort of stuff.

Mr NICK LALICH: A bloke with a flag.

Mr SIOROKOS: That is right.

Ms ELENI PETINOS: I think some of the other questions that we have asked witnesses over the previous day's hearing were more around the markings being beneficial for other road users in not getting distracted by the novelty and looking at the driverless vehicle or understanding what was going on around them. I think that is the vein of that, but thank you for answering. You have suggested that the Government develop a road map to identify any barriers to the legal operation of driverless vehicles on our roads and your submission refers to the road map produced by the United Kingdom's Department of Transport. What aspects of the United Kingdom's road map do you suggest that New South Wales implement?

Mr SIOROKOS: One of the key questions, I guess, is what does control of a motor vehicle mean and who is in control? You have got cars right now that you can jump out of and press a button and the car will park itself. I mentioned before that these things are already happening, that you could theoretically get in a car on a motorway and drive quite safely in almost fully autonomous mode. It is those questions about do you have to have your hands on the steering wheel, for example, at all times? What does "distraction" mean in an autonomous car context? There are a whole lot of questions like that that need to be answered. In the UK they are looking at things like age limits: do you need to be over a certain age to get in one of these things on your own?

I mentioned a bit earlier as well that I think one of the big drivers—probably not the best word—for autonomous vehicles will be for older people who are no longer capable to drive a car in the current context. We know, for example, that for that group the minute they lose their licence their health deteriorates very quickly, and it is particularly a problem in the regions. So if a doctor says to someone, "You can't drive a car", what does that mean for an autonomous vehicle? It would make sense to allow someone who might have slow reflexes or might not have the best eyesight to be in an autonomous vehicle that is heavily controlled in terms of speed and where it can go. So there are all those sorts of questions that we think need to be answered and we think are becoming more and more urgent.

Ms ELENI PETINOS: That is quite an interesting predicament. My final question to you is around data. What would you foresee as being the impediments to data sharing?

Mr SIOROKOS: We have some concerns about what would happen to data these cars produce. We think that data should be shared and should be made available, and ownership needs to be determined as well because knowing where you drive, what time you drive, what shop you stop at is very valuable information for someone, and who owns that is a really, really important question because theoretically if the owner of that data builds up a profile of you they can very, very specifically target marketing materials to you: "We know every morning you drive past coffee shop X; if you stop by this morning we will give you 20¢ off". Or worse, "We know you are going to stop there so we are just going to up the price for you".

So there are all sorts of things that need to be considered. It is a really important question and figuring out who owns that information and what is done with it. For example, if you drive a particular route every day and it just so happens that every second day or every day that you drive coincidentally there is some sort of political demonstration or some sort of crime committed, you do not want people saying this person is a suspect because they just happen to drive that route on those days, and cause all sorts of civil liabilities incursions. So the data question is a really important one.

The CHAIR: I think we could take it one step further; you probably undersold it. I think the vehicle would arrive with the coffee already available. In your submission you referred to a recent world economic forum predicting that 48 per cent of global cities expected the sale of driverless vehicles within the next 10 years and that a further 40 per cent of cities anticipate driverless vehicles to be operational by 2025. Interestingly, you also noted that New South Wales should compete with Australian and international jurisdictions when it comes to the introduction of autonomous vehicles. Do you believe that competition is preferable to a whole-of-country approach in the implementation of the vehicles and could I get some comments about the mixed fleet during these intervening years?

Mr SIOROKOS: In terms of competition, our view would be that we probably do need to be doing more than we are doing at the moment because these vehicles do have the potential to significantly improve safety outcomes and congestion outcomes. I mentioned earlier that there are also some economic benefits to being at the forefront of R and D when it comes to autonomous vehicles. If we want to take advantage of that R and D economic potential then we should certainly be looking at doing more than we are doing now. But,

having said that, we do think that the rules and the frameworks around when and how autonomous vehicles are allowed to be used need to be national. But there is nothing to stop us conducting our own trials or looking at how we can leverage from the economic benefits that they bring before others.

The CHAIR: With the mixed fleet one of the concerns, and it was referred to in passing, is the perhaps dilution of driver skills as reliance upon technology increases. In a mixed fleet situation, and you referred to some of the instances of the accidents relating to human error, clearly that would be an issue in these years to 2025 and 2035.

Mr SIOROKOS: Absolutely. One of the things we know is that one-off ad hoc driver training every 10 years does not work because people forget. What you need to do is to repeat activities over and over and over again so that you become accustomed to them. If you drive in an autonomous vehicle or a semi-autonomous vehicle and then go into a vehicle that does not have those features, there are risks that you may neglect to do something simply because you are not used to doing it anymore. One of the classic issues that we come up with from time to time is when people go from cars with reversing cameras to cars without reversing cameras and they kind of make assumptions because they think they are going to hear a beep if there is an object in their path. So there will need to be a great deal of education and there would need to be a great deal of repetitive training, I guess. But it is a really difficult question because a mixed fleet poses all sorts of challenges.

From the perspective of autonomous cars mixing with other vehicles, I do not think that is a huge problem because a lot of the vehicles have in-car technology that lets them predict or see what another car is doing. But a driver going from one to the other is a problem and that human factor needs to be dealt with. Having said that, the latest statistic I saw on something like autonomous emergency braking says that 30 per cent of new cars on the market are fitted with it. So these technologies will become more and more prevalent and more and more ubiquitous, and I suspect that will happen more quickly than we think because that just seems to be the pattern of these things. So even if you go from, say, a fully autonomous or almost fully autonomous car to a car with autonomous emergency braking, lane-keeping technology, adaptive cruise control, those sorts of things, then you are probably going to be safer than you would have been, but how you actually make people pay attention and remember that the car that they are in is not as safe and as robust as the autonomous or the fully autonomous car they were in the other day is a really difficult question.

The CHAIR: Thank you very much for appearing before Staysafe today. We appreciate your submission and your answers to questions. If we have any further questions that members consider were not sufficiently answered we will forward them to you.

(The witness withdrew)

TOBY WALSH, Professor of Artificial Intelligence, University of New South Wales, and Research Group Leader, Data61, before the Committee via Skype

The CHAIR: Good morning, Professor Walsh. Thank you for appearing before the Committee at a very early hour of the morning in Germany.

Professor WALSH: My pleasure. Thank you for allowing me to do this via technology.

The CHAIR: Thank you very much for appearing as a witness and thank you for your submission. You will not be sworn in as you are outside the jurisdiction of New South Wales. Do you have any questions in relation to the procedural information?

Professor WALSH: No, I do not.

The CHAIR: Given that you are overseas, would you be willing to provide any further information requested or answer supplementary questions on your return to Australia?

Professor WALSH: I would be most willing to do that.

The CHAIR: Thank you very much. Would you like to make an opening statement?

Professor WALSH: Yes. Like many other presenters who have made a submission to this inquiry, I welcome the introduction of autonomous vehicles. For a number of reasons, both economic and safety reasons, I think autonomous vehicles will be of great benefit. I am most concerned, though, about the period of transition. The most dangerous time will be when there is a mixture of autonomous and non-autonomous vehicles on the road. We must take care to protect all road users during that period of transition. I imagine that in 30 or 40 years we might get to the point of having only autonomous vehicles, and then the world will be a much safer place. The cars will talk to each other and it will be very easy to ensure safety. But in the period in between, when there is a mixture of road users, it will be most challenging. We must be very careful. To ensure that the technology is allowed to fulfil its potential and so that we do not get held back by unfortunate mistakes, we need to carefully plan and carefully protect the safety of road users during the period of transition.

As I suggested in the submission, that means we have to make sure that non-autonomous vehicles with human drivers are made aware of autonomous vehicles on the road. That could be done in a number of ways. At the very least, we should be thinking about having a special licence plate—for example, an "A" plate for "autonomous vehicle"—so that other road users are aware that there is a special type of car coming up on the road. It used to be very easy to spot an autonomous vehicle. There used to be a huge amount of technology glued on to the ceiling of the vehicle. They looked rather strange. Nowadays we are starting to see some very conventional looking vehicles being fitted with autonomous technology. It will be difficult for road users to know whether someone is driving or paying attention to them.

I outline a number of situations where I think it would make a lot of sense if other road users could tell whether an autonomous vehicle was coming at them. For example, at a four-way intersection a lot of non-verbal communication goes on. Eye contact is made between drivers. That goes away once you have autonomous vehicles, so it is important to know that the person sitting in the driver's seat is not driving. They may look you in the eye, but they may not be in control of the vehicle. Therefore, you must be more careful of them. Equally, when an autonomous car approaches roadworks and there is a roadworker trying to direct the traffic, they need to know that the autonomous car will behave in a way that only autonomous cars will behave.

The CHAIR: Thank you very much. That was the main thesis of your submission. The Committee is putting questions on that to other witnesses as well. I refer to the guidelines for the trial that commenced in Singapore, which required prominent sign boards to be displayed on roads, to give information to the public. Do you think that such measures would address your concerns? Should that be something that we should consider during the testing phase?

Professor WALSH: I certainly think that you have to make it very well known to the public where cars are being tested so that they are aware that there is a special set of roads where they may encounter autonomous vehicles. At some point autonomous vehicles will be so widespread that it will be hard to distinguish them, but when they are on only a limited number of roads—for example, a particular set of roads in Adelaide, as was the case in November—the public can be made well aware of that. Even then, it is hard to ensure that everyone chancing upon a vehicle is aware that it is autonomous. It seems to me good sense to prominently display on the vehicles an indication that they are autonomously driven and not just to rely upon prior publicity. Where we are starting to trial these vehicles and they are very rare, we should take advantage of publicising that.

The CHAIR: I will check with other members and I might ask them to come around and sit in this position, rather than try to hand the computer around.

Professor WALSH: One thing I have not said, yet it has surprised me that in a number of jurisdictions where they have started trials in California and Nevada, where I studied the law, they have not taken much notice of this so far. I think it is largely an oversight so far that the terminology has not been advertised to the public when it has been driving along. I think it would be very good if Australia would take the lead here and set a precedent because I think it is an oversight, if anything.

The CHAIR: I introduce Mr Nick Lalich, the member for Cabramatta.

Professor WALSH: Good morning.

Mr Nick LALICH: How are you Professor Walsh?

Professor WALSH: Good, thank you.

Mr Nick LALICH: Can I start with a question that could be out of left field? I was thinking that, once we have automotive vehicles, is technology underway to be able to take any one vehicle out of the line of vehicles and put it to one side in case of criminal activity or terrorism? Because once you have a car that you can program where you want it to go, for a terrorist it would be easy to load it with bombs and just send it off. Is the technology there to be able to terminate that vehicle or shift it out of the normal line of vehicles? Are we looking at that issue?

Professor WALSH: Technically you are right, it is very feasible and there are lots of questions there in terms of our rights and privacy as to whether we will allow those sorts of technologies to be enabled. There is technically nothing to stop that happening. In fact, there are lots of arguments as to situations where this would be desirable, where there is some undesirable person in the vehicle or some activity happening where you want to be able to bring all the cars maybe on a section of the road to a halt very quickly where you should and technically could do that. They are interesting questions about our liberty of movement, whether we will actually allow that to happen or not. But it is certainly technically feasible and something that I think we should be considering.

Mr Nick LALICH: We can talk about personal liberties. When we talk about aircraft travel, they test us, take off our shoes and belts and everything else; but if we are going to get to the other side without being blown out of the sky or off the road who cares? A lot of us are quite happy to give those liberties away. I know that it can go too far sometimes.

Professor WALSH: I am sympathetic to that. Here in Germany, once a week they talk about ghost cars driving the wrong way down the motorway and it is technically possible. Once you have autonomous vehicles and V2V communications, you could just stop that vehicle instantly; and say there are accidents, there is no reason technically to not allow that to happen.

The CHAIR: I introduce Dr Mehreen Faruqi from the Upper House.

Dr Mehreen FARUQI: Good morning, Professor Walsh.

Professor WALSH: Good morning.

Dr Mehreen FARUQI: Given your concerns about safety, especially when the transition period is in play, do you think that drivers of autonomous cars should get some extra training while they are trialling and then later on when we actually move to driverless cars outside of trials?

Professor WALSH: Those are all interesting questions. The good thing about autonomous vehicles is it is going to give mobility to people who do not have ability today: very old people, people with disabilities, very young people. It is an interesting question whether we can afford the route that the companies like Google are advocating, which is to not have a steering wheel in the car. What they would like is that you do not have a driver in the car; the driver of the car is the technology and there is no-one else in the car who can drive the car because there is no steering wheel.

If that is the case, then, of course, there is no need to have any training at all. All you need to do is to turn it on and say where you want to go, as opposed to the route that is taken by some more conventional car companies who are looking at more slowly introducing automation, slowly taking away some of the functions but ensuring that there is a trained driver. The interesting challenge we are going to have is that the next generation of drivers coming along may not actually learn to drive. If the technology is there they may not go through the burden. It is quite difficult, painful, expensive and challenging to get your driving licence, as it

should be. And so they may never end up learning and we may end up with the next generation who technically cannot drive. And that poses interesting challenges as to what we allow in terms of technology.

I do not think I have answered your question yet; I think I have answered some other questions so far. But it is an interesting legal question as to whether you need a driver in the car if the technology is driving the car. Companies like Google I think are trying to push the point by removing the steering wheel and making it so that there does not have to be a competent driver in the car, somebody who is capable of taking over at whatever required notice.

Dr Mehreen FARUQI: Most of the trials that are going on across the world at the moment do have a steering wheel in the car? Am I right in assuming that?

Professor WALSH: Yes, pretty much all the trials. Google I think is probably pushing it more than anyone, in terms of their home-designed car. They would like to take the steering wheel and the brakes out of it. Then the legal problem disappears if there is no steering wheel.

Dr Mehreen FARUQI: One more question: What do you think are the minimum infrastructure requirements for New South Wales to support a driverless car trial and do we have them?

Professor WALSH: As I said earlier, I think we need to ensure the public is well informed. I think we need it to be in very contained, well-defined areas to begin with, because of the risks of the interaction between autonomous and non-autonomous vehicles. I think, in terms of the roadside infrastructure, I do not think there is a huge amount that needs to be done. I think the challenge for the technologists is to make autonomous vehicles so that they work pretty much within the current environment. Certainly, as we move forward, we can continue as we always have done to redesign the roads to make them safer and safer, given the capabilities of the vehicles on them. I think the safest thing to do is to ensure that the technology is designed to work with the current infrastructure that we have and that people are made aware of the changes that are happening around them.

The CHAIR: I introduce Mr Adam Crouch, the member for Terrigal.

Professor WALSH: Good morning.

Mr Adam CROUCH: Good morning, Professor Walsh, and thank you for getting up at this hour of the morning to answer our questions. One of my questions goes back to your introduction, regarding that transition period where we have a mixed fleet. You highlighted in your report your concerns, which was a great example, about coming across a building site or a construction site on the road, for instance, and how driverless vehicles or semi-autonomous vehicles deal with those sorts of issues, which a human obviously deals with automatically. That is a concern we have had outlined here before about a mixed fleet. How do we address that in New South Wales? Obviously, technology is moving so quickly, but how do we address those sorts of issues where you have an unforeseen issue, where a computer may not be able to adapt to it?

Professor WALSH: I think it is a great challenge and we do not want the technology to be tarnished because of the benefits it will ultimately bring. The thousands of road deaths that we have in Australia will plummet once we have autonomous technology. But there will be mistakes and errors that happen. Far fewer, of course, than happen today with human drivers; but nevertheless, we have to make sure they are as few as possible. At some point, I suspect we are going to have to mandate that non-autonomous vehicles are not allowed in certain areas, to make sure that there is not this long tail of non-autonomous vehicles on the road going north 30 or 40 years into the future. Because it will be so much safer when we can ensure there are only autonomous vehicles with V2V communication, talking seamlessly to each other and aware of what is going on around them. We will have to think about equipping roadworks with adequate V2V communication as well, so that it is not just human-like communication but electronic communication going on so those autonomous vehicles are as aware as the human drivers as to the changed circumstances.

It may be that you mandate that there is some centralised database that autonomous vehicles can access that will advise day by day or minute by minute where roadworks are underway. At the moment a lot of autonomous vehicles have what you might call high-precision GPS navigation. They are not actually very smart; they are very stupid, but they are working to extremely detailed maps. We may have to mandate that those maps are maintained and are as up to date as possible. It may be that you are not allowed to do roadwork unless you update those maps so that autonomous vehicles know what is going on around them because they will not necessarily be able to sense it themselves.

Mr ADAM CROUCH: Concern was raised last week about drivers losing their skills set over time. We discussed the idea of a mandated period every 12 months during which motorists must drive. That is, at certain times the automatic vehicle would insist that the motorist drive it to ensure that he or she maintained

their skills set. Do you believe it would be beneficial to make that mandatory so that they do not lose their skills set and do not become too reliant on the technology?

Professor WALSH: It is a very valid concern that people will lose their skills because they will not be driving. However, you have to be very careful because one of the benefits of this technology is that it will give mobility to certain groups such as the disabled and the very elderly who cannot drive and who will never be able to drive. You must be careful about introducing legislation that will continue to prevent those people from having mobility. You are correct that it is a real concern that people will lose their skills. As I said earlier, it is also a concern that younger users will never have those skills because they will never have the road hours to develop them in the first place. That is a very real concern. Hopefully at some point the technology will be so good that we will never have to depend on having those skills.

Ms ELENI PETINOS: Thank you for being awake at 2.00 a.m. to give evidence to the Committee. I refer to your idea of marking driverless vehicles. An earlier witness today said that he did not necessarily have a problem with it, but he did not see its value. How would you respond to that?

Professor WALSH: It is not only my idea. Baidu, which is developing autonomous cars, has said publicly that it is trying to make its vehicles as distinctive as possible so that other road users are aware of them. I mentioned the historical precedent here. We already distinguish between different types of road users and insist that they carry different types of plates and so on. Ultimately they will be better drivers than regular users and they should be distinctive. There is a number of reasons that we would want to know that there was a car in front of us that will stop and will follow the rules very precisely.

I think the people at Google have been a little economical with the truth in terms of reliability and their reporting of the dozen or so accidents they have had. They have claimed that in only one of the accidents was the vehicle at fault when it pulled out in front of a bus. In that case it would obviously be responsible. But almost all of the other accidents involved rear-ending where, for example, the vehicle stopped suddenly at a red light. I suspect that if you were to study the situation you would find that a normal driver would have gone through the yellow light and not stopped so quickly. In that regard they may have been partially responsible. If the motorist in the car behind had been aware that they were following a Google car they would know that it could stop abruptly and that it would follow the rules to the letter. In that case they might be able to brake and avoid the accident. We should always err on the side of caution.

Ms ELENI PETINOS: I have asked most witnesses a question about data sharing. What do you believe are the impediments to data sharing?

Professor WALSH: Privacy is one of the big issues. There was some discussion about sharing road data with other users, and taxi drivers and bus drivers were worried that their employers would be able to track them too closely. I do not think these issues are insurmountable. We give away incredible amounts of private information every day to companies like Facebook. There are apps such as Waze, the traffic information sharing app, which benefit people by sharing information. People must be made aware of what they are giving up and know that there is a quid pro quo in terms of better traffic or safety information, or whatever it might be. There must be a two-way flow of information. It should not simply be about value being taken from the user. That could address those privacy issues.

Ms ELENI PETINOS: Your submission quotes from an article by senior researchers at Baidu Research in Silicon Valley published in the online journal *Wired* on 15 March 2016, which states that "although autonomous vehicles do not drive like humans, the differences can be managed by modest infrastructure changes by programming cars to behave as predictively as possible and by teaching people how to interact with self-driving vehicles". What in your view would be the major priority in terms of community education about driverless technology?

Professor WALSH: To begin with it would be simply making people aware of where the trials are happening so they know that they will come across strange cars that are behaving in ways that cars driven by humans might not. In the long term, as a technology there is an interesting interplay where people's driving changes to adapt to autonomous vehicles and we change autonomous vehicles to adapt to people's driving. An interesting example of that is an old technology dealing with the green wave. I was talking to some of the people at what was then the Roads and Traffic Authority who said that the green wave down Parramatta Road operated at a speed greater than the speed limit.

They said that it was because motorists drive down the road in excess of the speed limit. They also said that if we want to have a green wave and not have vehicles stopping, the wave must be programmed at a speed greater than the speed limit. I asked whether that encourages people to break the law. They said that it is a chicken-and-egg situation; that is, it is a question of whether people drive faster than the speed limit because of

the green wave or vice versa. Who is encouraging whom? It is an interesting interplay between how autonomous vehicles behave and how human drivers behave. We adapt to each other.

The CHAIR: Thank you very much for appearing before the Committee today. We appreciate your time. Thank you also for your submission. I opened the hearing by bidding you good morning; I think I can conclude it now by bidding you good night.

Professor WALSH: It was my pleasure. Thank you for listening to my evidence.

(The witness withdrew)

(Short adjournment)

KIERAN TRANTER, Associate Professor, Law Futures Centre and Urban Research Program, Griffith University, sworn and examined

MARK ALBERT CHRISTOPHER BRADY, Solicitor and PhD candidate, Law Futures Centre, Griffith University, sworn and examined

The CHAIR: Welcome to the Staysafe inquiry into driverless vehicles and road safety. Do you have any questions concerning the procedural information sent to you in relation to witnesses and the hearing process?

Dr TRANTER: No.

Mr BRADY: No.

The CHAIR: May I confirm that you would be happy to provide a written reply within 10 business days to any questions taken on notice or any supplementary questions the Committee may have.

Dr TRANTER: Not a problem.

The CHAIR: Would you like to make an opening statement?

Dr TRANTER: Yes, I would. Driverless vehicles, as no doubt the Committee has been informed in both oral and written submissions, offer real opportunities to make Australian roads a lot safer. Engineers have clearly pointed out that the only place where we can make improvements for safer roads and less road trauma is to increasingly augment and replace the driver. That is the weak point in the system. The level of passive safety we can build into roads and vehicles has pretty well been reached. So autonomous vehicles at one level is the next step. We know that the car manufacturers and the technology providers over the past 10 years have been moving increasingly to augmenting driver control and replacing driver-controlled vehicles.

At one level Australia is well positioned to adopt and adapt to autonomous vehicles; at another level it is at a severe disadvantage. We are able to adapt within our laws and institutions because Australia has already, in my opinion, a fairly robust set of principles, institutions, policies and reform processes, of which this Committee is part, where I think we can make sensible, realistic changes to phase in an autonomous vehicle fleet and also deal with some of the issues of a mixed fleet. I think we are at a massive disadvantage in Australia because we are no longer the producers of this technology and outside of our heavily populated urban areas there are some serious questions about how appropriate and adaptable autonomous vehicles will be for remote and regional Australia. We have got some really good opportunities to make some really good reforms in order to bring these things in, and we particularly see them as being really positive in the urban and populous parts of the country, but we need to be also aware of the unique challenges that this technology development from the northern hemisphere is going to be introduced into the more far-flung regions of this State and this nation.

The CHAIR: We appreciate you appearing before the Committee today. Your submission is very positive about the possibility offered by driverless vehicle technology to reduce human fallibility as the cause of road accidents, and we again heard that in your opening statement.

Dr TRANTER: Yes.

The CHAIR: On the other hand, you do acknowledge that there will be technical malfunctions that will result in accidents.

Dr TRANTER: Yes.

The CHAIR: What in your view are the main priorities for legislators and policymakers to maximise the benefits and to minimise the potential risks associated with autonomous vehicles?

Mr BRADY: The challenges you are going to face in relation to this will be the transition to mixed fleet from inception. There has been some suggestion that this will increase some of the difficulties that will be faced in the short term as they become more of a spectacle to other road users. The challenges you will face primarily will be the notion of who is in control of the vehicle. Who is the operator? Who is in charge? The current legislation here in New South Wales, and similarly in Queensland, requires someone to be holding the steering wheel at all times. There are a few minor technical things that will need to be altered to enable people to engage the autonomous functions in vehicles in the short term and will require some legislative reform.

Dr TRANTER: There are three main categories of immediate legislative reform. One—and the recent report of the National Transport Commission clearly demarcates some of these issues—is that some points of anomaly in the Australian road rules that we have in New South Wales potentially need to be addressed,

particularly the idea that it is an offence not to be in proper control of a vehicle. Our law enforcement community tends to interpret that as hands on steering wheels and eyes fixed on the road. The vehicle companies and the technology companies are suggesting that with some of the vehicles in North America, for example, like the Tesla, you do not need to do that in certain circumstances. There are some immediate hurdles in the road rules. There is potentially an immediate need if New South Wales is keen and interested in adopting trials of fully autonomous vehicles on our public streets—we have seen in South Australia and the Australian Capital Territory specific amendments to various road rules and motor vehicle laws to allow that to happen, particularly with ministerial consent and the provision of insurance and liability cover for those trials. That is where we have had active legislative reform here in Australia.

The one area that no-one has grappled with, which I think is really important and the National Transport Commission report was a little bit hesitant on this, is questions about how increasingly autonomous vehicles interface with our mandatory third party insurance scheme. That is a real issue here in New South Wales because your third party scheme is dependent on there being a motor accident. A "motor accident" is defined as something that happens where there is a fault by the driver or owner.

You can immediately see if we are dealing with an autonomous vehicle or a quasi-autonomous vehicle in autonomous mode, where the error comes from the software or a bug and the driver was not realistically able to resume control in time, the driver could arguably say, "I was not at fault." And the owner would say, "As far as I knew the system was working well." Conceivably you have a motor vehicle accident that could have hurt third parties that would not be covered by your scheme. That is one thing we need to make some fairly quick move on because we could be talking about the SAE-style level three vehicle, which we know is the Tesla model available in America, and it will be coming here very soon. So we are talking about one or two years before that arrives here in this country, and potentially we have a gap where innocent people who might be damaged by one of these vehicles will not be covered by your third party insurance scheme.

The CHAIR: Does that go to the heart of your submission, which was discussing the incremental increase in regulation in a three-phase process?

Dr TRANTER: Yes.

The CHAIR: And you outlined those stages.

Dr TRANTER: Yes, so we need to do some things immediately—those three things—and then, once we start to get a much more strongly mixed fleet, we need a whole range of potential reforms. At one level we might not know what they mean until we see these vehicles on the street and learn how to adapt to them.

The CHAIR: Let us look at a specific example. You mentioned in your submission the need to revise road rules relating to driver distraction, and you noted that in Nevada the law had been changed to allow drivers of level 3 vehicles to use mobile phones while the vehicle is in driverless mode. Do you recommend that similar legislative action be taken here in New South Wales?

Dr TRANTER: I can imagine certain buyers of the latest model Tesla would think that that is a fantastic idea. The whole reason there is a market for this at one level from a consumer point of view, and this is why Silicon Valley is into this, is that it is all about freeing up convenience and productivity. We waste a lot of time driving cars. So the consumer will be going, "If I do this then I can be emailing or doing some work." In fact Volvo has this wonderful video about their driverless test in Stockholm where they have a woman put the XC90 into driverless mode, pull out her tablet and start work—and that is real-time footage; it is footage taken in actuality now. So I can imagine there might be some pressure, at least from the early adopters, for such reforms. I can imagine there will be significant pushback from many members of the law enforcement community and the wider community. They will be uncomfortable, at least in the first couple of years, with the idea that there will be people piloting vehicles who will not be consciously looking out the windscreen at all times.

Ms ELENI PETINOS: My first question is around data sharing and the potential impediments to data sharing. What are your views on that?

Mr BRADY: These vehicles are going to generate a huge amount of data, just as we currently do with our mobile telecommunications devices—and a lot of that data is available. The data that will be coming from connected vehicle technologies and autonomous vehicles will be specific to the motion that is travelled by the vehicle. That could be used, or misused, but it really needs to be managed as far as who gets access to it and in what set of circumstances. For example, after a motor vehicle accident perhaps the last 30 minutes of data generated could be continuously recalled. It would only be a matter of mandating it within the guidelines or code of practice to enable this to be utilised.

Dr TRANTER: That is a really good point. We have talked about the privacy of the vehicle around data privacy. I think that is a very general way to look at it. I think we need to look at who is going to be really interested in accessing the data generated by these vehicles and in what form. So I am sure the New South Wales Police Force would be rather interested in accessing some of this detail, either specifically or more generally. I am sure manager of road traffic systems would love to access this data in order to better manage and understand road use and movement patterns. As Mr Brady said, I am certain insurers would love to get hold of this data—not only after an accident but also to determine pricing and principles, because they could map the behaviour of this vehicle and this driver and look at, for example, whether they go to risky places or whether they park in risky spots, in order to work out a more flexible premium.

The issue is going to be that the one group of people who are definitely going to get this data from the vehicles is the manufacturers. Like in the case of airlines, this data will be sent back; and it will be sent overseas. One thing we have not yet grappled with is how our privacy laws are going to deal with sending that data back to the manufacturers. It is going back to them for very good reasons—like in the airline industry, it will allow them to constantly monitor and test and to develop a large dataset on how their technology works. So I think we need to break this down into who is going to want the data and in what form, and to what extent it is necessary for pinpointed, personalised information to be part of that data or whether just aggregate datasets are enough for various institutions.

Mr BRADY: Another things is that as we move towards universal adoption this data will become less and less pertinent to a chattel that is kept in a garage. The fleet will more than likely develop into one provided by a service provider, or the manufacturer may be running the fleet. They will have every right by then to access that data.

Dr TRANTER: So we will have some sort of contract arrangement, and no doubt in order to access this service will be signing away our privacy rights—like we do now when we get into a taxi or Uber for that matter.

Ms ELENI PETINOS: The New South Wales Government submission stresses that many of the new safety issues relate to the implications of having a mixed fleet, with vehicles of different levels of automation and human involvement interacting on the same road network and using the same road infrastructure. Some witnesses have put it to us that it might be beneficial to have the automated vehicles marked with a sign or some sort of number plate system. Others have commented that they do not really see any value in that. How do you feel about identifying autonomous vehicles on the road in a mixed network?

Mr BRADY: I think this is particularly important. As some of the earlier witnesses have stated, the behaviour of an autonomous vehicle, which follows the road rules that we currently have to the letter, could be quite erratic relative to normal human-driven vehicles. We might potentially go through a yellow light and think, "Okay, it is safe to do so." Whereas the autonomous vehicle might be programmed to stop immediately. So an identification system such as easily visible numberplates would tell other road users, "If you are behind this vehicle, beware; it could stop suddenly." It would function in the same way as the current warnings that say, "This truck may stop at any time," on the back of a garbage truck.

Dr TRANTER: The one concern, though, and this I know is a concern that the motor vehicle accident insurance commissioner in Queensland sees as the biggest issue, is that if we demarcate autonomous vehicles then we are going to get certain sections of the current road users go out of their way to harass them and cause them to make errors. He was of the opinion that that would actually generate the most accidents—that certain members of the road user community will harass these vehicles, not watch where they are going and cause accidents either to themselves or to the autonomous vehicle by causing it to overload and do something erratic.

Ms ELENI PETINOS: Do you consider there to be any merit in doing a cost-benefit analysis for skipping the transition period and delaying the introduction of automated vehicles until there is a robust body of evidence that level 4 autonomous vehicles, which do not require driver involvement other than for providing their destination, are safe and available on the market?

Mr BRADY: Let us just be clear when we are talking about level 4 is that the National Highway Traffic Safety Administration [NHTSA] level 4 or the SAE level 4, because the SAE one goes to level 5.

The CHAIR: We are talking here about the highest level—the fully autonomous vehicles.

Dr TRANTER: That is the National Highway Traffic Safety Administration [NHTSA] one. I think that would be, unfortunately, like New South Wales trying to ban touchscreen smartphones and saying, "We are going to wait until we have proven this technology before we allow people to stream videos on their phones." I think we have to see ourselves as part of a global economy, and these are global consumer goods. These things are going to be introduced.

The brand-new XC90 Volvo is already on sale here. I saw one drive up Macquarie Street as I walked in here. It is a level 3 capable autonomous vehicle. It just needs to have the software installed. I think doing anything like that would be seen as a fairly retrograde step, and the people in the community who want this would be rather upset if we did anything like that. I also think it just will not be possible. Quite frankly, given the vehicles coming out now, and the way the technology is filtering down, you will not be able to buy a vehicle that does not have level 2 autonomous functions by about 2020.

I think we have to be part of this global movement and adapt appropriately as we see fit. It might be nice to wait to get the full cost benefit and we are concerned about this mixed fleet period, as I just mentioned, with certain road users who might think it is rather fun to hassle an autonomous vehicle, but I am a bit of a believer that these things will be safer than humans. While there will still be accidents and there will be things that go wrong—in fact I often talk about the things that go wrong actually being quite catastrophic in an autonomous vehicle system; they will go wrong very badly—that is a regrettable situation and must be minimised. But I still think we will have safer roads compared to what would exist if we did not go down this path in the short term.

The CHAIR: I have a follow-up question. Do you envisage during the trial period particularly that there will be cameras in the autonomous vehicle recording the external influences to mitigate the issue you raise—about people deliberately attempting to set the autonomous vehicle off course?

Dr TRANTER: I can only look at Queensland, which has just announced a million-dollar trial. Mark and I are actually working with the coordinator of that trial. They are buying in four Teslas and they are updating the software to make them fully autonomous. That vehicle has a full-time front and rear camera as part of the system which does continually record.

The CHAIR: It records external influences?

Dr TRANTER: Yes. The Tesla is interesting because it has a purely autonomous robot vision. Arguably, it could drive itself anywhere; therefore, it has a lot of high-end sensors, and one of those is these cameras that will continually record.

Mr ADAM CROUCH: In your submission you advocate inclusion in the road rules the definition of "a driver" and, obviously, "a vehicle" that were adopted in California in relation to driverless vehicles. Obviously we have had the discussion this morning somewhat, but why do you consider that approach to be the best fit for New South Wales road rules at this time?

Dr TRANTER: I think that is a convenient reform to make sure that regardless of whether it is a quasi or fully autonomous vehicle, there is an identity that is legally liable for its actions; that is, the human in it is liable for its action, even if they would argue technically they are not the driver because they are not in control of the vehicle.

Mr BRADY: That would simplify things from a legal perspective and it would streamline any necessary litigation.

Mr ADAM CROUCH: It is interesting because we had Volvo in here last week. Obviously, we have all seen the XC90. Volvo has taken a step to ensure that as soon as you activate the system, Volvo takes responsibility for the vehicle and its actions. They are clearly standing by what they believe their product to be able to do. Do you believe that that could cause problems when you have manufacturers that are willing to take responsibility?

Mr BRADY: If the vehicle does not have a finite span before it needs to be removed from the road—if it can go for 10, 15 or 20 years—many of the sensors may start to reach their term, their functional lifespan. So there might need to be a certain amount of time when an autonomous vehicle has to be either fully re-serviced or removed from the road, or the insurance premium goes very high as a disincentive. These things and the system, nothing will last forever. The particular point in time at which these technologies remain fully functional without failure or ageing may need to be mandated for a certain period of time before the manufacturer pulls the vehicles off the road.

Mr ADAM CROUCH: Most cars are very clever these days, including mine, which is seven years old. It tells me when the brake pads are worn down and I have to get them replaced.

Mr BRADY: Yes.

Mr ADAM CROUCH: With a modern car, such as a Tesla or one of those Volvos, they are cars that are incredibly intelligent and they are monitoring thousands of bits of data every second. You would think that as part of that model they would be able to build in warnings to say, "This car needs to be serviced or checked".

Mr BRADY: Yes.

Mr ADAM CROUCH: The other thing that was mentioned earlier was capturing data. We have spoken about the airline industry being a guide for what we are doing. Obviously, aircraft have black boxes that record data—the pilot's actions as well as the actions of the aircraft itself. Should an accident occur, who has responsibility to ascertain liability? As my colleague mentioned earlier, having a black box in every car, effectively, would that not alleviate the issue of who is at fault? After all, you are capturing all the data anyway.

Mr BRADY: Yes.

Dr TRANTER: That is actually really interesting because the United States of America has just started to mandate the use of black boxes in vehicles anyway. This technology is clearly there. The way the stand-alone autonomous vehicles, like the Volvo and the Tesla, work in the United States is that they do have very large storage capacity. Essentially, they already have a black box in their autonomous vehicle systems. The issue will be if we move toward the vision of Google's people-less pod car which is much more networked and therefore might not have the same level of storage in a vehicle. That might be a bit of an issue. But I think in the immediate term we are talking about the prestige vehicles with their essentially fully self-driving robot, which does not rely upon the vehicle infrastructure communications or vehicle-to-vehicle communications as much as maybe the second-generation autonomous vehicles that will come later. That technology seems to be very comparable with that idea because they will be storing vast amounts of data within internal data sinks within those vehicles.

Mr BRADY: Another thing is that a black box in a motor vehicle will not need to be as robust because the G-force in a collision will not be anywhere near that of an aircraft.

Dr TRANTER: Yes, and the United States has rolled it out. That could be something that New South Wales could work with the National Transport Commission to have included in the Australian standard vehicle design rules.

Mr ADAM CROUCH: Earlier we discussed cars becoming more autonomous. Concerns were raised about driver's skill sets based on cars becoming more autonomous. One of the matters discussed is that a mandatory period of driver interaction with their vehicle be carried out every 12 months or six months or two months, whatever. Do you believe that that would be something that we should mandate, effectively? When you buy an autonomous car, no matter what the level of the autonomy, you as the driver at some point need to spend some time actually controlling the vehicle so you realise how to react to it under certain circumstances.

Mr BRADY: Personally, I do not believe that that would be good because it would negate the benefits of removing the human driver from the equation. Potentially, a more effective idea may be to require the driver—in the same way as most professionals have to keep up their professional development points—to go and have a test or go and take some time at a set territory where they go and conduct themselves and learn to drive. It would defeat the purpose to put the driver back into the equation when they cause approximately 94 per cent of all vehicle crashes.

Dr TRANTER: I think that is a really interesting point. We have seen with the increased automation of vehicles—automatic transmission, better brakes, suspensions that actually go around corners—at one level a de-skilling of the average driver. If someone was in a skid, unless they learnt to drive in the 1970s, they would not know quite what to do. What we are seeing is a long progression. This autonomous vehicle that we are dealing with has come over essentially the history of the automobile, which is taking the human out of the dynamic control equation and making it easier and easier for people to drive.

Mr ADAM CROUCH: In addition to having an advanced driver training course, which I did when I got my first car and which taught me to do exactly what you just described, we could almost have an automated driver course that teaches a driver how to understand their vehicle as part of the process.

Dr TRANTER: Yes.

Mr BRADY: Another thing is that even now we have people who are not qualified to drive a manual transmission car. It will be very similar and it will be graduated. In conversation with the Motor Accident Insurance Commission recently, they recommended a different class to be made specifically for autonomous vehicles, depending on the level of autonomy.

Dr TRANTER: That could be a really good segue situation whereby we could maximise some of those mobility advantages when we are talking about autonomous vehicles. Elderly people might get to a point where medically they should be removed from having a human driver licence but be able to—because their eyesight is still okay and they still have some pretty good motor control although not enough to pass a threshold to be still driving—have an autonomous vehicle licence.

The CHAIR: There is already in-principle acceptance of that with the modified or restricted licence.

Dr TRANTER: Yes.

The CHAIR: Already we are seeing those potentials.

Mr SCOT MacDONALD: When you first began, you were talking about insurance. Would the CTP market or the insurance market not respond to these different levels and maybe have a different product for zero through to five? Could you foresee that?

Dr TRANTER : A UK insurance company has just released an insurance package for an autonomous vehicle.

Mr SCOT MacDONALD: So the market will eventually respond; they will do their risk analysis and their actuary work.

Dr TRANTER : But we have to be careful here because we have got all our statutory third party insurance schemes and then we have our private market for third party property schemes. So the third party property is going to adapt really quickly because we have left that to the market. Some of the issues we have in a rather appropriate highly regulated statutory-based third party personal compensation scheme is where we might need to do some more reform because that cannot move as quickly as the market.

Mr SCOT MacDONALD: Are there any examples in any other jurisdictions for us to look at?

Dr TRANTER : No, at one level not, because Australia is quite unique for having our statutory third party insurance schemes.

Mr SCOT MacDONALD: Fault—

Dr TRANTER : Fault or non-fault; we have non-fault schemes in Australia too. We are quite unique that we have set up this scheme and at one level it is the guiding staff in the world for how we should deal with motor trauma. So we are a little bit alone because we have done this historically on how we are going to adapt these schemes in each State to autonomous vehicles.

Mr SCOT MacDONALD: It is pretty timely because right now the State Government is doing a review into the CTP for New South Wales. Maybe one of our recommendations as part of that review is to look at what is down the track.

Dr TRANTER : I think that is really important because we have also introduced the NIS for catastrophic compensation injuries, which is a non-fault scheme. At one level that could be triggered by autonomous vehicles if they go horribly wrong. I think this is a really good opportune time for each of the States to look at their third party insurance schemes and have a good idea about where we are heading. Because what Mark was suggesting and what all the technologists are saying is that in 20 or 30 years the idea of us owning a motor vehicle will be potentially history.

Mr SCOT MacDONALD: It could be redundant.

Dr TRANTER : We will have a contract with a couple of providers. These providers will probably be some conglomerate of manufacturers and service providers. These vehicles will be electrified, they will be stored somewhere charging and we will just call them up and they will trundle up and we will go off. In that context we no longer have the need to insure millions of people in New South Wales for their road vehicles because there will only be a handful of companies in control of, essentially, the private motor vehicle market.

Mr SCOT MacDONALD: New South Wales can do its review, and it is doing its review now, but if you live on the border we might do something in New South Wales and then Queensland is different, the ACT is different and Victoria is different again.

Mr BRADY: In the Northern Territory where they have got their pure no-fault scheme, they say if you are driving a vehicle that is registered in the Northern Territory in any other State you will still be covered. So something like that could be migrated or imported. With the way that this technology looks set to disrupt the CTP schemes, it will eventually cause the net pool of income to be set aside for personal injury to necessarily dwindle somewhat, which will lower the premiums.

Mr SCOT MacDONALD: But you could have a lower accident rate as well.

Mr BRADY: Yes.

Mr NICK LALICH: The New South Wales Government's submission observes there are provisions in the New South Wales road transport law for exemptions to be granted for legal requirements in certain

circumstances and locations. Would you consider the use of exemptions as being a viable alternative to address driverless vehicle technology through the rewording of the road rules, at least in the early stages in the implementation of technology? We know that the law, the road rules, have to go hand in hand with technology as it improves. At what phase do you feel it should be implemented? Do you think stage one, stage two or stage three would be a bit early? I believe personally that at stage four or five you could start adjusting the rules, but at what stage do you guys think it should be brought in that the rules are then changed hand in hand with the exponential increase in technologies?

Dr TRANTER : That is at one level the really important question. My research is in the way the law adapts to technological change. I can point to a whole handful of situations where enthusiastic parliaments have anticipated a certain technological future and made all these laws which turned out to be either redundant or actually harmful for the way that technology evolved—because we cannot predict exactly how these things are going to go. There is some strong argument that if New South Wales wants to conduct a trial of, say, level 5 vehicles, like Queensland is and the ACT and South Australia, you could just rely upon those exemptions. You will need to do something about the insurance cover, but you could just rely upon those exemptions. Therefore, you need not introduce a whole new amendment like they did in South Australia. That could be a non-legislative path by which we could get fully autonomous vehicle trials in New South Wales.

The issue is going to be when the prestigious manufacturers in a year or two start making for sale in Australia vehicles that are pretty well—the Tesla, the Mercedes, the BMWs—level 3-capable vehicles to an early adopter market who wants that technology because they want to use their phone on the way up the freeway on the way to work. The question is going to be essentially how much we are going to rely upon police officer discretion, et cetera, in that early time or how much will that sector of the community push strongly for some clear legal guidance on what is needed. We know historically when it comes to road change the law enforcement authorities tend to be, quite rightly, very conservative and will crack down rather than be permissive. So I do anticipate there might be some high-profile media of someone in two or three years' time who has been pulled over on the freeway in their Volvo or their Mercedes or their Tesla because they did not have their hands on the steering wheel, and they are going to argue.

There was a great case recently in Queensland where a QC got a speed camera fine and he took that to the High Court to question the constitutional validity of the speed camera system. So I can imagine some of those early adopters are going to be potentially quite capable of litigating around these issues. So we are going to probably see some interesting events. Whether we wait for a couple of those to come through so we get a feel before we legislate change or whether, as I think we could, make some pretty basic changes by using the Californian idea of just saying a driver includes an operator of an autonomous vehicle and an operator is the person that puts the autonomous system into motion, and suddenly they are caught.

Mr BRADY: He who presses "engage" will be liable. Another thing is that in Britain they have just recommended a set of guidelines rather than being prescriptive in the legislative changes because the technology is changing so rapidly. They have suggested a set of guidelines to be adopted to give manufacturers a broad frame of reference.

Mr NICK LALICH: So you could have at some stage two different laws—one for autonomous vehicles and one for, if you want to call it, old-fashioned cars—running in tandem.

Mr BRADY: We have it now.

Mr NICK LALICH: If I am driving an autonomous car, will I get away with this and if you are driving the old car you have got to go with the old rules?

Mr BRADY: It is the same now for vintage and veteran vehicles—you do not need to wear a seatbelt and so forth.

Dr MEHREEN FARUQI: Thank you very much for coming along today to provide evidence. I just want to take up the point of prestigious cars, because at the moment we have been talking about Tesla and Volvo and they are not affordable for ordinary Australians. In terms of the cost-prohibitive nature of fully autonomous cars or autonomous cars at the moment, how do you see that as impeding the progress of more and more autonomous cars on roads, because we know that the safety benefits fully come into play when everyone is driving an autonomous vehicle?

Dr TRANTER: We are seeing a rapid acceleration of both those protocols. We used to say it took 30 years for a technology to be available in a front-end vehicle—for example, seatbelts—and for it to be in 90 per cent of the fleet. But that was data based on seatbelts back in the 1970s and 1980s. We have seen autonomous enabling technologies in vehicles being implemented rapidly through the manufacturers. The best example is the VE Commodore that came out recently that can park itself. Only four years ago that technology was available

only in Mercedes. It took only three or four years for that technology to filter down. Ford is selling similar technology in its more basic models, such as the Focus. It is really rapid. Anti-lock braking systems were first available in Australia in 1979 in a Mercedes. They were not fitted in the Holden Commodore until the mid-1990s.

The ability of manufacturers and technology providers to reduce the cost and to make the technology available in more mainstream models has really increased. This is one of the important factors to take into account. The other factor is that we are replacing our cars more quickly. Cars are comparatively much cheaper than they were. The age of the Australian car fleet has diminished. Not so long ago, 15 years was the average age of a vehicle. Now the average age of the fleet is 9.5 years. I suspect we are going to see a lot of these technologies in mainstream vehicles much more quickly than in the past. Secondly, because Australians are replacing their vehicles more quickly, more and more people will own these types of vehicles.

Mr BRADY: The fact that cars are replaced more often and the fleet is getting younger all the time will mean that once these technologies are standard in most available vehicles then we will very rapidly see people on P plates driving them. If you look at the local high school now, you will see how rapidly we replace our fleet.

Dr MEHREEN FARUQI: A few witnesses have spoken about the positive benefits of driverless cars for older people, especially those living in rural and regional New South Wales. The Committee has also heard that fewer younger people are obtaining licences. The other way of looking at it is that to increase mobility for these people we can invest in good, really efficient, affordable and convenient public transport systems. How do you see the balance between the two being maintained? How will more and more driverless cars have an impact on traditional public transport? Are they compatible and can both be improved?

Dr TRANTER: This is the question that is making all the urban planners whom I work with very excited. If we see the development of Google-style people pods that we do not own—we just have a contract for them and they turn up—then we suddenly radically change our urban environment. We do not need housing for cars. We do not need the private ownership model. We still need mass public transport to move people in and out of centres quickly. With autonomous vehicles we could have a quasi public-private system—private in terms of a discrete unit—that radiates from hubs. We are talking about this happening mid next decade or thereabouts. One of the exciting possibilities is that the public transport system could be the provider of these people pods, in conjunction with the manufacturer. It could be part of a seamless system where you use the same ticket. You get off the train or the tram and the driverless vehicles are lined up there. You jump into the next one and it takes you home.

Dr MEHREEN FARUQI: Hopefully, the Opal card will be integrated by then.

Dr TRANTER: Yes. In traditional Australian cities we like to spread out a bit. We like our houses in the suburbs, but we could have a more seamless integrated transport system where there is large-scale public transport to nodes, ideally some sort of rail system. Once people get to the node, then the little autonomous people pod takes them to their final destination. The issue will be buses. Potentially the bus system might not be as attractive in that environment. It might be better to invest in transport that can move large numbers of people, such as rail and light rail systems, and to have large hubs where autonomous pods are lined up to take people to their final destinations.

Dr MEHREEN FARUQI: Thank you.

Dr TRANTER: It could be quite exciting.

Dr MEHREEN FARUQI: Yes, absolutely.

The CHAIR: I have one final question that is potentially controversial. You suggest in your submission that in the long term road rules will be irrelevant and that in the short term they need to be revised to provide for the highly automated and conditionally automated vehicles. You also point out that no jurisdiction has legislatively come to terms with fully automated vehicles. In your view, what would be the best approach to take in formulating regulations to ensure that road safety regulations remain relevant to those technological changes?

Dr TRANTER: One of the things we have suggested is to define the driver as a human operator so that someone is at stake if the vehicle does not behave according to the accepted road rules. That would be a clear way to go. We make that comment because no jurisdiction has allowed fully autonomous vehicles. South Australia has, with ministerial consent, but that is only in the trial environment. The American legislation, similarly, caters to only trial vehicles, and they cannot be level five. In other words, it is not legal for a vehicle to drive itself without a human on board. We have not reached that level yet. I think that if we define the

operator as the driver we catch the vehicles, however they behave, because someone will be responsible in the usual way if that vehicle does not obey the road rules.

Mr BRADY: Currently a motor vehicle accident is covered by compulsory third party insurance. But, with higher levels of autonomy, if it becomes a product liability matter then the pathway to recovery for an injured person will be completely different. It will need to be in some way linked. The rules need to designate the person who pushes the button as liable. They could then facilitate the process, rather than it becoming a product liability matter where personal injury will not be so easy to follow up.

The CHAIR: Thank you very much. We appreciate you appearing before the Committee today. If the Committee has any questions that it was not able to put to you they will be sent to you.

Dr TRANTER: Thank you very much.

Mr BRADY: Thank you.

(The witnesses withdrew)

RODERICK KATZ, Director, Amy Gillett Foundation, affirmed and examined

The CHAIR: Good morning. Thank you for appearing before the Staysafe Committee today to give evidence. Do you have any questions about the procedural information sent to you in relation to witnesses and the hearing process?

Dr KATZ: No, it is all clear. Thank you.

The CHAIR: Before we proceed to questions, would you confirm that you are happy to provide a written reply within 10 business days to any questions taken on notice or any supplementary questions the Committee may have?

Dr KATZ: Yes.

The CHAIR: Thank you. Would you like to make an opening statement?

Dr KATZ: Yes, I would. Thank you very much for holding this inquiry. I will introduce the Amy Gillett Foundation, for those of you who are not aware of what we do. Our mission is to save lives. We have a vision of zero people killed while riding bikes on our roads. We implement this through a variety of activities, including awareness raising, education and training. If you are aware of our activities it is most likely to be through the work that we have done in promoting the need for legislation to dictate an overtaking distance of one metre.

In that regard I note that we would hope that in future, autonomous vehicles, that overtaking distance would be incorporated into their programming. I think this inquiry is coming at a really exciting time and thank you very much for the opportunity. I guess the jargon would be that we are at an inflection point and I think many of the exciting aspects of this technology have been brought up in the various submissions and I feel privileged to have heard the last two witnesses who obviously have a great deal of technical knowledge about the legal requirements. Our focus is on the safety aspects of a move towards driverless vehicles and we can see that there really are two competing visions for where this is going to take us. There is the utopian vision and we very much hope that we can see an elimination of driver error and hence, crashes and the trauma that that represents.

On the dystopian side, of course, we see the prospect for technology failure, for the misallocation of road space, for more vehicle kilometres, for costly and unequally shared benefits. Those things I think need to be taken into account as we move, with haste but cautiously, into this new era. We would love to see a future where the SMIDSY does not exist. I am not sure if you have heard of the SMIDSY—it is the phrase, "Sorry mate, I didn't see you" that happens all too regularly on our roads. Hopefully, technology could well prevent that phrase being uttered in the future.

In our submission we make two key points and we have broken them into three but they are really two things. Firstly, in the move towards the benefits as quickly as possible, let us do the simple things first, let us introduce autonomous emergency braking into all our vehicles, with cyclist and pedestrian protection, as part of the Australian design rules as soon as possible. We have evidence to support the value in doing this, the Bureau of Infrastructure, Transport and Regional Economics [BITRE] in 2014 commissioned modelling which showed that this simple change, which is available, doable now, would see a reduction in the vulnerable road user trauma by 30 per cent, just by 2033, which is not very far away, and that modelling was done on the basis that that would be introduced in 2018.

The second key thrust of our submission was that, as we introduced driverless vehicle technology regulations and the technology, that we correct for moral hazard that might come up in the system. The moral hazard occurs because designers of the system will undoubtedly be looking after the interests of those people in the vehicles and those dear to them but might not necessarily pay the same amount of attention to the safety and well-being of those outside the vehicles so that is why we need to be extremely cautious as we introduce this technology. I think we can be captured by the past in some ways in our imagination as to how this will go forward and I think we have heard a lot about, "We will have this change and this change".

We continue to assume that there will be private ownership of vehicles and that the road network will remain essentially unchanged. We do need to think further ahead than that and understand that what we really want is mobility and we want mobility with certain characteristics. Obviously, safety has to be at the top of that list of features but also we want efficiency, we want flexibility so that we do not be too prescriptive about what we require to allow growth and improvement so emphasising outcomes in the way we introduce our legislation, rather than prescribing particular technical details. We do need to pay attention to the equality aspects of our mobility systems and we want them to be healthy and environmentally benign.

Those other considerations can sometimes be lost in the excitement of the technology. We do have—the Government in particular has a lot of levers available to it, as system managers, to adapt vehicle standards, road rules, access requirements or limitations, infrastructure investment and levies and charges to create the right incentives for a system that gives us what we want in terms of mobility. So I just ask the Committee, as it makes its recommendations to keep those mobility values in mind and recommend the adoption of smart levers as we go forward. Thank you.

The CHAIR: Thank you very much. In your submission, you raise concerns that vehicle designers will prioritise the safety of vehicle occupants over other road users and you re-emphasise that in your opening statement and those other road users, obviously the vulnerable road users such as cyclists, motorcyclists and pedestrians and you did propose a couple of ways to address that potential bias. Can you elaborate on your options, in particular radio frequency identification which would help vulnerable road users detect autonomous vehicles and correct the potential bias you mentioned.

Dr KATZ: This was actually something that I have mixed feelings about, interestingly, because—and I did notice that in one of the other submissions they have trialled transmitters in different scenarios and seeing that road workers, for instance, can be protected from autonomous vehicles by the wearing of transmitters. And that is, theoretically, quite an attractive solution but do you require everybody to be wearing these the moment they venture out of the roads? Do we build them into every pair of shoes sold in the country? Do we implant them in our heads or anywhere else on our bodies? It is problematic and we would need to think carefully about how we migrate it to such a system. It is a theoretical possibility and certainly one that we need to have in our arsenal.

The CHAIR: Certainly it was one of those that you particularly had raised so I wanted to ask that question.

Dr MEHREEN FARUQI: Thank you for coming in today. You raised in your opening statement the issue of keeping the value of the quality in our minds when we move towards driverless vehicles. Would you elaborate on that?

Dr KATZ: I think we want everybody to have some access to things they need to access and we would like our elderly, our children, all the different segments of society, whether new or well established, to be able to access the things they need to access. If, through inequalities that could potentially arise through some people having access to great technology and others not having access to such great technology, that the prospect for access to, potentially, important activities is limited, then I think we would create a system that would not be optimal and indeed could entrench levels of inequality and lead to social dysfunction.

Dr MEHREEN FARUQI: It has been one of my concerns, so thank you for bring that up. The Motor Cycle Council of New South Wales has suggested that the current driverless car technology is not really capable of detecting vulnerable road users very well. I am wondering, would you have knowledge of where the technology is up to and how much that needs to improve, even before we start trials, for instance?

Dr KATZ: Frankly, I think that it is still an open question. I note that in the South Australian trial the vehicle did run over a dummy kangaroo and a dummy child and that caused much consternation in the general public and much hilarity in the media. So obviously, there is a need to tweak these systems to make sure that they do protect those vulnerable road users. Whilst the transmitters might be one way to go to do that, hopefully they would develop with enough smarts internally to be able to detect the existence of another person without the use of transmitters.

Dr MEHREEN FARUQI: How do you think cyclists might be involved in trialling autonomous vehicles? We are hearing that they probably should be trialled on motorways where there are no cyclists. However, that is not a real-world scenario. What would you suggest with regard to cyclist safety? Should there be separate infrastructure? What is the best way to go about it?

Dr KATZ: Many people call for separated infrastructure anyway. I do not know how realistic that is once you get into the finer tentacles of the road transport system. We do need to trial it, and obviously controlled trials would be a sensible way to go. These are no doubt happening in Europe, and to a lesser extent in the United States, where vulnerable road users probably do not get the same priority that they do in Europe. We need to follow what is happening in Europe particularly carefully to ensure that any problems they discover with the detection of vulnerable road users are picked up. I cannot provide an answer to where the technology is currently because it is evolving so quickly.

Mr NICK LALICH: What is the best way to transition to autonomous vehicles?

Dr KATZ: We need to do the obvious things first. That may sound trite, but I am referring to things like autonomous emergency braking. It is not strictly driverless, but it takes control away from the driver at a particular juncture. As I said, that has the potential to provide immediate safety dividends. We can then look at some of the other high-trauma aspects of vehicles that we can introduce technology to control. That might involve heavy vehicles and the sleep issues involving drivers. We could use technology to deal with that issue, which causes major trauma when there is a problem. It could be issues such as people flinging open doors in the path of a passing cyclist. That is another area in which we could quite readily introduce simple technologies that would make vehicles safer.

Going beyond that in the immediate term, I think having detection capability for pedestrians, cyclists and motorcyclists at intersections will be a game-changer. Intersections present a particular problem for vulnerable road users. There is this lack of visual recognition of the cyclist, pedestrian or motorcyclist. They may be on the road and even clearly in a visual field, but there is no cognitive recognition.

Mr NICK LALICH: You mentioned transmission and using a watch, having something on your helmet, or wearing a safety vest with a transmitter. An individual might not bother to put on the watch, helmet or vest. Should it be a central transmitter which operates within perhaps 50 metres of a worksite and which sends an alert and anyone within that area would be protected?

Dr KATZ: That is a good idea, and I do not see any problem with introducing that sort of system. Worksites are a special case. We will probably be able to rely very much on occupational health and safety people to look after the interests of those people who are clearly exposed to significant risks.

Mr SCOT MacDONALD: Dealing with cyclists is difficult. I refer to point three in your submission relating to ensuring ITS includes vulnerable road users. How would you see the Government requiring people who are developing driverless vehicle technology [DVT] to factor that in? Would it be addressed in trials, should we mandate it, or should it be included in insurance regulations?

Dr KATZ: It does present a challenge. I can conceive of a situation where systems developers will come to the Government seeking permission to operate. It is at that point that I envisage it would be within the capability of the regulators to respond to the question of how this technology will make vulnerable road users, including cyclists, better off from a safety perspective. There are certain key points along the development path where it is open to interrogate the proponents of different systems.

Mr SCOT MacDONALD: Our road toll is now about 1, 300 a year. How many cyclists are included in that number?

Dr KATZ: Annually in Australia the number is between 30 and 50. It varies substantially.

Mr SCOT MacDONALD: What about injuries and accidents?

Dr KATZ: Again, the injury figures are an unknown quantum.

Mr SCOT MacDONALD: Because they are not necessarily reported?

Dr KATZ: There is a reporting issue; many accidents and injuries are not reported. I point to the evidence I included in the submission of high threat to life injuries that I picked up from hospital data around the country. The change we are seeing in that area indicates that it is at its worst for bicycle users.

Mr SCOT MacDONALD: They are the most vulnerable.

Dr KATZ: They are becoming worse off faster than anybody else in terms of high threat to life injuries.

Mr SCOT MacDONALD: Why?

Dr KATZ: I think it is because more people are choosing to ride because of the benefits that it brings for health, economy and various other reasons. As a result, they are increasingly being injured. Those injuries can range from those requiring very minor hospital admissions through to very severe injuries that are an enormous cost not only to the person concerned and their family but also to society. I point to the graph at page five of the submission, which identifies that trend in high threat to life injuries and traffic accidents by user type. The graph indicates that the curve for pedal cyclists has a significant increase over the others.

Mr SCOT MacDONALD: The cycling fraternity was able to point to research indicating that the metre rule should have an impact. Therefore, we should be able to say to people developing driverless vehicle technology that they must prove it up in terms of the protection it should deliver for vulnerable users.

Dr KATZ: There are various things that lay behind the introduction of the one-metre overtaking distance rule. Many of them are simple principle questions of whether people understood the previous rule. The answer to that was general not really. So we perceived the need to increase clarity. There is also the apprehension caused in the mind of a cyclist when someone passes them at a distance of three inches. That may seem subjectively a sufficient distance to the driver, but it is certainly not sufficient to a person on a bike. That is a lot of what was behind the prosecution of that change in the law. We will see over time whether that causes a marked change in trauma rates. However, it will be very difficult to disentangle it from various other features.

Mr SCOT MacDONALD: The Committee has heard a number of times about Google's 1.5 million kilometres. Has there been any interaction with pedestrians or cyclists?

Dr KATZ: Not that I have heard. It may well be that there have been small incidents, but they have not been picked up. The Google cars certainly have a reputation for waiting at pedestrian crossings until pedestrians are completely clear and anticipating their arrival at crossings. I would have thought it unlikely that they would have had any negative interactions with pedestrians. Bicycles, I have not heard.

Mr ADAM CROUCH: We joked before about having a sensor in a helmet. One of the things that has been made very clear to this Committee over the past few days is that cars will become inherently safer for not only the driver but also the surrounding environment. I suppose that will put the pressure back on cyclists because at this stage there will be no automation of bicycles. I put it to you that cars will become inherently safer for cyclists, not more dangerous. But should we be looking at how we can make a bicycle more noticeable to an automated car? For instance, in the United States bicycles have registration plates, which means the bicycle and its owner are clearly identified.

Could you not look at putting a sensor in a registration plate that is attached to a bicycle, as you could a motorcycle, so that no matter who is riding the cycle it would be detected by an automated car? Is that something that should be considered to ensure that every bicycle is recognised? It would also put the onus back on the cyclists because, like many drivers, I have seen many cyclists ride through red lights—it happens in the city on a daily basis. The reality is that the onus would be back on the cyclist to behave more appropriately and to follow the road rules, even more than they presently do.

Dr KATZ: There clearly needs to be an onus on every road user to do the right thing on the roads. I must admit that I did notice a few pedestrians, and I may have been one, who crossed against a red light in the city, inadvertently I am sure. I do not think it necessarily links in with the registration argument but it raises the question of whether to build sensors into bikes to allow them to be detected more readily by connected vehicles. That is certainly what I have raised in the submission. I mentioned that I have some reservations about it simply because it may be possible for bikes to get out there without a transmitter and then what happens? Do they get driven over by a driverless vehicle because they are not detected or is there some other system that supports that vehicle-to- vehicle communication?

We clearly do not want to rely on just one thing, particularly for pedestrians. There would need to be some on-board guidance for the vehicle to prevent it from running into things that came into its path that did not fit the typical picture of a vehicle it is designed to connect with. I do not necessarily think that it relates to a registration argument. I think you make a very valid point that the onus needs to be on riders to do the right thing. I think there is a clear case for more training and for more education from a very young age—the way it is done in Europe—to make sure that our pedestrians and cyclists come through understanding their role.

Mr ADAM CROUCH: Across the country, and especially in New South Wales, drivers are extensively trained but, other than what parents teach their children to do at a young age, we do not have any formal training for bicycle riders. We have talked about having formal training for driverless cars and ensuring that a driver spends a certain amount of time driving one of these cars. Do we need to formalise the way in which we train people to ride bicycles because we could be instilling incorrect information into our children?

Dr KATZ: I do not want to get into the area of licensing because in order for there to be licensing of riders you would need to make training universally accessible, and until we put the resources into doing that I do not think it would work to make licensing an issue. We have attempted to introduce widely available bike training for adults and young people. It is done better in different jurisdictions than others; New South Wales is probably lagging a little. The Amy Gillett Foundation was a foundation partner in the AustCycle training scheme, which has as its mission to train people in safe bike riding. For lack of funding it has not grown at the rate that we would have liked to have seen it grow, although it is a nationally credentialed network of cycle training providers and teachers who are able to teach safe riding within an accredited curriculum. We hope that will grow in the future with the benefit of sponsorship from government and corporations.

Ms ELENI PETINOS: My question relates to how we tackle the interaction between riders and driverless vehicles. I frequently follow riders on a single-lane road in a national park so I have a very different experience with riders to what one would experience on a metropolitan road. Quite often the riders will block the entire lane and deter all vehicles from passing. In the national park there are some safe areas where you can overtake but I am interested in your thoughts on how such a scenario would work with driverless vehicles. Quite a lot of driving is based on human judgement such as leaving appropriate space and so on. Do we need to think about the different scenarios of the rider-vehicle interaction? Do you have any ideas on how we should tackle the difference between a national park or a regional road with metropolitan roads and bike lanes and driverless vehicles?

Dr KATZ: That is a really good question. I know your pain; it can be frustrating from a driver's perspective to be behind a peloton. I guess one of the great things about a driverless vehicle is that the frustration would be greatly reduced. I note that also in the introduction of the one metre overtaking distance laws it was made clear that drivers are able to cross double yellow lines in order to pass cyclists, where it is safe to do so. Hopefully that will remove the illegality element that would have taken place previously. I do not know which national park you were talking about—

Ms ELENI PETINOS: The Royal National Park.

Dr KATZ: There are some very winding hilly roads through there with poor sight lines and I would imagine it is quite difficult to find situations where it is easy to pass. It is a beautiful road and lots of people use it for tourism rides down to Wollongong, for charity rides and that sort of thing. I have had experience in doing the Wollongong ride and various other rides down through there, so I apologise if I was part of your delay at some point. That sort of road certainly creates difficulties. One wonders how many kilometres a driverless vehicle would do on that sort of road and whether coordination between driverless vehicles would reduce the chance of head-on collisions between driverless vehicles if they were wanting to overtake a group of cyclists. I could only see positives there for you as we move towards a fully autonomous vehicle. I would like to think that the health benefits of having a healthy transport system, including mixed used by pedestrians and cyclists, would make sure that any decisions about restricting their use would be rejected.

The CHAIR: Time is against us. Thank you for appearing today before the Committee and for bringing a cycling perspective to our inquiry into driverless vehicles and road safety.

Dr KATZ: Thank you for the opportunity.

(The witness withdrew)

JOHN ROYDHOUSE, Chief Executive Officer, Institute of Public Works Engineering Australasia, New South Wales Division, sworn and examined

MICK SAVAGE, Manager, Roads and Transport Directorate, Institute of Public Works Engineering Australasia, New South Wales Division, sworn and examined

The CHAIR: I welcome the next witnesses to this hearing as part of the Staysafe Committee inquiry into driverless vehicles and road safety in New South Wales. Do you have any questions concerning the procedural information sent to you in relation to witnesses and the hearing process?

Mr SAVAGE: No.

The CHAIR: May I just confirm that you would be happy to provide a written reply within 10 business days to any questions taken on notice and any supplementary questions the Committee may have?

Mr ROYDHOUSE: Yes, that will be fine.

The CHAIR: I invite you to make a brief opening statement.

Mr ROYDHOUSE: The Institute of Public Works Engineering Australasia [IPWEA] is a professional membership based organisation which represents the interests of infrastructure managers across New South Wales in particular, including our roads and transport network. Two weeks ago we held a roads congress in conjunction with Local Government New South Wales and our roads and transport directorate right here in Parliament House. It was great to see 110 delegates, representing both technical managers and elected representatives at both local and State Government level, discussing road and transport policy. The key theme coming out of that congress was road safety—even though it was not on our agenda it came up as a recurring theme throughout the day. We had everyone from the chief executive officer of Roads and Maritime Services down talking about road safety as a priority, which is a very positive step forward.

IPWEA does have the interests of road managers in New South Wales at its heart. To give some perspective to this, the road network in New South Wales covers some 180,000 kilometres, of which 160,000-odd kilometres are managed by local Government. So it is significant. The Australian Local Government Association [ALGA] has quoted the National Transport Commission statistic that 36 per cent of all the kilometres of road network right across Australia are actually local Government roads. If we have a look at that and then have a look at the crash statistics coming out of Transport for New South Wales, we see that in excess of 60 per cent of crashes in New South Wales are occurring on local Government roads. So there is a bit of an imbalance there in terms of where the funding is going and where accidents are occurring.

Our roads and transport directorate does a road asset benchmarking report every two years. The last one was done in 2014. It identified an annual funding gap for the road network in New South Wales in excess of $447 million—that is annually, and that is just to bring our road network up to a satisfactory condition compared to what it is currently. Unfortunately, due to the announcement of local Government amalgamations, we have not undertaken this survey in 2016. We are waiting for the dust to settle on the amalgamations and to see what local Government areas exist in 2017 before we undertake another survey. Certainly the evidence that has been gathered through the asset management reporting back to the Office of Local Government suggests that there is a significant funding gap.

That brings us to this inquiry into driverless technology. It is very difficult for an organisation such as ours, which is interested in the management of roads infrastructure, to comment too much on driverless technology. Our biggest concern is: who is going to fund the upgrades required for the infrastructure to allow this driverless technology? A classic example are the changes in the heavy vehicle sector of our transport industry. We have seen an increase in higher productivity vehicles across Australia, and New South Wales in particular. We have seen the issuing of applications and permits to allow those vehicles onto our road network, especially in regional areas. There is still an issue of compliance, and it is becoming a challenge, where B-doubles and B-triples are sneaking onto country roads where they really should not be. There are real safety issues around that, especially when it comes to bridges and causeways. I will leave it at that for my introduction and hand over to my colleague Mr Mick Savage. He might talk a bit about some of the other issues raised in our submission.

Mr SAVAGE: First of all, I will leave a copy of the benchmarking reports that Mr Roydhouse has just referred to with the Committee for reference.

The CHAIR: Thank you.

Mr SAVAGE: Secondly, I would like to pick up on the issue of road safety again. It was not something I had given a lot of thought to probably up until two years ago. In the last calendar year there were 348 people killed on our roads in New South Wales, and 60 per cent of those, about 210, were travelling on regional and local roads. That by itself is fairly frightening. It is occurring in an environment where we have a shortfall in funding, and our estimate from that report is that the shortfall is $447 million per year to maintain the road network at its current standard. So that is not to facilitate any improvements. As our submission says, we are not experts in this area yet—we might become so in the future through necessity. However, we do understand the asset management issues. So our submission raises a number of questions with a view to hopefully having a wider consideration of those issues in conjunction with the implementation of this technology, because we are of the view that if one happens without the other then we are going to be in trouble.

The CHAIR: Thank you. I would like to now go to some of the specifics. In your submission you state that the potential is great for driverless vehicles in the reduction of accidents. I think you said it was "very significant". However, you were concerned that the technology should be able to address the potential risk of crashes with the roadside objects clearly in your purview, such as trees; and you had concerns about how to manage road networks, including speed restrictions and barriers. Can you elaborate on those concerns? Do you have any examples that you were able to base those concerns upon? How can they be addressed?

Mr SAVAGE: I suppose the simplest view, going back to the statement I just made, is that we do not fully understand what the technology will look like. Is it going to be totally within the car? Is it going to be car and satellite? Is it going to be a range of technologies that can pick up roadside objects? Or is part of it also going to include the installation of sensors on roads? For example, probably the simplest question is: in metropolitan areas and town centres where you have centre lines and edge lines does the technology pick that up? If the answer to that is yes, and that is the basis for it, then what do we do on the 80,000 kilometres of unsealed roads where none of that exists? So those are the questions we are raising.

Certainly I think a large proportion of that 60 per cent of accidents and deaths is occurring on unsealed roads as well. The other aspect is that it is all well and good to drive around the city but, if you want to go away for the weekend and drive on an unsealed section of road, will the technology, which works extremely well in the city, work on those regional and country roads?

The CHAIR: Indeed, so you would be calling for an extension of trials to those areas?

Mr SAVAGE: Yes.

Mr ROYDHOUSE: Yes.

Mr SAVAGE: We would like to understand the technology and then, if there is a need to implement as part of the road building or the infrastructure provision, certain sensors or certain technologies that allow these vehicles to operate, then we would like to know what that is going to be and how it is going to be funded and maintained into the future. We currently cannot fund the maintenance of our existing road network into the future.

The CHAIR: You would be looking at any overseas experience to inform your position on this?

Mr SAVAGE: Yes.

Ms ELENI PETINOS: The New South Wales Government's submission suggests that driverless vehicles may actually not bring a road safety benefit if they increase traffic congestion, yet other inquiry participants noted that vehicle automation may free up road space due to greater efficiency of car movements. The Committee is aware that if driverless technology is combined with vehicle-sharing systems, it could lead to a significant decrease in volumes of cars on the roads. Do you consider that vehicle-sharing systems are one of the key ways to maximise the potential road safety benefits of driverless vehicle technology? Do you consider that vehicle-sharing systems are something that should be a prerequisite for, or coincident with, the introduction of driverless technology?

Mr ROYDHOUSE: It is a great question and it is probably that the driverless vehicle-sharing is limiting itself to passenger vehicles. We would say that there needs to be consideration of the freight industry as well in that. It would be a fundamental concern because the road network is about economic connectivity as well as the social impact. Roads are a connecting tool and they are there for more than just passenger vehicles.

I would like to see more information around the numbers regarding whether there would be an increase or decrease in vehicles and people's behaviour. My inclination would be that if there is an element of convenience of shared driverless cars that are able to pick you up and drop you at work and then someone else takes it off somewhere else, it all sounds very wonderful—like the Jetsons. I think there actually will be a tendency to use that service more, which potentially means more vehicles on the road, not fewer.

Mr SAVAGE: I would like to follow up on that. An issue that was raised in previous presentations and that we have picked up in our submission is the impact on public transport, particularly on the bus component of public transport. The question we raise is: If you could get a vehicle at the front door to take you either to the station or to work, why would you walk down the road and stand at a bus stop waiting for a bus? If the Google model, where you can dial it up, comes to be, I can see major changes and major impacts on public transport.

One of the problems we have had with the closure of George Street is congestion on Elizabeth Street of buses during peak periods. That would disappear, or have the potential to disappear. The time when you get picked up and dropped off at work might be dictated by congestion, so that you would avoid congestion simply by the time you could get a vehicle. There are lots of positive impacts. If we did not have buses on the metropolitan network, particularly in the city and in the inner city, the capacity for moving people by other vehicles would have to be greatly increased. I see major changes in that respect.

The other impact is likely to be a greatly reduced need for parking in office blocks and shopping centres. Again, when you get a vehicle at the front door and you are dropped off at the shopping centre, you do not need to park and you do not have to drive around in congested parking areas because that vehicle will be off somewhere else, picking up and dropping off someone else. I think there are lots of scenarios and lots of positive outcomes to provide greater utilisation of the network that we currently have.

Ms ELENI PETINOS: Earlier you mentioned connectivity. I want to ask you a question around connectivity from a technology perspective. What would you consider to be the impediments to data sharing in a driverless vehicle environment, not only from the vehicles themselves but, as we move forward, also looking at data collected by various infrastructure?

Mr SAVAGE: There is an element of that existing at present, I suppose, through the Intelligent Access Program [IAP], which is technology that is available to manage the location and to report the loading of heavy vehicles. That technology has been around for a number of years now, but it has been resisted by a number of commercial operators for commercial reasons aside from the privacy considerations. I think both of those things are issues that we as a community will have to come to grips with. We walk around now with mobile phones and you can be pinpointed from tower to tower. You will not be up to get away from it. That is an issue aside from the legal issues of operating a vehicle that I think we need to give thought to and come to grips with as a community.

Mr ROYDHOUSE: I think there are some real advantages in that data-sharing technology. I am thinking about things like grain harvests. When a truck is full off the header, the message can go through to the receivable silo. Before the truck leaves, it will be told that there are 10 trucks in front of it, booked in, so stop at home and have a cup of coffee before you go. There are all sorts of those practical examples where technology can really assist.

Mr ADAM CROUCH: I am from the Central Coast where there is a very diverse range of roads ranging from incredibly well maintained roads to, as you pointed out, regional roads.

Mr ROYDHOUSE: And lots of roundabouts.

Mr ADAM CROUCH: Correct. We have a few of them. From my perspective, the reality is that we are trying to address some of the issues of the quality of local roads. Have you engaged with councils that it may not necessarily be the road itself which may need upgrading but it could be that additional data infrastructure could easily be applied to a road. Rather than spending millions of dollars on upgrading a specific road, have you talked to them about actually putting in technology on those roads, which could assist drivers, I suppose, in driverless cars? We also spoke about the better use of roads by vehicles, so reducing the volume of traffic on roads so that the wear and tear on those roads subsequently may be reduced as well. The ongoing costs of maintaining those roads could effectively be reduced, if they are better utilised.

Mr SAVAGE: You have just mentioned something that someone pointed out to me couple of weeks ago of which I was not aware. One of the problems with driverless technology is that vehicles might travel in exactly the same wheel paths rather than moving across the road, thereby creating additional damage to the situation that exists now. To go back to the beginning of your question, no we have not engaged with our community about what do you know or what are your needs. We have started from the point of view of we do not know anything; let us raise the issues that we know are going to be of concern but also let us see where we could go to accumulate that knowledge and get that back out to our industry, and that is really the reason we are here. We are not only representing the asset management issues for our industry but we are trying to find out how can local government make better use of this technology? Is there a cost involved? Is it going to be done with us or done to us and how can we manage that into the future? That is exactly what we are about.

Mr ADAM CROUCH: In addition to that, we have heard evidence about Transport for NSW introducing the Smart Innovation Centre. What do you consider the New South Wales Government should focus on to adequately prepare for the introduction of autonomous vehicles and the associated technology?

Mr SAVAGE: The simple answer to the question is: the road network. Someone mentioned previously that when you get in your car in the morning to drive to work or drive to the station you take a trip. From the Central Coast you might drive across two local government boundaries—although possibly one now—on to a State road and then back on to a local government road. You do not care who owns those as long as there is access, they are not full of potholes, they are not damaging your vehicle. Those issues need to be addressed. As a State government entity it is not just the State road network that needs to be managed but the road network that provides connectivity between the farmer and town and the market, whatever.

Mr SCOT MacDONALD: Just listening to you there reading your submission, the fear for me would be a divide widening between city and country. In the city you could well find manufacturers very willing to roll out the technology and find an economic model that works for them and maybe even paying for all that road maintenance in the built-up areas, the urban areas. But in regional areas it is a lot harder to do. Besides the technology challenges, how do you have an economic model that can work for regional New South Wales?

Mr ROYDHOUSE: That is a very good question. I will go back to Mick's example of wanting to know about the technology. If you go to the unsealed road network, if the driverless technology is relying on line marking we are yet to see the paint that will stick on an unsealed road. If you have got 20 people living on an unsealed road that is 40 kilometres long the economics are not there to go and paint it for that 10 or 20 people. The challenges of regional New South Wales—and, again, I have been highlighting the transport measures—just have a look at the Newell Highway and see the transport that is going from Melbourne or Adelaide up to Brisbane at night-time. That is a major impact on the road, and for all of regional New South Wales those heavy vehicles are having a considerable impact. The question about the Central Coast and trying to reduce the number of cars—great—but you have still got to deal with those trucks, and they are the ones that are having the major impact on our road networks.

Mr SCOT MacDONALD: I think the witness before you and others have said that you could conceivably have manufacturers; so you will not have private ownership of cars, let us say, but you can have manufacturers making this driverless vehicle technology available, maybe even having the economic model where the price, the fare, the charge covers all that road maintenance in the city. So that is terrific. Somehow you link it up to your journey and the cost of the road network is built in and you get cost recovery, or thereabouts. How can you possibly have that in regional situations?

Mr ROYDHOUSE: There is not going to be an economic model that works; that is the reality. You could look at our telecommunication industry, those universal service obligations—there is that tyranny of distance.

Mr SCOT MacDONALD: The risk for us then is that the divide that you have already got now between urban and country will potentially widen further.

Mr ROYDHOUSE: Yes.

Mr SAVAGE: I think another question to ask though is what is the technology ultimately going to look like? Because if it is a combination of in-car technology and precise GPS location that does not require anything else to happen with the road infrastructure, then those vehicles will be able to travel anywhere on the network and there should not then be the additional cost; it is just the cost that we have currently got of maintaining the vehicle. So what the technology is going to look like is really critical to what appropriate cost recovery models might look like. If it is infrastructure-dependent then I totally agree with you; the gap that we have currently got is going to get much wider much more quickly.

Mr ROYDHOUSE: The only challenge with the technology, as Mick has outlined, is trying to deal with those unforeseen circumstances like wildlife, which you tend not to get too much in metropolitan areas and how technology deals with kangaroos and wombats and pigs and those sorts of things.

Mr SCOT MacDONALD: Is the challenge for the committee to come up with a recommendation that at the moment we have got significant subsidy of public transport and our network from general revenue, if you like, to think about the modelling to support our future infrastructure, if you like, across city and country?

Mr ROYDHOUSE: There is a real need to investigate further how we fund public infrastructure in New South Wales. A classic example would be the change for local government in how they have managed their garbage collection. In years gone past there were smaller trucks and crews went round and threw the bins up and unloaded them physically. There has been a real push to having mechanised vehicles and the bigger,

heavy vehicles, and there have been cost savings. But if you acquaint that across to the damage to the road network for those suburban streets, caused by garbage trucks—everywhere there is a section where the garbage truck turns around at the end of a cul-de-sac—

Mr SCOT MacDONALD: And tears up the bitumen.

Mr ROYDHOUSE: The overall cost has been significant, and if you ask the asset managers and the senior engineers in local government which was the most cost-effective model they will tell you the old way was the better way. That is, I think, a really good example of where the discussion on future funding needs to evolve. Yes, public transport may be expensive, but at the end of the day it is still probably the cheaper option when you incorporate the whole cost of our transport network.

Mr NICK LALICH: You have commented on the need for a transition period. What do you recommend is the best way for the transition to driverless vehicles to take place and what do you see is the biggest risk during the introduction and the transition phase?

Mr SAVAGE: It is not really an area that we have any expertise in other than as asset managers. If there is going to be a change in the loading on pavements then that needs to be managed, particularly if it is going to be an increase; it is more likely that there is going to be a decrease, which is likely to lead to an increase in the life of some of our assets. But the impact on assets and asset management and renewal of our existing assets and also of any new infrastructure that is required and how are we going to fund that is going to dictate how quickly change should happen.

In terms of road safety, it cannot happen quickly enough. In terms of cost to the community and the sustainability of infrastructure assets, the shift might need to take place over a longer period of time. It needs to be modelled and we need a better understanding of the impacts. I am sure there will be impacts that we have not even thought of at this stage but that we need to take into consideration. It is within that framework that we would like to see more of the technology used to reduce the number of deaths and injuries on our roads, but there is a cost involved in doing that that also needs to be managed with the community.

Mr NICK LALICH: In the future there will level 4 or 5 driverless cars on the road. As asset managers you might like to see the State Government run carpools, or perhaps there will be dial-up cars provided by private companies. For someone like me who travels from Liverpool to the city every day, all I need is a little smart car. I really do not need a Kluger. That is a truck. I do not think people should call them sports utility vehicles; they are really trucks. I do not think one person needs to drive from Liverpool to the city in a Kluger. All they need is a smart car. There could be 10 of them on the road in place of four Klugers. Is it your view that the lighter the vehicle the better, as it would not damage your assets as much? The trucking industry is a different matter because trucks have to carry loads.

Mr SAVAGE: The critical factor is axle masses. There is a limit to how long our pavements will last. If you increase axle masses, the pavements will not last as long. If you can decrease axle masses and create the same movement of people then, yes, our assets will last longer and we will be better off.

Mr NICK LALICH: If you go on holidays with your family, you probably need a Kluger, but for local driving down to the shop you need only a smart car.

Mr SAVAGE: That outcome has to be driven by economic modelling so that it is more attractive for people to get into a smaller car than to take the big car to work.

Dr MEHREEN FARUQI: Thank you for your submission and for appearing today. You raise some excellent questions in your submission. I must admit I have been using some of them to ask questions of other witnesses. Hopefully some of your questions will be answered. Having worked as an engineer in two local government areas, in both regional and urban New South Wales, I empathise with the challenges you face, especially with road maintenance. You have spoken a bit about public transport. I think yours is probably the only submission that has done so. You have also raised the issue of moving freight via automated vehicles, which could mean more freight on the roads. You suggest that we need a cost-benefit analysis to compare that with moving freight by rail or increasing mobility through public transport. Do you think that is an important element to take into account when we consider the different uses of driverless vehicles? Is it important to do a specific cost-benefit analysis of the different options?

Mr ROYDHOUSE: It is required as part of the overall planning process. Having gone out to a local government area for their budget launch recently and seen the north-west growth corridor, with an extra 200,000 people being catered for and another 70,000 homes, I see a real opportunity to do some integrated planning of transport out there. That includes looking at the cost-benefit analysis. There is an opportunity in the future, especially in new growth areas, to say, "This is a greenfield site. Let us get it right."

Mr SAVAGE: There are some other opportunities. Much of our planning currently allows deliveries to supermarkets only between 9.00 a.m. and 5.00 a.m. There is a period between 6 o'clock in the evening and 7 o'clock in the morning when there is no traffic and access could be provided. This technology might allow that sort of integration so that freight vehicles do not use the infrastructure at the peak time for other transport vehicles. There is an opportunity to broaden our horizons, to look at a range of planning issues and at how this technology might allow us, through temporal changes and changes in how to get from A to B, to provide much better outcomes for the community.

Dr MEHREEN FARUQI: You raise an important point. I know that in some cities in the world light rail is used at night, in off-peak hours, to do deliveries.

Mr SAVAGE: Yes, absolutely.

Dr MEHREEN FARUQI: You have noted in your submission that there is a potential for the skill range required for driver's licence needs to be enhanced when driverless cars are introduced, especially as technology improves. What skills might need to be enhanced? What skills might drivers need to be trained in?

Mr ROYDHOUSE: There is still a need for drivers to be able to drive. It involves an education process. A really good example is graders. There was a move from using a steering wheel to using a joystick to control them. There was resistance, and there had to be a re-education process for operators. That is their living; they do it every day. Everything was fine until something went wrong and there was a gut reaction to grab the steering wheel but there was no longer a steering wheel to grab to turn the grader off the road. That is where we believe there needs to be really good re-education and an upgrading of skills, especially for my generation. We are used to doing things one way. When you learn to use new technology and have to sit back and let someone else do the work, there is a tendency to compensate. We need to learn those skills. The younger generation still have to learn the road rules. They still have to learn how to drive in a situation where something goes wrong.

Dr MEHREEN FARUQI: Thank you.

The CHAIR: That is a very important element to touch on. Another issue raised in your submission was liability in case of accidents involving pedestrians, cyclists or animals. You asked whether the vehicle owner, road authority or provider of the vehicle's operating system should be held responsible. Have you any comments on that?

Mr ROYDHOUSE: It is a question that needs to be asked and explored further. There was example three years ago of a car manufacturer that went to court with Apple over iPod technology. There was an upgrade to the software for iPods, and the advice was to replace the car because the stereo system was not compatible. In the end the car manufacturer had to replace, under warranty, the stereo system in that car model because the software provided by the third party had not aligned with it. That is the sort of issue that still has to be resolved. If there is an upgrade to the software and the technology, who is liable? Is it the road authority, which provides the infrastructure that the vehicle travels on but which may not have been advised that there has been an upgrade to the software? It is hard to upgrade 180,000 kilometres of road network in New South Wales quickly. A lot of work needs to be done in that regard.

The CHAIR: That is an important point to raise. Thank you very much. Mr Roydhouse and Mr Savage, thank you very much for appearing before the Committee today.

(The witnesses withdrew)

(Luncheon adjournment)

IAN FAULKS, Private citizen, affirmed and examined

The CHAIR: I welcome Mr Ian Faulks who is appearing before the Staysafe Committee this afternoon to give evidence to our inquiry into driverless vehicles and road safety. Before we proceed, do you have any questions concerning the procedural information sent to you in relation to witnesses and the hearing process?

Mr FAULKS: No I am okay, thank you.

The CHAIR: Would you please identify yourself and your position?

Mr FAULKS: My name is Ian Faulks, I am an NRMA - ACT Road Safety Scholar at the Queensland University of Technology and the Centre for Accident Research and Road Safety Queensland [CARRS-Q]. I am also an adjunct at the Department of Psychology, Macquarie University. I also have a private practice in Psychology.

The CHAIR: Before we proceed with questions, may I confirm you will be happy to provide a written reply to any questions taken on notice or any supplementary questions the Committee may have?

Mr FAULKS: I would be happy to do that within 10 days.

The CHAIR: It is not necessarily 10 days but we do put that in as a guide, thank you. Would you like to make an opening statement?

Mr FAULKS: If I may. There have been developments since the time I put a submission in, some of which came from evidence I heard on Friday as well, so I would like to make an opening statement. Thank you for the opportunity to discuss my submission and the issues raised in the inquiry. It appears that, for those drivers for whom a car is a utilitarian device or mechanism to allow them to engage in private travel or to connect with public transport for work or for personal or social reasons, driverless vehicles offer neither a challenge to their concept of driving or road use nor a concern about the increased reliability of technology to assist and ultimately control that driving. However, to drivers who engage in the task of driving, in terms of personal fulfilment and enjoyability, perhaps in the sense of mastering the display of skill and competency, the concept of automated vehicles is quite challenging and is often rejected.

In my research, when asked: If you were to ride in a completely self-driving vehicle, what do you think you would do? The respondents often indicate that they would, and would continue to, monitor the travel down the road, answering the question: I would watch the road, even though I would not be driving. This was a forced choice question. They had a number of options but that was typically the one they would tick. A smaller but significant proportion of respondents would simply say that they would refuse to travel in an autonomous vehicle.

Safety-related vehicle technologies, often called driver assistance systems, include things such as electronics, stability control, emergency braking, adaptive cruise control, lane departure warnings, and other technologies such as auto-parking. These technologies operate when and if needed, not continuously and often operate without the awareness of the driver. Indeed, in my research, many respondents do not know such technologies are actually fitted to their vehicles, let alone how they operate.

Safety-related technologies, therefore, are necessary elements of driver vehicle technologies but are not the essence of driverless vehicles. Similarly, connectivity through vehicle to vehicle or V2V and vehicle to infrastructure or V2I, provides components for but again not the essence of what driverless vehicles are about. They are technologies on the way to driverless vehicles and they do act continuously, but they remain less than fully autonomous operation.

A related issue—it is off on a tangent, but I wanted to bring it to your attention—is the rise of new insurance products. Members will probably be familiar with what is known as pay-as-you-drive [PAYD] insurance offered by companies such as Youi. A new product into Australia is pay-how-you-drive [PHYD] insurance. This product has been much delayed in Australia compared to the United Kingdom and the United States, but is now available through such things as QBE Insurance Box. It is using the same kind of technologies, a big focus on monitoring the driver behaviour itself through onboard data recorders. I will stop there and answer some questions but if some of the matters I wanted to raise are not discussed, I can raise them in a supplementary submission if the Committee is pleased to receive them.

The CHAIR: You note in your submission the estimated reduction of up to 90 per cent for road accidents and associated costs is too optimistic, in fact, I think you said it is "sensationally optimistic". Could you elaborate or outline the circumstances in which it might be conceivable.

Mr FAULKS: I guess what the question is moving towards is, how well will driverless vehicles address the core road safety issues. The core road safety issues or the road safety problems in the past, when I first started working in this area we used to refer to them as the "fatal four", commonly now called the "fatal five" and I often call them the "fatal six". They are: management of speed, substance-impaired driving such as drink-driving and drug-driving, seat belt use and other protections, fatigue, distraction and inattention and the sixth one that I often add is illegal manoeuvres.

I think that driverless technologies will address some, but not all, of those quite adequately. Included in my submission was a commentary paper that I wrote when I was asked to provide an opinion about whether driverless vehicles would enable us to address drink driving. My answer to that was, under the current situation, it is no. In order to program a driverless vehicle that, in my view, would constitute driving. You would still have to sit in the driving seat, all those sorts of things, under the current law and that would constitute driving. So it wasn't the answer. If it was a fully autonomous, robotic vehicle, with no steering controls and those sorts of things, which is one of the aspects of autonomous vehicles, then you could have that situation arising but for the kinds of concepts that have been raised in submissions and that I discussed in my submission, the answer was no.

The other of the core road safety problems can be adequately addressed. In particular speed will be very strongly addressed by autonomous vehicles. If we move into an autonomous vehicle world, the major benefits will be no illegal speeds, excepting perhaps where there would be temporary speed limits and no functional connectivity to link the vehicle approaching that road segment with a temporary limit. You may have an illegal speed at things such as a work zone and those sorts of things. There would probably be more potential crashes avoided because incidents and near-miss types of circumstances will not happen. There is the possibility, through connected vehicles—the V2V and V2I connectivity—to ensure that speeds could then be made appropriate to conditions, let alone what the actual speed limits are.

It is likely that autonomous vehicles, in the situations where crashes are occurring, will probably result in a marked reduction in the impact speeds of those crashes, simply because of the way the systems are working. That said, we do have some modelling from the intelligence speed assistance area that provides us with an indication of what could be expected. This was some work by Professor Oliver Carsten and his colleagues into speed limit adherence and its effect on road safety. He indicated from their modelling that, with a mandatory intelligence speed assistance [ISA]—so it is fully functionally working; it is what you would expect to have for an automated vehicle—that even with 100 per cent within the vehicle fleet, the reduction in the fatal crashes associated with speed would still only be 30 per cent. So there has been this issue of whether or not there is a critical mass that you could achieve where having legal and speed-appropriate autonomous vehicles on the road would then capture everybody else. The modelling that Professor Oliver Carsten and his colleagues did indicated that probably is not going to occur. But still, a 30 per cent reduction in fatal crashes would be quite good.

For seat belt use and other optimal protection, one of the other factors, the suggestion that I would make is that seat belt use should remain mandatory in those sorts of vehicles, even for robotic vehicles and even for very low speeds. You would get some benefits from lower travel speeds and illegal speeds, and if there were seat belt interlocks required as part of the autonomous vehicle, then you would expect benefits from that. For fatigue, driver distraction, inattention and illegal manoeuvres you would expect major benefits. Added all together, I still do not see it achieving 90 per cent. You would look at substantial reductions in the order of 30-plus per cent, but not up to 90 per cent.

Ms ELENI PETINOS: You said an "up to 30 per cent reduction". What do you foresee as the maximum? If 90 per cent is not feasible, what is the potential maximum benefit?

Mr FAULKS: I am a strong advocate for the zero fatality proposal in how we work and design in road safety. That is what I would regard as desirable. In terms of driverless vehicles, I was suggesting that that, in and of itself, would not give rise to the kinds of massive reductions we are seeking across the board.

Ms ELENI PETINOS: I have been asking most witnesses about connectivity and data. What would you foresee as the impediments to data sharing ?

Mr FAULKS: They are the ones associated with not designing the system well. I am talking about proprietary systems that are not making the data available to all of the system managers. A vehicle manufacturer that has a particular system might not be making relevant data available to the road manager, be it a local government or a state road authority, or to policing and investigation authorities. They would be the major issues in terms of connectivity. A bunch of other issues fall into areas such as whether the landscape itself allows for full and continuous connectivity to occur. John Wall from Transport for NSW discussed issues

associated with the Illawarra trial and the mountainous nature of that location. There are those sorts of issues as well. Does that answer the question?

Ms ELENI PETINOS: It is a different perspective from that of other witnesses, but, yes, it does.

Mr ADAM CROUCH: I have been asking witnesses questions about driver training and driver awareness. The biggest concern raised by witnesses relates to the transition period where we have a mixture of vehicles on the road. Some will be automated and some will be in different stages of automation. You made a recommendation about training of vehicle passengers as well as the driver or the director of the car. One of the suggestions put to the Committee is that there be a mandatory period over 12 months during which drivers are forced to drive the vehicle rather than drivers having no experience other than directing a vehicle. What do you see happening during that transition period? What sort of training do you believe needs to be implemented and what are your views about licensing?

Mr FAULKS: The research I have been doing indicates that people often do not know that a lot of the prerequisite technologies in a driverless vehicle are already in the vehicle fleet. They are not sure what kind of in-vehicle safety technology they have and they are unaware when it comes into play. Their experience is that they simply did a manoeuvre and the wheels of their vehicle went off the road and into the shoulder and that the vehicle went back onto the road. They do not know that their vehicle has braking and steering systems that intervene and bring them back onto the road. They do not notice those sorts of things. On that level, the notion of whether we should train for this is probably irrelevant because the systems will generally kick in and run.

With regard to the more general issue of whether we should have a requirement to practise real driving and so on, that is far down the track when we are looking at almost all of the fleet being autonomous. That is a very different kind of world. Professor Regan discussed those issues on Friday. I think he opined that it would be good to have some kind of catch-up arrangement. I am not sure. I wonder whether we need to have any licensing system when we get to that stage. If we have fully autonomous vehicles will we face the issue of, for example, a mum with a very busy life simply programming her car to drop the kids at school or to pick them up without her being there? Will it be an issue if we have children in a car without adult supervision? If it is a fully driverless car, you do not need a driver. Essentially you are all passengers in the vehicle. It is a very complex world.

The really interesting questions relate to what will happen to get to that point. I was thinking about that over the weekend. The evidence the Committee heard on Friday suggests that we already have vehicles that have substantial autonomy. One witness on Friday indicated that he programmed his vehicle in Camden and it drove him to Parliament House. He had his hands on the steering wheel, but he did not need to have them there. That was extraordinary evidence. It indicated that some of the matters that I raised in my submission—in fact, that we all raised in our submissions at the beginning of this inquiry—are probably already outmoded simply because things are moving so quickly.

Mr ADAM CROUCH: The concern is the speed at which this is progressing. Members saw that vehicle. I was a passenger in it and it was a little unnerving. I am talking about the scenario where we are transitioning from old vehicles without that technology to new, fully automated vehicles. My concern relates to drivers who have no experience at all being on the road and dealing with that transition period.

Mr FAULKS: Encountering autonomous vehicles or being involved with them?

Mr ADAM CROUCH: Being involved.

Mr FAULKS: It probably will not be an issue simply because a lot of that technology already exists—we are simply combining those technologies and managing them. That relates to the occupant of a vehicle. There are issues that need to be considered if you are driving another vehicle and encountering an autonomous vehicle. Certainly, some of the media reports, rather than formal research, about Google Car in particular that I have read indicate that there have been crash involvements. That is typically because the vehicle is behaving in ways that do not replicate what a human driver would expect the vehicle to do in terms of speed, how it brakes, and how it moves within the road system.

Mr ADAM CROUCH: The Committee has heard evidence that the car struck another vehicle when that vehicle made an illegal or incorrect movement.

Mr SCOT MacDONALD: The Committee must make some recommendations. One of your recommendations is that the Staysafe Committee consider enhancing capacity in the Centre for Road Safety, and you go on to refer to NSW police. What would that look like? What are they doing now and what would be different?

Mr FAULKS: The Centre for Road Safety and Transport for NSW are national leaders, and may well be considered to be international leaders, in some aspects of thinking about new vehicle technologies and how they can be introduced into the road transport system. I think the work of the Centre for Road Safety in this space has been very good since the road safety technology area was set up in, I think, 2008.

Mr SCOT MacDONALD: Do you mean ANCAP?

Mr FAULKS: No, the area that John Wall heads up. There is also the crash lab, which again is a world-class facility, and the recent announcement of the Government as part of a future transport process in further developing that as a smart innovation centre and engagement with universities and so on is an excellent idea as well. I do want to raise—and this relates to the previous question and I have not seen any significant consideration of this particular aspect—that as we move into the autonomous vehicle world, and the evidence appears to be a little mixed in terms of trying to future predict what is going to be occurring, an important issue is the availability of qualified personnel who will be critical in maintaining the driverless capability of vehicles fitted with these kinds of technologies. I have seen nothing written about what skillsets will be required for that.

Mr SCOT MacDONALD: Is that the technology, the mechanics, everything?

Mr FAULKS: Everything. I have seen nothing written so far that has sought to address what that particular issue would look like. What experience will be required for mechanics and technicians to approve the systems to be operational? A driverless fleet will need to be supported by additional personnel in various essential roles such as logistics, maintenance, operational planning and training to name just a few. Some of these support workforce positions will not require experience in driving a driverless vehicle but it would seem that the bulk of the direct support roles will require some experience in that area. As and when driverless vehicles enter the New South Wales fleet the situation regarding skills and training will be quite fragile and will likely remain so in the short to medium term.

Of equal importance to a workforce directly involved in the operational aspects of driverless vehicles—and this answers the Chair's question—is the support provided not only by the vehicle manufacturers and other prime contractors involved in delivering and supporting the technology but also the staff in areas such as Transport for NSW, the Centre for Road Safety, Roads and Maritime Services and other government organisations. People within these organisations will be vital to sustainment of a driverless vehicle capability and there maybe skill shortages in relation to those areas as well. We just simply have not addressed those sorts of issues and I think none of the submissions, including, sadly, my own, raise that as an issue in the first instance.

Mr SCOT MacDONALD: Some of this technology is coming out very quickly—Volvo, Audi or whatever—but are they addressing that skills lag?

Mr FAULKS: I do not know but I would presume that Volvo would be addressing it for its own service staff. It means changes as to how we manage the overall vehicle fleet. If you are going back—and this answers some of the earlier questions—to a situation of where you cannot take your vehicle to the local service station; it has to be sent to a regional or State-based service centre for the required maintenance, problem solving and so on, then that changes the way we think about how our vehicles are used.

Mr NICK LALICH: Your submission contains an article on the use of alcohol whilst in a self-driven car. In that article you expressed concern about the operation of such a vehicle by a driver under the influence and recommended that the best advice for people under the influence of alcohol was not to drive. Would you still suggest that for a fully automated vehicle such as phase four or five vehicle and how do you suggest that the users of autonomous vehicles be tested for alcohol or drug use?

Mr FAULKS: If it is a fully autonomous vehicle, where essentially we are talking about a robotic vehicle being used as some form of shuttle pod—and there are a range of products going on around the world looking at that kind of usage—then I do not think I would have a problem. It is just the same as if you are very drunk or drug-affected and you get into a taxi or get onto a train; it is the same kinds of issues. If it is a vehicle that you have to program to get you from point A to B and you are substance impaired—so you are drunk or drug-affected—then my argument in that paper was that you are driving. The act of doing that programming is the driving and therefore I would argue that you have committed a driving offence.

Dr MEHREEN FARUQI: The Committee has been engaged in quite a bit of discussion about liability in accidents. For example, how do you classify a driver? Would it be the owner? Would it be the operator? Would it be the manufacturer? You gave the example of someone under the influence of alcohol who programs a car as to where to go. But have you given any thought as to how this would operate, particularly given compulsory third party insurance and who is at fault scenarios?

Mr FAULKS: If it is a fully autonomous robotic vehicle the liability would rest with the vehicle operator, not necessarily the occupant of the vehicle. They can basically take anybody because they are operating fully autonomously. If it something less than that it is no different to what the situation is today—if you are in the driver's seat and have access to the controls you are driving. It as simple as those sorts of issues when it comes down to aspects such as whether or not you are committing an offence or if there was a criminal act. More generally I think there are issues that arise out of my previous comments about the availability of appropriate skillsets and so on, and that falls into a general category known as sustainment. You actually have this system, which is some form of autonomous operation within your vehicle fleet. How reliable is that? Who is responsible for the reliability and maintenance? Those sorts of issues would then attract those questions. Is there harm? Who is responsible for that harm? Therefore where does the liability lie in that circumstance? These issues could become quite important. For example, in some overseas jurisdictions we already have neighbourhood electric vehicles [NEVs], which are general use things within a community. If we shift those over into fully autonomous or robotic kinds of vehicles then presumably it is the jurisdiction or whoever is the owner within that neighbourhood structure that would be responsible and would have the liability. But it would also go down to those questions of maintenance and the sustainment issues I was talking about.

The CHAIR: I understand you have some views on retrofitting, which becomes an issue related to the liability question. Could you make some comment about modification?

Mr FAULKS: In the research centre I am attached to at the Queensland University I am working on offender rehabilitation and management issues, and my focus for the last couple of years has been on traffic offenders, but there is a separate area that is dealing with a whole lot of intelligent transport system issues. That area is working with the Queensland Government on a whole range of issues, including autonomous vehicles announced in the last few weeks. The concept, as I understand it, is that they are looking to retrofit some existing vehicles to allow some degree of autonomous operation. I do not know how that is to be attempted or the circumstances in which it is going to occur, but it raises that really interesting issue that if you start trying to retrofit existing vehicles within the fleet to have some kind of autonomous operation then it really opens up a whole number of doors that allow new questions to be discussed and advanced.

Going back to questions of liability, it really comes down to assessments as to whether or not that work was done appropriately. We do not have anything in terms of standards or that sort of thing. In the Defense Advanced Research Projects Agency [DARPA] Grand Challenge in 2004 no robotic vehicle succeeded. I think the furthest a vehicle travelled in that rally was about 12 kilometres. The next year five vehicles, I think it was, actually completed the challenge. So within 12 months we had this revolution in the capacity for people to build vehicles that could behave autonomously in a very complex off-road environment. That was just from 2004 to 2005. We are now 10 years down the track. I drew up a list of areas where I knew there were trials or deployments going on in this space. Those are happening all over the world and there is a multiplicity of them. As you heard on Friday, we now actually have them occurring within the New South Wales road system. It all happened very quickly. We blinked and the next moment they were there.

The CHAIR: Mr Faulks, sadly we are out of time but I do thank you for your submission and for appearing before the Committee today. If we have any supplementary questions, we will send them to you.

Mr FAULKS: I do have some additional material and if the Committee is so minded then I would like to make a supplementary submission. I heard the questions asked on Friday about whether or not vehicles should have particular markings and so on. I have prepared something which I could just submit today.

The CHAIR: We would ask that you table that if you could.

Mr FAULKS: Yes, I can table that. It shows what is held to be the world's first number plate for an autonomous vehicle. It was issued in 2012 in Nevada.

The CHAIR: I thought it was a submission.

Mr FAULKS: I will table it as a paper. The second image I have is more for your amusement than anything else, and you will recognise some of the figures in it. Concerns about the fact that these sorts of vehicles do actually drive at the speed limit arose with the first intelligent speed assistance trials. It was reported by drivers that following drivers got quite frustrated by the fact that the vehicle never exceeded the speed limit. So they placed a sign on the back of the vehicle which said, "This car obeys the speed limit." I would direct your attention to the two people who are examining it in this image.

The CHAIR: Thank you very much.

(The witness withdrew)

RAY RICE, Chief Executive Officer, Bicycle NSW, sworn and examined

The CHAIR: I welcome Mr Ray Rice to this hearing of the Joint Standing Committee on Road Safety, also known as the Staysafe Committee. Do you have any questions concerning the procedural information sent to you in relation to witnesses and the hearing process?

Mr RICE: No.

The CHAIR: May I just confirm that you would be happy to provide a written reply within 10 business days to any questions taken on notice and any supplementary questions the Committee may have?

Mr RICE: Yes.

The CHAIR: Would you like to make a brief opening statement?

Mr RICE: Thank you for the opportunity to appear before the Committee. My background lies in engineering. I have over 30 years' experience in consulting engineering and I remain a fellow of Engineers Australia. Bicycle NSW is the peak advocacy body for bike riders in New South Wales. We have been operating in New South Wales now for 40 years. We have over 30 local bicycle user groups affiliated with us, so we do have wide representation around the State in both metropolitan and country areas.

Our submission has three main points. We looked at the potential benefits, the need for national standards and also pointed out that we believe that, in the near and not so near future, the best way to ensure the safety of bicycle riders will still be by providing separated infrastructure. To deal with our first point about the potential benefits, we do believe that automated and driverless vehicles have the potential to increase the safety of all road users. I want to stress two things here. Firstly, it has the potential and, secondly, it has to be for all road users. That potential must be well managed so that it does provide real benefits to all road users, including vulnerable road users such as pedestrians, bicycle riders and motorcyclists.

We really are on the cusp here of a major transport revolution. For over 100 years humans have been in control of vehicles. So we really have to get this transition right. I do not think we should get too carried away with some of the Utopian views of the future that have been presented by some respondents. We must look for the unintended consequences, and there are a number that we have seen already. One question of driverless vehicles is: what will they prioritise when making the choice between the safety of a passenger in the vehicle and the safety of an external pedestrian or bike rider?

The mixed fleet period where there are different vehicles on the road is incredibly important. We will see a new style of crashes between driverless vehicles and human controlled vehicles. Driverless vehicles just do not behave the same as human controlled vehicles do. I think we have seen that with the Google vehicle. Even though the crashes that have occurred there have been the fault of humans, they have occurred because in a lot of circumstances the vehicles are not behaving as human controlled vehicles do. The same thing applies in the mixed fleet vehicle period as far as vulnerable road users goes.

I was interested to see the Volvo submission mention driverless vehicles dropping passengers off at work and then going away to find parking elsewhere. It really raises the vision of hordes of autonomous vehicles cruising the streets looking for parking spots that simply do not exist. How will the State charge for that road usage? Really it raises the question: isn't public transport a better option in those circumstances? So those are the sorts of things that we have to look at. Technologies such as autonomous emergency braking are already available, and we join with the Amy Gillet Foundation in calling for the introduction of that in all new vehicles sooner rather later—that is, by 2018.

Our second point deals with national standards in this area. A lot of submissions mentioned this and that was good to see. We cannot afford to be reactive in this area. We cannot afford to do it system by system, vehicle by vehicle or State by State. So we must be prepared with these standards and we have to back those standards with independent and mandatory testing. Recent history in the area of car fuel consumption software shows us that vehicle manufacturers will require this independent testing.

Our third point is that, while automatic and driverless vehicles have the potential to greatly reduce road injuries including for vulnerable road users, the best way forward is to avoid conflicts in the first place. Very often that is still going to mean the separation of pedestrians, bicycle riders and vehicles. For many years to come that will be achieved by having safe and separated cycleways. That is really just applying the safe systems approach and applying the safe roads approach to bicycle riders. We have already seen good evidence of the benefits of separated cycleways in the Sydney central business district. There separated cycle lanes have increased bicycle usage and also reduced the actual number of injuries. Thank you, that concludes my opening statement.

The CHAIR: Very good, thank you. One of the proposed ways to address potential safety risks with autonomous vehicles was for other vehicles, riders and pedestrians to be equipped with devices such as a phone app or radio frequency identification to detect autonomous vehicles. Another submission suggested that autonomous vehicles be identified with plates similar to those used by learner drivers. What is your view on that? In other words, this is designed to protect those vulnerable road users to whom you referred.

Mr RICE: The question of vulnerable road users having some sort of identification through electronics is interesting, but does that mean that the simple bicycle then becomes not so simple? You have to then differentiate between bikes with or without identification and pedestrians with or without identification. I think it is a huge area. You have vehicles with or without technology and now you have bicycles with identification technology and pedestrians. I think we have to look at more fundamental ways of doing that rather than completely relying on the technology. Identifying vehicles which do or do not have technology? I think the results would be mixed. We already identify the learners and P-platers. Although it has some effect on other drivers, it just tends to be a source of irritation for other drivers.

The CHAIR: Apart from that separation to which you referred, can you suggest any other means of ensuring that vulnerable road users are best protected? Here we are talking about cyclists, in particular.

Mr RICE: There is a range of areas there but it always comes down to a multifaceted approach. The education of road users is always important. With regard to legislation, we have recently seen the introduction of minimum passing distance regulations and that has been advantageous. We have had anecdotal evidence that a lot of the riders are feeling the difference already and we prefer to see some greater education in that area and publicity. I hope that is forthcoming. Then you have to look at infrastructure as well. So I suggest a multifaceted approach—education, regulation and infrastructure.

Dr MEHREEN FARUQI: It is predicted that more and more driverless cars will start coming onto our roads in the very near future. What is your view on the impacts of active transport? I am thinking more of the use of active transport. Do you think that will have an impact? If so, what could it be?

Mr RICE: Yes, it will have an impact and hopefully by the vehicles becoming more ordered and better regulated it will be safer, therefore, for active transport. I think that one of the greatest sources of injury to pedestrians on the footpath is in fact vehicles mounting the footpath. By far the greatest number of deaths of pedestrians are on the footpath when there is a vehicle hitting them. If we could stop that sort of thing, that helps to promote active transport for pedestrians.

The technology of braking and sensing of riders will help to promote cycling as the cyclists feel greater confidence in what is going on around them. It is often said—and the statistics show—that 70 per cent of people would ride a bike more often if it was safer and more convenient. Separation by infrastructure, legislation and technology will help to promote active transport.

Dr MEHREEN FARUQI: The Motorcycle Council of New South Wales has suggested in its submission that the current driverless car technology is actually not capable of detecting motorcycles or other vulnerable road users. Do you think that that technology needs to be improved before any trials, for instance, are conducted?

Mr RICE: I think it has to be proven before it is introduced. I do not think we should rely solely on the manufacturers and the vehicle manufacturers' testing. I think that has got to be independently tested and shown to work. I mentioned earlier the cases of fuel consumption software fudging. That says that we should be looking at mandatory independent testing.

Dr MEHREEN FARUQI: You mentioned public transport earlier. I have been having discussions with witnesses today on what could be the likely impact on traditional public transport of driverless vehicles, and should there be a really thorough cost-benefit analysis in terms of government investment in public transport or government investment in infrastructure to bring more and more driverless vehicles on the road?

Mr RICE: If the results of driverless vehicles is to just increase the number of vehicles circulating, it is going to be a poor result. If the introduction of driverless vehicles leads to rationalisation of the number of vehicles through vehicle sharing, public transport and things like that, that is advantageous. I think the Government has to be careful of this and steer what is going on. Take the example of what has happened in China over the last 20 years. Huge numbers of vehicles are now clogging their roads to no real gain. We have to be careful of that.

Mr NICK LALICH: Your submission states that the introduction and implementation of driverless vehicles needs to be a national rather than a State-based approach. What are the benefits of having a national approach?

Mr RICE: Not only does it have to be national but I think we have to key into what is happening internationally as well. Obviously, a national approach is required such that there is no impediment to vehicles moving from State to State. In relation to the national approach, we are becoming a smaller Australia in any case because of travel between States. It is no time now to be introducing barriers to that. Vehicles' standards must be based on one Australian standard. It is good to see New South Wales already participating in that, and I encourage it. It just has to be a national-based approach.

Mr ADAM CROUCH: I put this question to the gentleman from the Amy Gillett Foundation earlier. Part one of my question is this: The reality at the moment is that we are being told that semi-autonomous or autonomous vehicles may not be able to detect a bicycle or a motorcycle. Given that technology will keep advancing and that we have to try to stay in front of it as best we can, the reality is that the vehicles will become inherently safer than they are now due to the technology involved. That means that in time it may be that the cyclist is the one causing the accident because it is a human controlling a bicycle or a motorbike.

Would it not be prudent to consider fitting bicycles and motorcycles or all vehicles with some type of transponder device so that the car, which is no longer controlled by a human, can actually detect the motorcycle or the bicycle that it is coming close to at the time? I mentioned to the Amy Gillett Foundation's representatives that in Maryland every bicycle has a registration plate. Could you not fit a device to the identification plate of every bicycle so that the car recognises that? Do you see that as something that could be of benefit to cyclists? Part two of my question is about the bigger issue we are facing, which is the transition period of a mixed fleet whereby we have two types of vehicle on the road, some being autonomous and some being semi-autonomous. Training for both cyclists and drivers alike, how do we look at tackling that in the future?

Mr RICE: If I can go back to the first part, which is to do with sensors on bikes, I really think you have to look at the practicality of that. In an ideal world it may well be feasible, but what are we looking at here—fitting them to children's bikes, all bikes? Then you start extrapolating: Are we going to require pedestrians to have this as well? You start turning a very simple and basic mode of transport into something more complicated and, therefore, possibly discouraging active transport. I would be wary of it. I think that technically it is possibly feasible in the future, but I would be wary of it as to whether it is actually helping to promote active transport.

Mr ADAM CROUCH: The second part of the question related to training for cyclists, especially when they are going to be riding with a mixed fleet of vehicles, potentially, over a transition period. Do you think that we train cyclists appropriately at the moment? Is there enough schooling and education for cyclists so that they will be able to deal with a motoring world that effectively will not have drivers involved? There will not be eye-to-eye contact of a driver, as we are seeing now, with a cyclist. We heard stories of the old theme of a door being opened, but we are talking about moving vehicles. The eye-to-eye contact will not come into it in the future, potentially.

Mr RICE : In fact, the eye-to-eye contact at the moment is sometimes not very much help at all because we already know that the Adelaide university study says that in 79 per cent of the cases of cyclist and vehicle collisions which result in a serious injury it is the vehicle which is at fault. So the technology of driverless vehicles may hopefully reduce that. On the education aspects, we do not do much for education of bicycle riders at present and I believe we could do more in the early days, especially school, and that would also help encourage cycling to and from school. If you look at the figures of the number of kids riding bikes to school these days, it has greatly decreased in the past 20 years and it is a huge shame. At the same time, we have got health problems. So if we can help encourage kids riding to school through bicycle education that would be great.

Mr ADAM CROUCH: But also having a better awareness program for people learning to ride a bike, as we do for motorbike riders, et cetera, there is some form of formal education.

Mr RICE : I think we could do better all round in our road user education. It is good to see some recent ads, the zero ads cropping up on television now. I think we could do better on the education on the minimum passing distance. We seem to have forgotten some of those aspects of public education of road users in the last few years. I think a number of us would remember the ads on television years ago: "Do you think you are a safe driver?" and then they would have a feature. We do not seem to see those so much anymore. Maybe more so recently as last year's road toll and this year's road toll have gone up fairly dramatically. We should be looking at those total public education aspects for road users.

Ms ELENI PETINOS: I wish to follow up on that. You are talking about education for road users, but what about education for the bicycle riders themselves? Your response intimates that you think that it is all other users of the road that need to be aware of the bicycle riders and that there is not necessarily a role for the bicycle rider to be aware of their behaviour and how they impact on the other vehicles around them.

Mr RICE : In the term "road users" I include bicycle riders.

Ms ELENI PETINOS: So you accept that there is an education onus for bicycle riders to be aware of how they impact on everyone else around them as well?

Mr RICE : I think there is a role for all road users—bicycle riders, motorcyclists, pedestrians when they cross the road—to have a greater education and sharing that road safely.

Ms ELENI PETINOS: Your submission states that the introduction and implementation of driverless vehicles need to be a national rather than a State-based approach. What are the benefits of having a national approach? In your response I would like to hear how you feel a national approach would benefit bicycle riders, given that is the industry you are representing.

Mr RICE : A national approach would mean that we have consistency across States of laws, of sensors in cars—all things. We really do not need to see things fragmented from State to State, so people when they cross a State border or go on holidays are scratching their heads saying, "Are the sensors different in New South Wales? Are the laws different in New South Wales?" We need that consistency because we are such a mobile population between States these days. So we already see differences in State-based rules for cars and bicycles and it is not helpful at the moment. I would prefer to see greater standardisation of the regulations between States and certainly for the driverless vehicles.

Ms ELENI PETINOS: Do you have any views on how automated vehicles are going to interrelate with bicycle riders in various environments, as in what are the potential impacts that we need to be aware of for a bicycle rider in a metropolitan area versus someone in a rural or regional environment?

Mr RICE : In a metropolitan area I think the gains are probably higher because the bicycles and vehicles will probably be in closer proximity where you will have bikes in lanes with cars. I prefer in many circumstances to see separation such that the vehicles and the bicycles who are travelling at different speeds are not mingling together. That is just better for both bicycles and cars, that if there is a greater speed differential that they are separated. But in those metropolitan areas we do have mixed traffic of bicycles and cars and there is potential there with the sensors in the cars to sense the bicycles and therefore make things safer for those bicycle riders. The automatic braking is a great example, which would benefit pedestrians and bicycle riders. There are already sensors available in some vehicles when you are overtaking such that you sense the vehicle in your blind spots. If they could sense bicycles that would be advantageous as well.

Ms ELENI PETINOS: What about environments though where you are sharing the road? I live in a part of Sydney where I get stuck behind cyclists every other day. There is one lane and there is absolutely nowhere to go—it is through a national park so there is absolutely nowhere to go other than staying behind them for 10 kilometres or going around them. How does that work with automated vehicles in the future?

Mr RICE : I think, firstly, the new minimum passing distance legislation does let you go past them if it is safe to do so.

Ms ELENI PETINOS: As I said, 10 kilometres—we are talking about a national park—of winding road. There is a reason I said it is difficult to overtake.

Mr RICE : It sounds like the Royal National Park.

Ms ELENI PETINOS: It does. When I said 10 kilometres that is very specific—I see it every day.

Mr RICE : In those circumstances it is not feasible to have that separation. Certainly then you have got to look at the educational aspects and the sharing road aspects to make certain that people do share that road. It also might mean some changes in the infrastructure such that you do provide overtaking lanes in places. But when we do not have that infrastructure we should be looking at sharing that road.

The CHAIR: Mr Rice, sadly we are out of time. If we have any further questions we will send to them to you. Thank you for your submission and thank you for appearing before the committee this afternoon.

(Witness withdrew)

GUY STANFORD, Delegate, Motorcycle Council of NSW, affirmed and examined

STEVEN PEARCE, Treasurer, Motorcycle Council of NSW, affirmed and examined

BRIAN WOOD, Secretary, Motorcycle Council of NSW, affirmed and examined

The CHAIR: I welcome you to this hearing by the Staysafe Committee into driverless vehicles and road safety. Thank you for appearing before the committee this afternoon to give evidence. Before we proceed, do you have any questions concerning the procedural information sent to you in relation to witnesses and the hearing process?

WITNESSES: No.

The CHAIR: Thank you. Before we proceed to questions, may I confirm that you are happy to provide a written reply within 10 business days to any questions taken on notice or any supplementary questions the Committee may have?

Mr STANFORD: Yes.

The CHAIR: Thank you. Would you like to make an opening statement?

Mr WOOD: I would like to make some opening remarks. Mr Stanford may wish to follow. I thank the Committee for this opportunity to appear before it to express our concerns about safety with regard to the introduction of driverless vehicles. I was surprised when I looked at the submissions. The Motorcycle Council of NSW is obviously not the only vulnerable road user group with concerns about the introduction of driverless cars and the impact that might have on road safety. SMIDSY or "Sorry, mate, I didn't see you," is a common term used among motorcyclists. In my riding career I have heard it several times. I know that Mr Stanford has.

Mr PEARCE: So have I.

Mr STANFORD: You hear that from the car that hit you.

Mr WOOD: It is a term we will probably hear less of initially, not because there will be fewer crashes but because the technology will not detect us in the first place. There will not be a driver to offer that apology. If the technology has not detected you then the car is likely to drive off and leave you on the side of the road. We are concerned that the technology will not detect motorcyclists. I have had occasion to drive a Holden that was fitted with forward collision warning technology. I know that when I followed a motorcyclist it did not detect the motorcycle; it detected the car in front of the motorcycle. That is a situation where our safety is already being compromised by technology because it does not detect us.

I have road-tested blind spot monitoring on a number of vehicles by riding up beside them and moving in, out and across to see whether the technology detected me. I was surprised to find that most of those systems are very good at detecting a motorcycle if you are going at about the same speed as the vehicle. So, while the technology can detect you if you are in the blind spot, it cannot detect when you want to change lanes and it will not detect you if there is a speed differential and you are overtaking the vehicle. Although there may be a reduction in the number of road crashes in the long term, when all vehicles are autonomous or have vehicle-to-vehicle or vehicle-to-infrastructure technology, we should really concentrate on what will happen in the interim, when there will be a mixture of different vehicles on the road, some with the technology and some without.

I am concerned that much of the current information comes from demonstrations. Lyft states that it successfully drove driverless cars across America. But when you look at where they drove, you see that they stayed on the interstate highways. Similarly, there are claims that driverless cars have driven across China, but they also stayed on highways and did not venture off them. That is the easy part of driving. Google says that it has clocked up 2.3 million miles using driverless cars. If you look at the detail, you see that only 1.3 million miles were driven while the car was in automated mode. The other million miles were driven with the car in manual. Why did they put the vehicle in manual for almost 50 per cent of the time? That is an indication that the technology is able, at the moment, to drive for a fair percentage of the time in automated mode.

Our concern is that our safety must not be not compromised at any stage. The Committee held an inquiry into motorcycle safety recently. It was very pleasing to see that the Government accepted all the recommendations made by the Committee. The Motorcycle Council is very supportive of those recommendations. Motorcycle safety has been improving—not at the same rate as for other road users, unfortunately, but there has been an improvement. I would very much hate to see our safety deteriorate because of the introduction of technology that has not accounted for us.

The CHAIR: Thank you, Mr Wood. Mr Stanford, would you like to make some opening remarks?

Mr STANFORD: I want to raise some other aspects. Putting on my consumer hat, my view is that any goods that we buy have to be fit for purpose. We have consumer rights. We have had major issues with motorcycle helmets, as the Committee may be aware. They are still not resolved. There are problems with the way the road rules are written. If you have a dodgy helmet, Roads and Maritime Services [RMS] can issue you with a ticket for not wearing a helmet at all. The manufacturer does not seem to be brought in because that matter falls under consumer legislation.

The question is whether this technology is fit for the purpose for which it has been sold. We have doubts that the artificially intelligent [AI] software will be able to cope with the structure of our road rules, because there are different implementations across different States. Helmet road rules are just one example. There is no statement of intent, of what to expect as the outcome of a particular road rule. Our road rules are not a guide to driving safely; they are a series of offences. As a result, you find cultural differences in different areas where you drive. If you look at behaviour at intersections, you do not see driver behaviour that is perfectly in accord with the road rules. Someone might wave you through. There is a bit of allowance.

Driving is one of the very few collective and cooperative activities that we still engage in. There are cultural aspects of that to take into account. If you introduce a driverless car into that, some sort of mobile vending machine, the concern is that there will be unpredictable results. It might behave in a slavishly perfect way, as far as the road rules are concerned, but it will create disruption. That is the very nature of this technology; it is called a disruptive technology. Boy, oh boy, we will see lots of disruption.

We are not ready to have them on the roads at this stage. Our responsibilities are not clarified to the degree that this will work. The Committee asked at a previous hearing about having to put transponders on vehicles. That is projecting the risk of the AI provider on to the rest of the community. We are losing track of who will be responsible for what. We see in the submission from RMS that they seem to have made a pre-emptive offer to cave in and depart the field without a fight, without even looking at the issue of responsibility. We are concerned about that.

The CHAIR: In your submission you state that rigorous testing of driverless vehicles is vital. You have referred to that today. Would you define your view of rigorous testing? Should motorcyclists be involved in that testing, and in what capacity?

Mr STANFORD: For each road rule that autonomous vehicles have to obey, standards must be applied to the outcomes. Then there should be testing to see whether those standards can be met. The second question should be whether that standard is appropriate. This is a major issue to do with road rules and what we expect from people as well as from AI. Our role in that would be as critical observers, as we are at the moment.

The CHAIR: Thank you. We will take that on board.

Ms ELENI PETINOS: Good afternoon, gentlemen. Your submission states that the road safety benefits of self-driving cars are still questionable and that more evidence is needed. I question on what basis you make that statement. What further evidence do you consider to be a priority?

Mr STANFORD: I do not think we have seen evidence of the performance of autonomous vehicles in real world situations. We have seen lots of theatrical demonstrations. We do not have the evidence.

Mr WOOD: I note that the Government's submission included a graph from the SIRA [State Insurance Regulatory Authority] predicting the uptake of the technology in the future, but they have just drawn a line from now to what is predicted in the future. What will happen in the interim, when there is a mixture of vehicles?

Mr STANFORD: There is a lot of speculation as to the potential outcome from the introduction of these vehicles. It is great to have dreams and hopes, but let us not get carried away and think that we are *The Jetsons*.

Ms ELENI PETINOS: The Government's submission says that there will be a 90 per cent reduction in accidents. Other witnesses have said that they do not believe the figure will be 90 per cent. They are more conservative about the number. You are saying that the technology is questionable. I wonder where that view has come from. It is fine to say that the tests have not been carried out in a real world environment, but are you throwing out everyone's research? Do you have something more substantial to say?

Mr STANFORD: No, not at all. There are certain circumstances where the technology will not be suitable. For example, I live in the Blue Mountains, on a little narrow street which clogs up with parked cars on a long weekend. I was trying to picture an automated car trying to get through there without using the normal

politeness that ordinary drivers offer. I certainly would not want to go through there on a motorcycle with an AI car on the street as well. There is a need to trial the technology on clear roads, but it needs to be brought on in stages. We would be recommending that they be limited very much to a very strict series of roads so that they could be monitored.

You might say that those are the easiest roads to put them on, that the demonstrations that they have done already could be operated on these roads. You are not going to put them in the back streets of Chippendale, it is just ridiculous to even think they would cope under those circumstances with any guarantees at all. So if they were to be restricted in area and restricted to a very clear and limited set of roads, I think at the same time that they should be screamingly obvious to see in the traffic. I think that fluoro chevrons is only a start. I would even be thinking of some kind of flag on the roof. I am not looking for a red flag and a man walking in front. But I think that you need to warn the population that in the middle of this traffic that is up ahead is a vehicle that is not going to behave the way that you think it is going to.

Ms ELENI PETINOS: Some other evidence that we have collected from witnesses said things like: It might be useful to have automated vehicles signposted like an L or P type plate to be affixed to the vehicle to make other road users aware that it is an autonomous vehicle that will not behave in the manners that you have just pointed out. Do you think that that would be helpful for motorcycle riders?

Mr STANFORD: Absolutely, but I think it needs to be a lot more than just a number plate. It has to be something that is up at eye level for pedestrians because pedestrians do not look at number plates, that is the last thing. So whatever it is, it has to be in that visual high line and it has to be really obvious and stand out through windows to vehicles on the other side, the little gap between big trucks and things like that. It has got to be really obvious that out there, in my nearby vicinity, is a vehicle that may not behave—and until we have gone through that phase, I think that it will be setting traps for people, basically, to have them hidden amongst the ordinary traffic.

Ms ELENI PETINOS: Do you think there are any other factors that should be taken into account for motorcycle users, other than the big red flag-type scenario that you are mentioning?

Mr STANFORD: We still cannot see that the technology is proven and is adequate at this stage to let them loose on the road with motorcycles.

Mr WOOD: Just about all of them have a disclaimer to say: We do not pick up smaller objects such as pedestrians, cyclists and motorcyclists. So if they are already just coming out with that disclaimer, as I say, the blind spot monitor is the only one I have seen where they will pick me up as a motorcyclist.

Ms ELENI PETINOS: Are you willing to have them tested with motorcyclists? It sounds like you are a little bit shut off from the evolution of the technology. Are you willing to engage and ensure that everything is available?

Mr STANFORD: We are very familiar with technology. It is interesting that technology that has been applied to cars has been very difficult to apply to motorcycles. We are quite aware of the value of good technology in catching those little mistakes that drivers make. But this is a whole new ball game; this is actually putting the technology in charge of the motions. So if you have got a driver who has driver aids such as forward collision stuff that works and is warning and picking up motorcyclists, then we would be more prepared to go with this. But when we find evidence on a practical day-to-day basis that this technology is not working on motorcycles, yes we get very nervous about that.

Mr WOOD: And usually we ask but we don't get a response. I know Transurban have made a submission. I do not know whether they are appearing before the Committee.

Ms ELENI PETINOS: They have already appeared.

Mr WOOD: Well, part of their footage, they show an autonomous vehicle coming up behind a police motorcyclist and it appears that the vehicle is moving to the left but then the police motorcyclist does a quick veer to the right. I mean, was that police motorcyclist concerned that he was about to get mowed down by that autonomous vehicle? Did that vehicle actually know that he was there as a motorcyclist? As I say, I contacted Transurban but had no response.

Mr STANFORD: One of the other things, when you start reading some of the details on the autonomous cars, it seems to be that one of the recurring things is that they all had drivers in them who had occasionally intervened. It is not like they are going for hours and hours in varied environments. If they are in a single environment they might get the software settled down and nobody has to touch anything for a long period of time. But once you start getting changes in the external environment, the driver is having to intervene to correct some small thing that the car has not done. So those things that are a bit deeper in the reports are the

things that are saying to us that if you have them in a varied environment you are going to get bizarre things happening. The only way they are properly going to work is if you control the environment very strongly. Which means that the Government is going to have to take responsibility for providing the ground work for the sale of vehicles and it is a form of regulatory protection in a way. So we need to be very careful about how this process is being managed because otherwise you are going to end up with "You can buy them from this company but not from that company". Well, why? And so we have then got the question: Is this a preferred supplier of the Government or is there a question of standards?

Ms ELENI PETINOS: It is a bit speculative.

Mr STANFORD: It is no less speculative than the subject of, are these things actually safe? We have doubts that they are genuinely safe.

Ms ELENI PETINOS: You are accusing the Government of having preferred suppliers of autonomous vehicles.

Mr STANFORD: No, I didn't say that. I am saying that is where you would end up if you did not control. So if there are going to be initial trials on the roads they are going to be highly controlled environments. Prove them there and we will go the next step. But until we see that evidence, we are hanging back here.

The CHAIR: Yes, I think we have certainly got that message.

Mr ADAM CROUCH: Following on from Ms Petinos's questions, it is interesting because one of the things we have seen from the evidence given to us is that the only thing that is unpredictable is the human behaviour. The machines themselves are very predictable. They follow very set patterns. Anecdotally, all the accidents that happened with the Google vehicle, for instance, have been caused by human error in another vehicle because their reactions are not the norm. It was interesting, you mentioned before about the vehicle coming up behind the policeman. He would not have known it was an automated vehicle so his reaction was unpredictable, not the vehicle's reaction.

Mr WOOD: I think he was part of the demonstration and I think he knew that that vehicle was coming up.

Mr ADAM CROUCH: He did but he reacted in a different way. This is the question I suppose—and you heard me ask it of the gentleman from Bicycle NSW. Motorbike riders are inherently situationally where they have to be, more so than most car drivers, and I acknowledge that. I mentioned before, and you would have heard that, about having a transponder on a motorbike. We are finding, as you said earlier, the blind spot awareness program situation with cars worked well in most cases and most cars have technology now which is processing millions of data per second and we are going to see that continue to improve.

So the question is, if bikes were fitted with a simple transponder—it might be incredibly small these days, like most technology and they are saying that these can be included in your mobile phone. Knowing it would be so simple to have that, and motorbikes are already better off because you already have a registration paper, you could be fitted with a registration paper motorbike. So as an automated vehicle is approaching a motorbike, it detects that there is a vehicle there because it gets the signal from the transponder.

Firstly, is this something you see as a realistic idea? Secondly, in line with what Ms Petinos said, at some point do you feel that you need to be involved with those tests, whether it be Volvo, Tesla, whoever else it is, and to simply say, "They scare us; we are not sure". At some point, you as a group need to take on board the active testing of these vehicles, because they are already out there. The gentleman from Volvo drove to work here from Camden on Friday. He did not have his hands on the wheel for the entire journey from Camden to Parliament. And no-one knows that vehicle is an automated vehicle. He managed to drive all the way from Camden without squishing a motorbike rider. That is the question. The technology is already there, gentlemen. So rather than say, "It is scary to us; we do not want to take the risk", do you think you need to look at it slightly differently?

Mr STANFORD: What you are saying is it is no longer an autonomous vehicle. You then had to connect the rest of the citizenry into your game and your disruptive technology here because you have actually connected the vehicle to every other vehicle now. My first question is, who is going to bear the cost of these transponders on every motorcycle, every pushbike rider and every pedestrian? Who is going to bear that cost? Is that going to be provided by the vendor of the artificial intelligence vehicle?

Mr ADAM CROUCH: But would you not think that the cost savings we have seen already from autonomous vehicles is running into the hundreds of millions of dollars by accidents being prevented? So the preventative nature of the technology itself reduces the accidents. Motorbike insurance, for instance, could be coming down because they would not be getting hit by cars so often. So the premiums that motorbike riders are

paying because it is a dangerous exercise, there are so many ways in which those costs could be recouped by safety and lack of accidents, reduction in potential accidents.

Mr STANFORD: I understand the upside. We are changing the entire road environment. I wonder whether we might be better off with public transport.

Mr ADAM CROUCH: Adaptive cruise control, collision sensors and so on already save in excess of $170 million annually. That is basic, straightforward safety technology.

Mr STANFORD: We have seen this. Most of us have cars with anti-lock braking systems, and we are aware that electronic stability control works. It worked for me on one occasion. It makes some funny noises, but it seems to do its job. There is a great appreciation of those things. The question is whether this will remain the push by the artificial intelligence [AI] vendors. Will it be a cost that is projected onto the community? They are selling this stuff and they will make a profit out of it. Our question is whether the ordinary person will be required to pay for it.

Most people in my street have cars that are 10 years old. If AI arrives, there will be the haves and have-nots; some people will be able to afford it and some will not. Some people keep their cars for a long time. When most cars reach four years old they transfer to a second owner and certain systems start to break down. The windscreen on the BMW is not replaced with a $1,600 version but with a Windscreens O'Brien windscreen costing $600 that does not have a rain sensor. That causes the computer to go funny, the automatic wipers do not work, and it keeps blowing up little warnings every now and again. Someone is then hired to shut down that part of the computer so it does not do that anymore. There was another problem with the run-flat tyres and the associated warning. The computer measures the difference in the diameter of the tyre, but a different tyre was used. These problems will increase down the track. The performance standards for the software in these cars and how it will be maintained as time goes by should be the responsibility of the car vendor and the owner; it should not be a cost to the rest of the community. It is not your responsibility to buy me a new $1,600 BMW windscreen.

Mr ADAM CROUCH: It is interesting that you say that. They have already said that they take responsibility for the technology. They have said it is their responsibility as a vendor. They are open about that. You refer to it as disruptive technology. The disruptive part is the human behaviour, not the technology. We have talked about airline travel. We have seen dramatic increases in airline safety because of the introduction of technology. Taking out the human reaction component made aviation safer. That has been proven. It is said that with adaptive technology in cars the most dangerous people on the road could be the motorcyclists and cyclists because they react in a human way, which is unpredictable. As you said, we are talking about letting people in. The reason our roads get clogged is that people are polite rather than follow the rules. We see that on the Central Coast all the time. We have traffic problems because people allow merging when the rules state that they should not.

Mr STANFORD: Do you think that this is a problem resulting from the increasing individualisation of society? Instead of behaving as a member of a community, people are behaving individually.

Mr ADAM CROUCH: That could be the issue. We are making the situation worse by being polite rather than following the rules. It is a grey area.

Mr STANFORD: It is a big policy area, and members will have to work it out. We are trying our best to give you our view.

Mr ADAM CROUCH: It is completely different from Volvo's view.

Mr STANFORD: The disruption will be of what is now a reasonably collaborative and cooperative process on the roads. We may see some negative social effects as a result of this. We need to be careful with the introduction of the technology. I repeat that we believe initial road trials should be on controlled areas to develop the evidence to go to the next step. Do not let them loose in the wild at this stage.

The CHAIR: I do not dismiss in any way the problems associated with a mixed fleet. The Committee has been probing that in the course of this inquiry. However, I envisage a situation where a lot of the newly developed technology will be included in the future production of motorcycles and potentially bicycles to some degree. That is bound to happen in the future.

Mr NICK LALICH: You note that the legislation should ensure that manufacturers are fully aware of their responsibility to protect vulnerable road users, and that automated vehicle suppliers should treat them as if they were a driver as a natural person. Can you explain and expand on that?

Mr WOOD: I think we have already said that vehicle manufacturers are taking responsibility. They should take full responsibility, and not only when they believe they are at fault. It will be a David and Goliath situation when someone has been injured and they believe it was not their fault, but they will be fighting a car manufacturer with all of its resources. In many cases they probably cannot prove who was at fault because there is no record. There is the vulnerable road user's word, but the car manufacturer might say that its vehicle operated normally. How do you determine who was at fault?

Mr STANFORD: Our big concern relates to the projection of risk onto the community by a large corporation. It might say that it will take responsibility for all of this and that all our worries will go away if we just sign on the dotted line. How enforceable will that be? Is it really just a bit of public relations spin, or is it real? If it is to be real then it must be covered by Australian Competition and Consumer Commission legislation, not road authority legislation. It also needs to have a national basis. If these goods are fit for purpose on the road, that must be able to be determined in the same way that it is determined for a motorcycle helmet. If there is a standard that a helmet must meet, it is up to the Australian Competition and Consumer Commission and its substantiation clauses to be able to say to the manufacturer that it must prove that it meets those requirements. At this stage, I do not think we have seen this in the real world. Until we have, we need to be very cautious with this process.

Mr NICK LALICH: You would be in favour of testing in certain instances where it is mandated on the M5 during certain hours?

Mr STANFORD: You would want to keep it in zones and time restricted areas, and probably mix it up to see how the traffic behaves with and without them under the same circumstances. If you do not start there and let them go everywhere they want, there will be mayhem. You will not be able to sort A from B.

Mr NICK LALICH: From what we have heard, it would have to be a fixed area for the initial testing period.

Mr STANFORD: Yes.

Mr NICK LALICH: I do not think anyone here would suggest that we should let them go anywhere.

Mr WOOD: The Volvo representative drove from Camden.

Mr NICK LALICH: We have not set any areas in which it can happen. He was probably 90 per cent in control of the vehicle.

Mr STANFORD: I assume that he would have been driving as the nominated driver under the road rules as they are now. Surely he would have been in charge of the vehicle as required by our road rules. Any shift away from that responsibility angle and giving exemptions from liability to private companies needs to be managed extremely carefully. Going down that path would be treading on a piece of very thin ice. I am deeply concerned that that has been done, and I would like to see the Roads and Maritime Services response. If it is saying that it will give indemnity to companies that want to run this stuff on our roads, that is not the kind of exemption it would give to ordinary users. It is a privilege. We need to manage that very carefully because ultimately it is about responsibility. We have a big body of long-established law assigning responsibility, and stating what is negligence, what is a criminal act, and what is a bit careless. Of course, a lot of it deals with the consequences. If the consequence of using AI is low then it might be assessed as reasonably low risk. Where is that scene? Where is the evidence? We do not have that. Rather, we have a lot of speculation.

Mr NICK LALICH: This Committee did an investigation into motorcycle safety.

Mr STANFORD: Yes.

Mr NICK LALICH: I am probably the same vintage as you. We had motorcycles back in the 1960s and we lowered our cars and bored out our engines before the manufacturers started making hot cars. It was pointless to do it yourself when that happened because they could do it 100 times better. I had mates who were hurt and killed in car and motorcycle accidents. In my opinion there is no way that you can make a motorbike safe on its own. You can ask a driver of a car to pay more attention and we can put sensors on bikes but that is getting away from personal responsibility.

Mr STANFORD: We have all learned either the hard way or the intelligent way that it is about personal responsibility. In the way the law is enforced it is fairly ingrained into us that it is the person who is charge of that vehicle who has to take full responsibility. You cannot rely on anybody else but you can try to encourage others to assist you in maintaining your own safety. There is a bit of a line set with some riders who say, "If you had a crash then it must have been your fault because you did not see it coming. Your ability to read ahead was inadequate." I guess that is one of things driving the idea of wanting to have that autonomous vehicle

highly illuminated, and preferably they would all look identical. If you had that situation then you would know something was ahead that is going to create a disturbance of traffic and an unpredictable circumstance. You can then manage your risk because a good rider is a good risk manager. I do not accept the view that we are in any way trying to offload our responsibility in looking after ourselves; we are looking for an equivalent from the other players in the game—whether it be other drivers, pedestrians or a piece of automatic intelligence.

Mr NICK LALICH: We need to look after each other and that may mean motorbike riders will be required to have sensors on their bikes for the receivers in these cars to pick them up. But I believe the technology will be so sensitive that you will not have to put anything on your bikes because these vehicles will be able to pick up even birds and animals walking across the road.

Mr STANFORD: I think it is agreed that the technology front is moving at a rate that is quite breathtaking. Some of the stuff is great—for example, every time you get a new phone it is fabulous. That is just a simple thing, but it can also get to the stage where it gets intrusive. The question then comes as to what point does everybody have to be geared up and with electronic eyes so that everybody knows exactly where we are all the time. That then turns into another problem such as a privacy issue or a question of civil liberty because you are proposing that we are all made integers in a much larger computer. This is a social problem that goes beyond the issue of the safety of these vehicles, which is another consideration. That is why we are putting our hand up and saying we would resist taking the risk from the vendor of the artificial intelligence machine. We think it is their responsibility to work out how to manage this stuff. They need to play on our terms, not reconfigure our society to play on their terms. I think that form of disruption is just too great for this society. That is a different view.

The CHAIR: Unfortunately, we must bring this to a close. The focus of this Committee, as you well appreciate, is road safety. We thank you for your submission and for your appearance before the Committee this afternoon. If we have any further questions we will send them to you.

Mr STANFORD: Thank you.

(The witnesses withdrew)

(The Committee adjourned at 2.53 p.m.)