6 February 2017

For the better

Committee Secretary
Standing Committee on Industry, Innovation, Science and Resources
PO Box 6021
Parliament House
Canberra ACT 2600

Dear Committee Secretary

RAC's response to the Inquiry into the social issues relating to land-based driverless vehicles in Australia

We thank the *Standing Committee on Industry, Innovation, Science and Resources* for the opportunity to provide this submission to the *Inquiry into the social issues relating to land-based driverless vehicles in Australia* (Inquiry).

RAC represents the interests of more than 900,000 Western Australians and is the leading advocate on the mobility issues and challenges facing Western Australia (WA). RAC works collaboratively with all levels of Government to ensure Western Australians have access to safe, easier and more sustainable mobility options.

RAC aligns its activities with the following three themes:

- **Safe** – We want to reduce the number of road deaths and serious injuries.
- **Accessible** – We want to reduce the cost of congestion and keep the cost of transport down.
- **Sustainable** – We want to reduce the impact of CO_2 emissions from private cars.

Autonomous vehicle (AV) technology is rapidly advancing, with vehicles becoming increasingly automated and requiring less driver intervention. Research suggests that AVs could deliver many benefits, including improved mobility and independence for many, and reduced crash risk and severity by removing human error for instance. Conversely, increasing automation does also raise many potential considerations that will need to be explored, including potential issues such as system failures, cyber security, and liability in the event of crashes.

While there are still many unknowns about what a future with AVs will look like, these vehicles will no doubt have considerable implications for our transport networks, towns and cities, and will change the way we move around.

It is evident from RAC's own research that public opinion is mixed in WA, but that the community is receptive and the discussion is already shifting towards *when* and *how* fully automated vehicles will be introduced rather than *if* they will. A well-defined roadmap for how we plan and manage the challenges of regulating AV technology has never been more important to ensure the safe transition of AVs onto roads and maximise their contribution as part of an integrated transport system.

We welcome this Inquiry, which is timely and will be crucial in ensuring the social issues are appropriately considered in planning for a sustainable future with connected and autonomous vehicles.

About RAC's Intellibus™: Australia's first Automated Vehicle Trial

Aligned with RAC's mobility agenda, RAC, with the support of WA State Government and the City of South Perth, launched Australia's first Automated Vehicle Trial on 31 August 2016 (RAC's Intellibus™ Trial).

In this purposeful trial, RAC is seeking to understand how AVs operate and consider their likely impacts on WA. The Trial's three aims are to:

1. increase the understanding about the potential impacts and opportunities from the advent of AV technology;
2. give Western Australians the chance to see AV technology and use and experience it; and
3. further help WA prepare a roadmap for changes to support and safely transition to AV technology.

The Trial involves three stages, with each stage designed to test and evaluate AV technology in a variety of settings, involving increasing levels of complexity, then, interactions with road users:

- Stage 1: Closed testing undertaken at RAC's Driver and Training Education Centre near Perth Airport;
- Stage 2: Closed stage undertaken on public roads outside of peak periods, without the Intellibus™ carrying passengers; and
- Stage 3: Open stage on public roads with the opportunity for the public to register and potentially ride on the Intellibus™.

In one of the first public trials globally, Navya's Arma (RAC lntellibus™) takes passengers along a 3.5 kilometre route along South Perth Foreshore, between the Scented Gardens at the western side of Sir James Mitchell Park and the Old Mill.

To date, 1,548[1] people have participated in the Trial and have ridden on RAC's lntellibus™. In total, more than 5,700 people have registered to take part so far.

[1] As at 16 January 2017.

Feedback on the Inquiry's Terms of Reference

Our submission has been structured around the following items of the Committee's Terms of Reference:

- General social acceptance levels;
- Passenger and non-passenger safety;
- Access and equity issues;
- Potential public transport applications; and
- Other considerations.

General social acceptance levels

Currently, AVs are the topic of news headlines, often on a daily basis, and as more information becomes available people are beginning to make up their own minds about how the technology could impact their lifestyles in the not so distant future.

To understand what Western Australians know, think and feel about AVs, RAC commissioned Painted Dog Research in March 2016 to undertake a baseline community awareness and perceptions survey prior to the launch of RAC's Intellibus™ Trial. The online survey was completed by 955 respondents (637 of which were RAC members and 318 non-members) from across WA (78 per cent from the Perth metropolitan area and 22 per cent from regional areas). Age, gender and location sampling quotas were applied and data was weighted to be representative of the WA population.

The survey[2] found that almost two thirds of Western Australians (64 per cent) had heard of AVs – when prompted with a definition, awareness increased to almost 90 per cent. Males, older generations (Generation X – born from 1965 to 1979, Baby Boomers – 1946 to 1964 and Builders – 1925 to 1945) and those residing in metropolitan Perth were amongst the sub-groups with the highest levels of awareness.

Despite AVs being in the early stages of development, almost half of Western Australians felt positively towards them (28 per cent of which felt extremely positive). Crash history[3], attitudes towards driving, and driving frequency did not have any impact on these attitudes. However, given the newness of the technology it is not that surprising that 30 per cent of Western Australians had negative feelings towards AVs.

When prompted, the benefits most Western Australians agreed would occur if all vehicles were fully autonomous were enhanced freedom and independence for the young, ageing and people with mobility difficulties, and more productive and efficient use of travel time. Males, those who drive vehicles with Level 1 and 2 automation and those with an awareness of AV were significantly more likely to have a higher level of agreement with all prompted benefits. In terms of concerns relating to the operation of AVs on WA's roads, when prompted, not being able to manually override the vehicle was the top concern, followed by cyber security issues and responsibility in the event of a crash.

More detailed analysis considering the relationship between attitudes towards AVs and opinions about the likelihood of prompted benefits occurring revealed that fewer crashes and

[2] RAC (2016), "*Autonomous vehicle survey*".
[3] Not having been involved in a crash, either as a driver or a passenger, in the past five years.

enhanced freedom were the two anticipated benefits which had the greatest influence on positive feelings. This is followed by reduced crash severity and less traffic congestion.

When it comes to receptiveness to use an AV, Western Australians were equally concerned about being an occupant in an AV as they were with being in another vehicle interacting with an AV. Nevertheless, one in two felt they would be very or extremely likely to use an AV which is privately owned (with 30 per cent being extremely likely to). Interestingly, those with no crash history were significantly less likely to want to do so than those with a crash history (28 per cent compared to 22 per cent). Those who considered themselves to be first to try new things and purchase the latest gadgets were significantly more likely to be willing to use an AV.

Unprompted, four in five Western Australians stated that they believed fully autonomous vehicles will be commercially available between 2020 and 2030 (the timeframe within which most manufacturers are claiming their vehicles will be released into the market[4]).

The findings from the survey therefore clearly show that feelings about AVs and the benefits that could be delivered are mixed and there is a reasonable level of acceptance that these vehicles will be available to use and buy in the very near future.

RAC's Intellibus™ Trial is now providing Western Australians with the opportunity to see and experience AV technology and such public trials are crucial in raising awareness and public acceptance of AVs.

Of the 1,548 people who have taken part in the Trial, RAC has received an excellent response to the post-ride survey. In response to the question, "Having experienced the Intellibus, how do you feel about driverless vehicles?" some answers have included:

> *"When a car pulled unexpectedly in front of us and we stopped – I experienced a thunderflash (sic) of understanding that if all vehicles were driverless and guided by computer technology that incident would never have happened."*
>
> *"Learning more about how driverless technology works has helped to ease some of the concerns that I've had about it."*

RAC continues to survey participants following their Intellibus™ experience and a second wave of the RAC Automated Vehicle Survey was conducted in late 2016 to gauge changes in awareness and attitudes with the Trial now underway. RAC will release results in the near future.

Passenger and non-passenger safety

Road injury is one of the largest causes of hospitalisation and death for Australians under 45 years of age, and serious road injuries accounted for $27 billion per year or 18 per cent of Australia's total health expenditure[5]. In Western Australia, too many people continue to die or be seriously injured on our roads, with 161 people dying on our roads in 2015 and 193 in 2016.

Autonomous travel has existed for almost a century, for example in the form of autopilot systems on planes, and recent developments by vehicle manufacturers indicate Level 3 and

[4] Main Roads Western Australia (2015), "Automated Vehicles: Are we ready?".
[5] University of New South Wales, (2015), "Inquiry into aspects of road safety in Australia", Senate Standing Committees on Rural and Regional Affairs and Transport References Committee Inquiry, Submission 50

may be even Level 4 automation vehicles will be in production and available for purchase in a matter of a few years.

Vehicles today already have levels one and two autonomy, particularly in the active and passive safety systems, for example electronic stability control, radar cruise control, lane keeping systems, and automatic emergency braking (AEB). The Australasian New Car Assessment Program (ANCAP) is an independent vehicle safety advocate which crash tests and rates new vehicles and from 2018, any new vehicle that wants to achieve a five-star ANCAP safety rating must be fitted with AEB. This could potentially reduce rear-end crashes, which make up about 38 per cent of vehicle crashes[6].

AVs use a number of sensors combined with localisation technology to constantly monitor a full 360-degree view of their environment. Autonomous and connected vehicles (both Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I)) could eliminate not only blind spots and unforeseen obstacles, but significantly reduce the probability of crashes by eliminating human error. Human error accounts for almost 90 per cent of crashes, with speeding, drink and drug driving and inattention being the three biggest killers on our roads. By automating the driving task, the possibility of a crash-free road environment is more likely than ever. For AV technology to really make an impact on road safety, there needs to be a greater understanding about the potential benefits of the technology in vehicle design and standards.

RAC's Autonomous Vehicle Survey highlighted that safety was a major consideration, with the views of Western Australians being divided as to whether we will be safer with or without AVs. While many stated they believe there will be road safety benefits (with fewer crashes and reduced crash severity rating third and fourth in the list of prompted benefits), many also had safety concerns about the technology and "trusting computers" (these included issues such as fear of not being in control / able to manually override the vehicle and the possibility of computer glitches causing crashes).

There are understandable concerns about network malfunction or vulnerability to hacking which remains an issue for governments, businesses, and individuals alike. The security of customer data, software enabling the autonomy of the vehicle, and the network coordinating the AVs themselves would need to be secured and the information stored correctly. Data collection is increasingly more common, and individuals should have certain assurances around private and personal information.

Access and equity issues

Mobility for many means having the freedom to easily travel from one place to another. While the private car is, and will continue to be, important to facilitate personal mobility for many, Western Australians should be able to access a range of viable and affordable options including public transport, cycling, walking, taxis and other forms of on-demand transport. Ensuring adequate access to a range of transport options is widely recognised as being crucial to supporting liveable and sustainable communities. Inequitable access to transport options can lead to social isolation, negatively impacting the health, wellbeing and quality of life of those in disadvantaged groups.

[6] Australasian New Car Assessment Program, (2015), "Study confirms effectiveness of Autonomous Emergency Braking", <https://www.ancap.com.au/media-and-gallery/releases/study-confirms-effectiveness-of-autonomous-emergency-braking>

The availability of transport options becomes increasingly important in maintaining independence for those who can no longer drive, choose not to drive, or for whom driving is not an option (such as the elderly, young people and those with disabilities). With an ageing population, and the changing attitudes towards car ownership and usage being seen amongst younger generations for example, the need for improved and equitable access to transport services will only intensify.

The Australian Institute of Health and Welfare reports that 18 per cent of Australians (over four million people) currently have a disability, with around six per cent (or 1.4 million) experiencing severe or profound disability[7]. While many people with a disability can still drive, for many others this is not an option or they require special equipment to enable them to do so.

RAC's Ageing and Driving Survey[8] highlights the perceived importance placed on driving in helping those aged 65 and over to stay mobile and connected to their communities. Of the 1,200 respondents, 95 per cent of those residing in metropolitan Perth and 98 per cent in regional WA felt the ability to drive was very or extremely important. Similarly, losing that ability was viewed as likely to be a major problem for 79 per cent of metropolitan and 82 per cent of regional respondents. Unsurprisingly, these views are influenced by perceptions of alternatives to driving, such as the quality and / or availability of public transport services and taxis (almost half of regional respondents and 21 per cent of metropolitan respondents rated bus services as poor or very poor).

The introduction of AVs could present a significant opportunity to address equity issues within the current transport system by providing improved mobility options for such groups. In fact, a majority of Western Australians (71 per cent) believe enhanced freedom and independence for the young, ageing and those with mobility difficulties is the most likely benefit which will occur from AVs. However, the increased convenience of single occupancy car travel must be balanced against the need to maintain the future viability of public transport services. It will be essential to ensure AVs complement, rather than compete with public transport to maximise the benefits of improved access and equity, and this will require action from all levels of Government. This is discussed further under '*Potential public transport applications*'.

Another key consideration from an equity perspective is the potential impacts on the cost of personal mobility. Transport affordability continues to be a concern for Western Australian households, with the overall cost of running an average medium sized car such as a Toyota Camry Atara being $191.22 per week in 2016[9] based on RAC's Vehicle Running Costs survey and public transport fare increases exceeding the rate of inflation. Likewise, the cost and lack of affordability was a serious barrier to greater taxi usage in WA, with nearly one in two respondents to RAC's Taxi User Survey[10] considering taxis to be expensive and around 80 per cent saying they would use taxis more if the fares were lower.

Keeping the cost of transport down is a key priority for RAC and AVs could have an important role to play. Some 55 per cent of Western Australians are extremely concerned about the cost of purchasing and / or fixing an AV (this was the fourth highest concern as captured by RAC's

[7] Australian Institute of Health and Welfare (2016), "Australian Disability Statistics", http://www.aihw.gov.au/disability/.
[8] RAC (2015), "*Ageing and driving survey*".
[9] Takes into account depreciation, licensing, vehicle registration, insurance, fuel and servicing costs, as well as the abolition of the private vehicle concession. It excludes the additional cost associated with the recent introduction of no-fault Compulsory Third Party (CTP) insurance.
[10] RAC (2014), "*Taxi user survey*".

Autonomous Vehicle Survey). However, they are likely to become cheaper over time and encouraging a focus on Mobility-as-a-Service (MaaS) solutions will be important in helping to ensure affordable access to AVs as a service, reducing the costs of owning and running a vehicle. This will allow those with lower incomes to share in the benefit of increased mobility options.

Potential public transport applications

Good cities need to have efficient, reliable and affordable public transport and this will continue to be the case into the future.

In October 2014, RAC commissioned a comprehensive study to explore car and public transport accessibility, with a focus on Perth's strategic, secondary and specialised activity centres[11]. The analyses[12] show a number of Perth's activity centres currently exhibit low levels of accessibility by public transport, highlighting the challenge faced in ensuring multi-modal access to employment opportunities for Western Australians living in the Perth Metropolitan and Peel regions.

The provision and operation of public transport services is not always cost-effective to enhance accessibility in some areas. This can often be true for our regional cities, towns and communities where there is often the greatest disparity between the need for, and availability of, transport options. RAC's Regional Transport Survey[13] of over 300 RAC members residing in the cities of Albany, Bunbury and Geraldton found 21 per cent of respondents were moderately or extremely dissatisfied with public transport services and a further 44 per cent were unable to comment because they do not, or have never used them due to issues such as poor network coverage and low service frequencies. When it comes to the longer-term outlook for the movement of people in their city however, over half of respondents (55 per cent) wanted to see the greatest priority being placed on public transport over the next 10 years. AVs may provide a viable solution to enhance accessibility in areas where patronage is not sufficient to justify public transport services. Under these circumstances AVs could be used to reduce operational costs and provide increased flexibility compared to traditional bus services with fixed routes and timetables.

Depending on how the adoption of AVs is regulated and managed, they could either complement or compete with traditional public transport. The latter is likely to result from a focus on private AVs (i.e. a vehicle owned by an individual), rather than fostering public or shared, demand-responsive services to supplement public transport (or MaaS solutions). Recent research published by the International Transport Forum (ITF)[14] demonstrates the potential for ride sharing and car sharing self-driving fleets, coupled with high capacity public transport, to reduce the number of vehicles on the road.

There is already some community appetite for, and receptiveness towards, MaaS solutions in WA, as is evident from the increasing popularity of ride sharing services. Over recent years, RAC has also been exploring the role of car sharing in helping to offset mobility and cost of living pressures, and its potential to work in Perth. As part of this work, an RAC survey of 800

[11] As identified in Directions 2031 and Beyond, which is the spatial framework and strategic plan that guides planning and delivery of housing, infrastructure and services to accommodate growth in the region.
[12] RAC (2016), "*Transport accessibility of Perth's Activity Centres".*
[13] RAC (2014), "*Regional Transport Survey*".
[14] International Transport Forum (2015), "Urban Mobility System Upgrade, How shared and self-driving cars could change city traffic".

respondents highlighted that the concept of car sharing is appealing to many people residing in inner Perth areas[15]. Almost half found it appealing, and one in four said they would actually use a car sharing service if one was available in their area, despite the concept being new to most.

When it comes to AVs being used for MaaS solutions, Western Australians showed lower initial receptiveness to this than private AVs. One in two respondents to RAC's Automated Vehicle Survey said they felt they would be very or extremely likely to travel in an AV which is privately owned compared to one in three for an AV which is public service / share with other travellers.

The role of AVs as a service, complementing public transport in areas and over distances which are too short to travel by car but too far to walk – 'the first or last mile' – was a key consideration in the design of RAC's Intellibus™ Trial. The intent was not to replace existing services or routes but rather to explore how new technology might be utilised to increase travel options. Feedback received from those who have experienced RAC's Intellibus™ to date supports its use for such a service in WA, with 98 per cent of respondents to the post-ride survey[16] stating they believe a vehicle like the Intellibus™ could be used for this purpose in the future.

Other considerations

There are a number of interrelated issues from a transport and land use perspective, aligned to RAC's mobility agenda, which are considered to be of relevance to the Inquiry.

Congestion: Our economy and the quality of life Western Australians enjoy are inextricably linked to the performance of our transport system. Infrastructure Australia estimates that road congestion will cost WA more than $16 billion a year by 2031, and Perth will have seven of the 10 most congested roads in Australia (including the top four) by that time[17]. Congestion is not only harming the State's productivity but it is also has social costs by negatively impacting the health and wellbeing of commuters and their families.

A number of studies have been undertaken exploring the potential impacts of AVs on key measures of road network performance (i.e. delays, journey times and reliability) under a range of possible scenarios. Generally speaking, research suggests that with increasing automation and uptake of the connected and autonomous vehicles (CAVs) performance against such measures is anticipated to improve, particularly for congested networks. A recent study commissioned by the UK Department for Transport suggests the scale of improvement in reliability could be between 30 per cent and 80 per cent with a 25 per cent penetration of CAVs[18]. Furthermore, the ITF's research suggests ride sharing and car sharing self-driving fleets, coupled with high capacity public transport, could make up to nine in ten conventional cars in mid-sized cities superfluous under in certain circumstances[19]. However, it also predicts vehicle kilometres travelled (VKT) would increase due to transfers from buses, pick-ups, drop–offs and re-positioning of vehicles.

When it comes to the community's thoughts on this issue, from RAC's Automated Vehicle Survey, just over half (52 per cent) of Western Australians agreed the adoption of AVs would

[15] RAC (2015), "*Exploring the role of car sharing in Perth*".
[16] The RAC's post-ride survey is ongoing and results from this survey are preliminary.
[17] Infrastructure Australia (2015), "Australian Infrastructure Audit".
[18] Atkins (2016), "Research on the impacts of Connected and Autonomous Vehicles (CAVs) on Traffic Flow", Department for Transport.
[19] International Transport Forum (2015), "Urban Mobility System Upgrade, How shared and self-driving cars could change city traffic".

result in improved travel time reliability (although this ranked fifth of ten prompted benefits) and 43 per cent agreed there would be less traffic congestion (ranked eighth).

Road infrastructure: Roads are currently designed for human drivers. Increasing levels of automation will result in more predictable behaviours and reduced risk of human error (discussed earlier under '*Passenger and non-passenger safety*'). This will mean that features of the road environment such as wide lanes, traffic control devices (road signs, traffic signals, traffic calming, etc.) and other safety features (audible edge lines and rumble strips, etc.) may no longer be required. In addition, with the potential for AVs to improve network performance, traffic capacity is expected to increase exponentially without the need to build new road infrastructure[20].

Road authorities will therefore need to integrate the necessary technology within the road infrastructure to enable AVs to operate safely (for vehicles to operate in full autonomy, a flawless communication network is needed for example) but also to consider the implications of AVs as part of an integrated transport system when planning future road infrastructure requirements.

The WA State Government is already leading with its support of RAC's Intellibus™ Trial in South Perth and its recently announced truck platooning trial. However, much of the longer-term planning for road infrastructure requirements is informed by transport models which do not take account of the implications of AVs on travel demand and behaviours. This situation is unlikely to be unique to WA, and further research is needed to better understand these implications. Initiatives such as the iMOVE Collaborative Research Centre (CRC) could help to further this understanding.

In early 2016, RAC joined with a range of national organisations, research institutions and Government departments to be part of the iMOVE CRC bid to the Commonwealth Government. Subject to Commonwealth funding (a decision about which is expected in early 2017), the iMOVE CRC would seek to take advantage of emerging technologies to aid the development of more efficient, intelligent and data driven transport systems and ensure a connected and competitive Australia. Such initiatives will be of vital importance in increasing the evidence-base and driving innovation and diversification within various industry sectors. This will help create and harness economic opportunities and position Australia as a global player in intelligent mobility.

The timely development and implementation of technology solutions will be crucial in ensuring WA and other Australian States are well positioned to capitalise on, and realise the benefits of, the advancements in vehicle autonomy. This will require leadership from the Australian Government in relation to funding and coordinating the national framework needed to support its successful implementation. This includes inter-operability standards of both vehicles and infrastructure and building effective relationships across all levels of government, vehicle manufacturers, technology and information suppliers, road user representatives, and a host of other stakeholder groups.

Based on RAC's Automated Vehicle Survey, three in five Western Australians think the Government should be investing to ensure roads are ready for AVs by 2025 and just over half (52 per cent) believe vehicle manufacturers and industry should be leading the way. Only one in five have confidence that the Government can be ready in this timeframe.

[20] KPMG (2012), "Self-driving cars: The next revolution".

In 2015, the UK Government allocated £100 million specifically for development of AVs and associated infrastructure, which was in addition to £19 million already allocated towards self-driving vehicle testing. As part of its Federal Priorities for Western Australia, since 2015, RAC has been calling on the Australian Government to commit $300 million towards the deployment of Intelligent Transport Systems in WA, which would include facilitating trials of AV technology and deployment of Managed Freeway schemes[21].

Parking: The aforementioned ITF study demonstrated significant potential for reducing both on-street and off-street parking supply in cities with the adoption of AVs. The research suggests that, under all scenarios tested, with increased levels of ride sharing and car sharing self-driving fleets could completely remove the need for on-street parking and reduce off-street parking by up to 80 per cent. By facilitating such decreases in demand for traditional parking, AVs could unlock opportunities for reallocation of road space for other modes (such as for the provision of cycling infrastructure), and allow land to be redeveloped for other purposes (such as residential or commercial uses) within the Central Business District (CBD), major activity centres and train station precincts.

This could support improved integration of land use and transport, assisting local governments to meet urban infill targets and improve employment self-sufficiency and self-containment within their jurisdictions. However, with the reduction in overall parking supply there would be an associated decline in revenue generated from parking charges applied to public and private parking. In cities such as Perth where funds collected through mechanisms such as the Perth Parking Levy and local government parking charges are hypothecated for transport, this will reduce the capacity of governments to invest in initiatives to promote active and more sustainable modes of transport (such as Perth's Free Transit Zone and Central Area Transit services).

It is apparent from RAC's Automated Vehicle Survey that Western Australians are uncertain about the likelihood of AVs reducing the need for public parking in towns and cities, with the proportion strongly disagreeing being comparable with the proportion strongly agreeing (26 per cent versus 24 per cent). However, this may be the result of respondents seeing more importance or personal relevance in issues such as safety and improved mobility options.

Nevertheless, Governments will need to be proactive in responding to this issue by reviewing the implications for parking supply, modifying land use zoning and ensuring parking policies are an effective mechanism to encourage MaaS solutions.

Urban sprawl: Historically, residential development to accommodate Perth's growing population has typically occurred on previously undeveloped 'greenfield' sites in the outer suburbs and on the fringes of the metropolitan area. This pattern of urban expansion, combined with the fact that employment opportunities are largely concentrated in the Perth CBD, has resulted in Western Australians travelling long distances between their homes and workplaces. In fact, over one third (35 per cent) of residents in Perth travel between 10 and 20 kilometres, and a further 30 per cent travel in excess of 20 kilometres to work / study[22].

[21] RAC (2015), "*Federal Priorities for Western Australia*".

[22] Australian Bureau of Statistics (2011), "Environmental Issues: Waste Management and Transport Use". Cat. No. 4602 0 55 002 Canberra ATC.

Western Australians believe that the ability to use their travel time more effectively / productively doing other activities is the second most likely benefit that would occur from AVs, with 60 per cent saying they agree (43 per cent of which strongly agree). This, combined with the increased convenience and flexibility of car travel, and improved travel times, could make it easier for people to live further from main employment centres and encourage continued urban sprawl. Therefore, appropriate land use policy responses will be required to reduce the potential for urban sprawl and associated poor urban outcomes. While this will largely be a local government responsibility, the Federal and State Government will have a role in providing strategic direction in planning for a sustainable future with AVs.

Conclusion

AVs have the potential to deliver significant benefits in terms of road safety and enhanced mobility but equally there is the possibility that vehicle trips and kilometres travelled could increase. Public trials of the technology, such as RAC's Intellibus™ Trial, will not only be crucial in advancing understanding of the implications of AVs, but also in increasing community acceptance.

Government, at all levels, will have a leading role in shaping the future with AVs. A well-considered roadmap will be essential to facilitate the safe transition of AVs onto our roads, and maximise the benefits through ensuring they form part of an integrated transport system. To achieve this, investment in Intelligent Transport Systems will be crucial to ensure that AV technology can be integrated with new and existing infrastructure, and a key focus should be on understanding MaaS solutions to complement public transport as a viable mass transit option.

We trust the information provided in this submission will inform the Inquiry and we thank the Committee for the opportunity to contribute to the national discussion around the social issues of driverless vehicles. In support of our submission we enclose the RAC Automated Vehicle Survey; it, along with other RAC publications, can be also be downloaded from RAC's website (https://rac.com.au/about-rac/advocating-change/reports).

Should you require further information about this submission please do not hesitate to contact Anne Still, General Manager Public Policy, on [redacted].

Yours sincerely,

[redacted]

Patrick Walker
EXECUTIVE GENERAL MANAGER
ADVOCACY AND MEMBERS

Autonomous vehicle survey

2016

Autonomous vehicles (also known as driverless or self-driving vehicles) are no longer the stuff of science-fiction. Autonomous vehicle (AV) technology is rapidly advancing and is the biggest disruption to transport and mobility since the invention of motor cars themselves. Understanding the community's attitudes and perceptions about their operation on Western Australia's (WA's) roads will be crucial in preparing for a future with AVs.

Many vehicles already have built-in AV technology and these features are becoming increasingly common. From automatic emergency braking, radar cruise control and lane-keeping, vehicles are becoming more automated, requiring less driver intervention.

Research suggests AVs will deliver many benefits, including improved mobility and independence for many, reduced traffic congestion and reduced crash risk and severity by removing human error for instance. Increasing automation does, however, also raise a number of considerations which will need to be explored, including potential issues such as systems failures, hacking, liability in the event of a crash, etc. Likewise, until such a time when all vehicles on our roads are fully autonomous, drivers and other road users will also need to learn how to safely interact with these vehicles.

While there are still many unknowns about what a future with AVs will look like, these vehicles will no doubt have considerable implications for our transport networks, towns and cities and will change the way we move around.

To understand what Western Australians know, think and feel about AVs, RAC commissioned Painted Dog Research in March 2016 to undertake a community awareness and perceptions survey. The online survey was completed by 955 respondents (637 of which were RAC members and 318 non-members) from across WA (78 per cent from the Perth metropolitan area and 22 per cent from regional areas). Age, gender and location sampling quotas were applied and data has been weighted to be representative of the WA population, as well as RAC's membership composition. The margin of error at the total WA population level is +/-3.17 per cent.

In an Australian-first, RAC with support from the Western Australian State Government is trialling a fully driverless, fully electric shuttle bus under RAC's plan to test AV technology. The purpose of the trial is to:

> consider the potential implications and opportunities of automated vehicle technology;

> give Western Australians the chance to see this technology, and to potentially use and experience it; and

> help WA develop a roadmap of changes that will need to occur for automated vehicles to safely transition on to our roads.

We anticipate this first step will lead to further trials, research and collaboration, which will increase WA's understanding of how AVs can be integrated into our transport system and how the technology will affect the way people move around our State.

RAC
For the better

Awareness of autonomous vehicles

The survey has revealed that awareness of the concept of AVs is high and a reasonable proportion of the community is familiar with some of the technology used by these vehicles.

Almost two thirds of Western Australians (64 per cent) have heard of AVs, with males, older generations (Generation X – born from 1965 to 1979, Baby Boomers – 1946 to 1964 and Builders – 1925 to 1945) and those residing in metropolitan Perth being amongst the most aware sub-groups. In describing AVs, 58 per cent referred to them as being driverless or self-driving and 30 per cent specifically mentioned they use technology (e.g. software, sensors, GPS) to drive themselves.

Fully autonomous vehicles (also known as driverless or self-driving vehicles) are vehicles that do not need any human intervention to operate, so basically, they can drive themselves. They can detect their surroundings using advanced control systems that interpret sensory information to identify appropriate navigation paths, avoid obstacles and obey signage and traffic signals. Autonomous features in vehicles still currently require human control.

Once prompted with a definition, awareness increased to 88 per cent. Around half of Western Australians are also aware they currently drive vehicles which have some level of automation (Level 1 or 2), while half believe they drive vehicles with no automation (Level 0).

Males and those classed as Generation X are significantly more likely to currently drive a car with Level 1 or 2 automation, compared to their counterparts.

Levels of vehicle automation (based on the US National Traffic Safety Administration's levels):

- Level 0: No automation. You as the driver are in complete and sole control of your vehicle but your vehicle may still have warning systems such as forward collision warning, reverse sensor warning and blind spot monitoring.
- Level 1: Function-specific Automation. You have overall control of your vehicle, and are responsible for safe operation, but you can hand over limited control to the vehicle (e.g. electronic stability control) or your vehicle can provide you with enhanced control (dynamic brake support in emergencies).
- Level 2: Combined Function Automation. You are responsible for monitoring the roadway and safe operation but your vehicle shares some control, for example, adaptive cruise control, lane centering and parking assistance systems. The vehicle has at least two primary control functions.
- Level 3: Limited self-driving automation. You, as the driver, are no longer required to monitor the roadway and are only required to be present and able to override the system and take control in some circumstances, as the vehicle can perform all safety critical driving functions under certain conditions. The Google Car is an example of Level 3 automation.
- Level 4: Full Self-Driving Automation. The vehicle can perform all safety critical driving functions. Under this level of automation, vehicles will be able to drive themselves around without any occupants. The RAC Intellibus is an example of Level 4 automation.

Figure 1 » Awareness of the concept of AVs (unprompted)

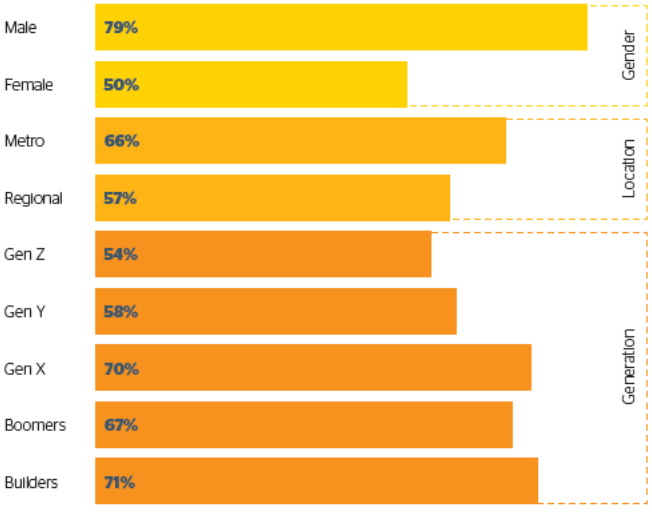
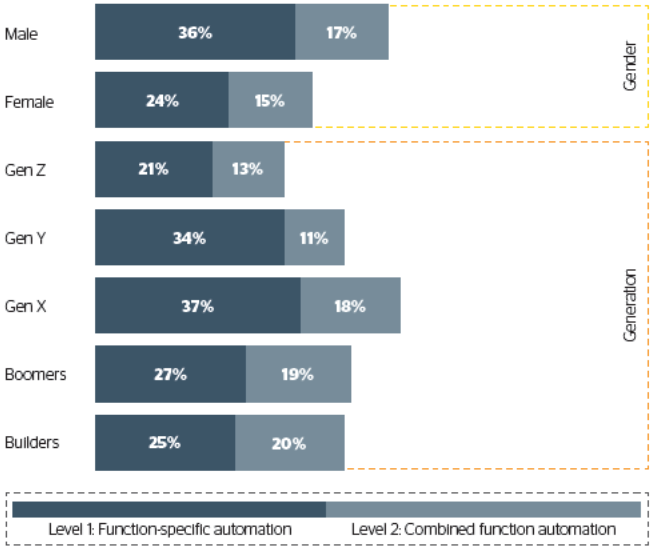


Figure 2 » Awareness of driving vehicles with Level 1 or 2 automation



Attitudes towards autonomous vehicles

Attitudes towards AVs are currently very mixed and safety is a major consideration, with Western Australians being uncertain whether we will be safer with or without them. Many believe there will be road safety benefits from AVs but a similar proportion have concerns about "trusting computers".

Despite AVs being in the early stages of development, just under half of Western Australian's feel positive towards them, with 28 per cent being extremely so. However, 30 per cent have negative feelings towards them. Crash history[1], attitudes towards driving and driving frequency do not have any impact on these attitudes.

Unprompted, safety, freedom and increased flexibility are the most frequently mentioned things that are welcomed most about the prospect of vehicles which are fully autonomous. Safety is however also the biggest unprompted concern, with 81 per cent of those who said they have a concern citing something safety related (not being in control / trusting technology and the possibility of computer breakdowns / malfunctions causing crashes are the main ones). This is followed by 19 per cent stating something related to missing driving, such as the risk of losing skills / becoming complacent and that driving gives them pleasure.

As shown in Figure 3, when prompted, the benefits most Western Australians agree would occur if all vehicles were fully autonomous are enhanced freedom and independence for the young, ageing and people with mobility difficulties (71 per cent agreeing this would occur), and more productive and efficient use of travel time (60 per cent). Reduced number and severity of crashes also features highly. More detailed analysis considering the relationship between attitudes towards AVs and opinions about the likelihood of these benefits occurring revealed fewer crashes and enhanced freedom are the two benefits which have the most impact on positive feelings. This is followed by reduced crash severity and lower traffic congestion.

Males, those who drive vehicles with Level 1 and 2 automation and those with an awareness of AVs are significantly more likely to have higher levels of agreement with all prompted benefits.

Western Australians are equally concerned about being an occupant in an AV as they are with being in another vehicle interacting with an AV. When it comes to concerns about increasing levels of automation, two in five have concerns about vehicles with Level 3 automation and half are concerned about vehicles with Level 4 automation. Females and older generations (particularly Builders) are the most concerned.

As shown in Figure 4, when prompted, not being able to manually override the vehicle is the top concern relating to fully autonomous vehicles (Level 4) operating on WA's roads, with 79 per cent being concerned about this (67 per cent extremely so). Cyber security issues and who is responsible in the event of a crash are also in the top three concerns. More detailed analysis identified the prospect of not being able to drive themselves, AVs not driving as well as humans and interacting with AVs while still driving non-automated cars as being the most influential prompted concerns impacting on negative feelings about AVs.

Figure 3 » Likelihood of anticipated benefits occurring with Level 4 AVs (prompted)

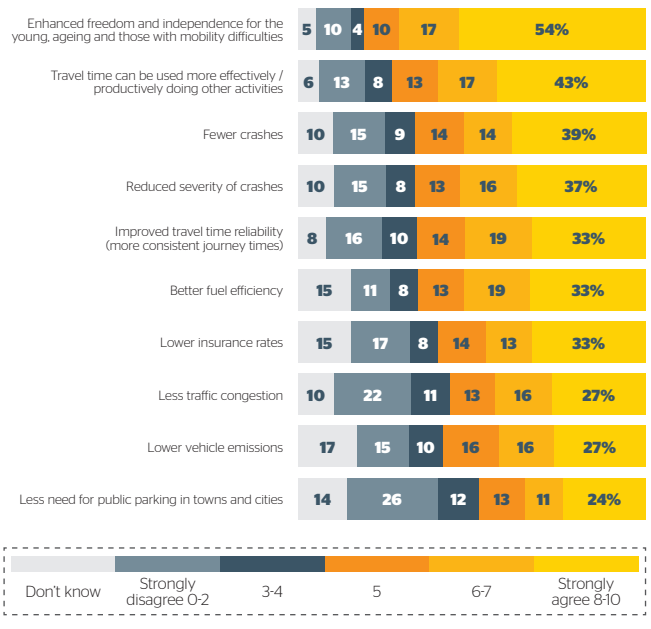
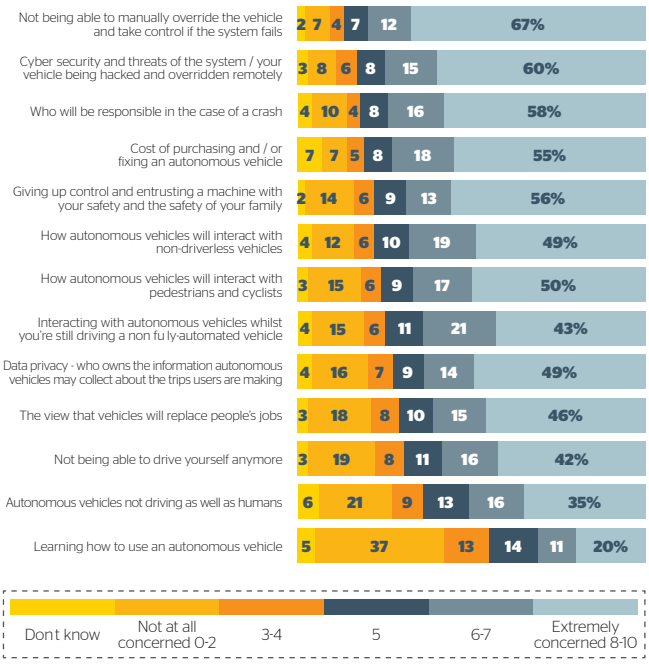


Figure 4 » Concerns about Level 4 AVs (prompted)



Respondents were asked how many crashes they had been involved in over the past five years, as a driver and a passenger.

Future of autonomous vehicles in WA

There is clear interest from Western Australians in travelling in private AVs once commercially available, but uncertainty over whether the Government will be ready in time for when these vehicles operate on WA roads.

Currently, one in two Western Australians feel they would be very or extremely likely to travel in an AV which is privately owned (with 30 per cent being extremely likely to). Those with no crash history[2] are significantly less likely to travel in a private AV than those with a crash history (28 per cent compared to 22 per cent).

There is less of a willingness to travel in an AV which is public / shared with other travellers or an on-demand service. However, this could be as much to do with feelings towards these types of transport services as it is about the use of AVs for such services. Those who consider themselves to be first to try new things and purchase the latest gadgets are significantly more likely to be willing to travel in an AV.

Unprompted, four of out five Western Australians believe fully automated vehicles will be commercially available sometime between 2020 and 2030, which is the timeframe within which most manufacturers are claiming their vehicles will be released into the market[3].

Those classed as Generation Z (born from 1995 to 2000[4]) and Generation X were the nearest, with average estimates of 2025 and 2039 for these sub-groups. When prompted with a conservative mid-point year of 2025, 52 per cent are not surprised at how soon or how far away the vehicles are expected to be commercially available.

Three in five think the Government of Western Australia should be investing to ensure roads are ready for AVs by 2025 and just over half (52 per cent) believe vehicle manufacturers and industry should be leading the way. Only one in five have confidence that the Government will be ready in this timeframe.

Figure 5 » Likelihood of use

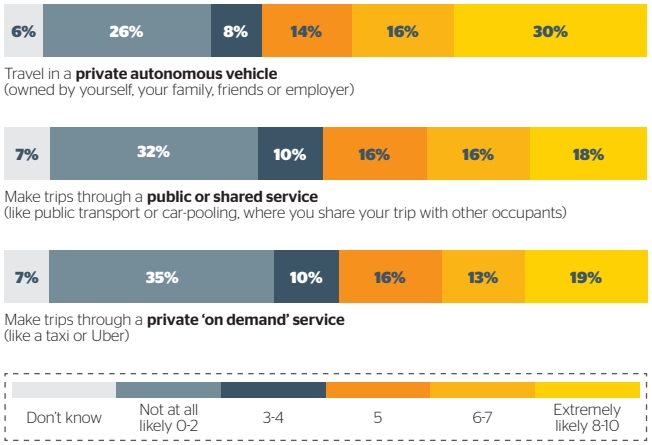


Figure 6 » Estimated timeframe for AVs to become commercially available

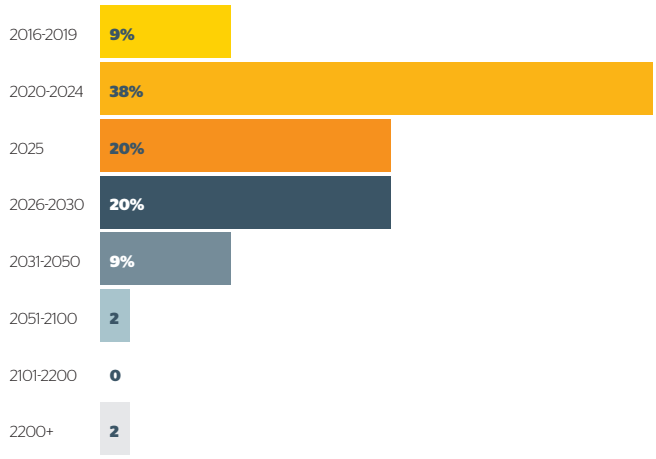
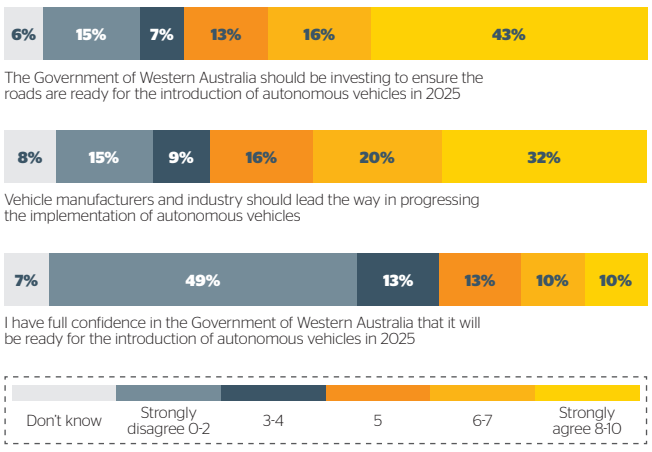


Figure 7 » Readiness for AVs



[2]Not having been involved in a crash, either as a driver or a passenger, in the past five years.
[3]Main Roads Western Australia, 2015. Automated Vehicles: Are we ready?
[4]While Gen Z includes those born from 1995 to 2009, all survey respondents were 16 years of age and older (so, born before 2000).