SUPPLEMENTARY QUESTIONS – INQUIRY INTO DRIVERLESS VEHICLES AND ROAD SAFETY

SUBMISSION 11 – DR GARY ELLEM, UNIVERSITY OF NEWCASTLE

Potential Road Safety Benefits

1. Your submission refers to a paper published under the auspices of the United States Studies Centre at the University of Sydney, which examines the likely impact of transformative technologies on western society over the next few years. The paper predicts that, with proactive regulation, it is not unreasonable to expect that during the 2020s, developed countries could mandate a date by which all vehicles must be autonomous in order to be registered.

   - What do you think is the most realistic implementation strategy to be adopted in NSW to transition to a safer fleet of vehicles based on autonomous vehicle technology:
     - setting target compliance dates at strategic points within a strategic plan? OR
     - allowing for natural diffusion according to the life expectancy of existing vehicles within the transport system?

Response

My view is that the most realistic implementation strategy is somewhere between these two strategies. The technology is developing very quickly but still has a little way to go in terms enough manufacturers having access to capable and reliable systems. My feeling is that it is likely that new passenger vehicles could be mandated as having full autonomy by the end of the 2020's, but mandated full autonomy for the whole national vehicle fleet is unlikely – especially for hobbyist, trade, construction and primary producer vehicles that are often used off road and carry equipment and loads that may block sensors. There is no suggestion that the national motorcycle fleet will become autonomous any time soon.

Assuming the technology is good enough, two things are likely to bring forward the proportion of journeys conducted in driverless vehicles:

1. *The transition of the everyday transport task from privately owned passenger cars to a driverless taxi/hire car/minibus fleet. This requires vastly fewer vehicles to do the same transport task and therefore requires a much smaller proportion of the vehicle fleet to be autonomous to have the majority of journeys in autonomous mode. There are also considerable financial incentives for transport service operators to proactively uptake autonomous vehicles in order to minimise the cost of labour, insurance and vehicle down time.*

   In my view it is realistic to think that the majority of passenger journeys in urban and suburban areas may be conducted in this mode by the mid 2020's with proactive government support for regulatory reform. This would bring a range of additional strategic benefits including a better balance of trade, reduced congestion and a reduced requirement for road infrastructure spending.
2. *As autonomous point to point transport as a service alternatives become more available, accessible and trusted by the public, the tolerance of the public for a range of factors including the waste and public nuisance of private motor vehicles, human caused motor-vehicle accidents and dangerous driving is likely to substantially reduce. The public may be therefore more accepting of increasing regulation that make it more difficult for owners of*

driven motor vehicles. This may include dramatic increases in the cost and skill requirements for driver's licences, reduced public access to on street parking, reduced access to parts of the road network and specialist registration for non-autonomous vehicles. These changes could restrict human driven vehicles to specialty commercial use and vehicle enthusiasts such as motorcyclists and hobbyist car club members. There are augments here that mirror the restriction of firearm ownership on public safety grounds to those with an approved use case along with strict usage and storage criterion.

Testing

2. In your submission you say that some jurisdictions have given State-wide range to trials up to Level 3 automation whereas others have focussed on Level 4 on-road tests in restricted areas. You express the view that regulators should be able to take a hybrid approach i.e. certifying individual OEM systems for operation at a particular level in identified zones.

   - Can you elaborate on what taking a hybrid approach to certification would involve in practical terms?

Response
The way to think about this is that developing an autonomous vehicle is really about creating and training an Artificial Intelligence (AI) system. You can think of this as each of the different competing technology companies training their own driver. Each of these AI drivers is at a different state of skill and their training has been focussed on different driving aspects e.g. highway driving vs slow speed pedestrian area driving. It therefore doesn't make sense to treat all AI drivers as being equal.
What I have called the hybrid approach, is really a mechanism to open up the use of individual AI driver systems to their demonstrated level of capability.
In practical terms this means developing four main processes:

1. *A responsive application process for AI driver developers to have their technology assessed. This application would need to include the designed use case, required operating conditions and operating environment. Ideally this process would interact for a national process for those wanting approval for a national scale operating environment.*
2. *A 3rd party verification process for AI driver capability claims – including the readiness of the system to operate for the designed purpose, operating conditions and in the proposed operating environment. This could be conducted by government or approved 3rd party assessor and is likely to include a combination of computer simulation and real world testing.*
3. *A regulation mechanism to approve and review the use of the AI driver system for operation in a recognised operating environment. This regulation mechanism would need to distinguish between test and ongoing operations and include appropriate negligence safeguards and insurances.*
4. *A regulation and reporting mechanism for performance verification, along with the mandatory recording and retention of sensor logs and data for incident reporting.*

Preparedness of the NSW Government

3. According to the NSW Government submission, the new Smart Innovation Centre will enable Transport for NSW to partner with industry to conduct research into the safety of connected automated vehicles (CAVs) as well as the wider transport issues.

   - What, in your view, should be the priorities of the Smart Innovation Centre with regard to local research into connected automated vehicles? And who should be involved?

Response
In my view the research priorities for the Smart Innovation Centre should be those connected to the state interest. In my analysis this means a strategic focus in two areas:

1. *Use of automated vehicles to dramatically reduce the number of passenger vehicles per head of population. This means a focus on developing, testing and regulating for an integrated, point to point transport service consisting of driverless taxi and dynamically routed minibus services with active transport and a mass transit backbone of ferries, rail and bus rapid transit. A commitment to open data from mass transit operators is a key component for the success of integrated multimodal systems.*
   Ideally the Smart Innovation Centre could attract interest from international technology developers interested in the driverless taxi/minibus platform such as Google, Uber, Telsa, WEPods, Navya, Ezymile and IBM/Local motors to focus on NSW as their test location of choice for right hand drive countries.
2. *Freight logistics, including increasing the safety and fuel efficiency of heavy road transport and innovative small vehicle platforms for home package delivery. This means a testing and regulating for autonomous and conditionally autonomous trucks and well as developing a streamlined process that encourages the development testing and trialling of small non-ADR approved road based delivery vehicles.*

Those involved should be:

- *Government regulators (Federal, state and local)*
- *Transport service providers*
- *Communications infrastructure providers*
- *Data services providers*
- *Driverless vehicle developers*
- *Engineering safety certification organisations*
- *Transport infrastructure designers, builders and operators*
- *Research organisations*
- *Vehicle designers/manufacturers*
- *Transport insurers*
- *Transport users*

4. You have observed that there will need to be close collaboration between industry and government for testing and certification of driverless vehicles as well as associated infrastructure and for legislating vehicle operation.

   - What, in your experience, is the most effective model for government/industry collaboration, particularly, with regard to reviewing and developing safety standards and regulations and certifying the connected and automated vehicles against those standards?

Response

The Civil Aviation Safety Authority (CASA) is a good exemplar model for government/industry collaboration. CASA is at the forefront globally in regulating for unmanned and autonomous systems and has an excellent experience and track record in the engineered safety of complex systems.

There are a number of international autonomous aircraft developers testing in Australia due to CASA's proactive approach to industry engagement.

They administer systems that are based on type certification for specific operating conditions and use 3rd party verification as part of their standard operating procedures. They administer excellent accident investigation and safety reporting systems.