

5 December 2018

Chair
House of Representatives Standing Committee on Infrastructure, Transport and Cities
PO Box 6021
Parliament House
CANBERRA ACT 2600

Dear Chair

National Transport Commission's submission to the inquiry into automated mass transit

The NTC is pleased to provide a submission to the inquiry on automated mass transit.

This submission provides information about the NTC's role in developing regulation for automated vehicles. It also outlines the progress that Australia has made in ensuring that there is an appropriate regulatory framework in place for the commercial deployment of automated vehicles.

I welcome the opportunity to discuss our findings and views further and meet with the Committee.

Yours sincerely

Dr Geoff Allan
Acting Chief Executive Officer

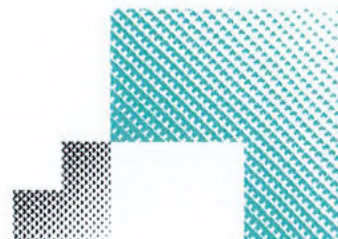
National Transport Commission
Level 3, 600 Bourke Street
Melbourne VIC 3000

 (03) 9236 5000

 enquiries@ntc.gov.au

 ntc.gov.au

ABN 67 890 861 578



Submission to the House of Representatives Infrastructure, Transport and Cities Committee inquiry into automated mass transit

December 2018

Report outline

Title	Submission to the House of Representatives Infrastructure, Transport and Cities Committee inquiry into automated mass transit
Purpose	For submission
Abstract	A submission outlining the work of the NTC, it's understanding of automated vehicles development and the roles and responsibilities in the development of automated vehicle regulation
Key words	Automated vehicles, end-to-end regulation, national reform,
Contact	National Transport Commission Level 3/600 Bourke Street Melbourne VIC 3000 Ph: (03) 9236 5000 Email: enquiries@ntc.gov.au www.ntc.gov.au

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1 Introduction

1.1 The purpose of this submission

The National Transport Commission (NTC) welcomes the opportunity to provide a submission to the House of Representatives Infrastructure, Transport and Cities Committee's (the Committee) inquiry into automated mass transit.

The purpose of this submission is to assist the Committee with its automated mass transit inquiry by providing information about the NTC's role in developing regulation for automated vehicles. It also outlines the progress that Australia has made in ensuring that there is an end-to-end regulatory framework in place for the commercial deployment of automated vehicles.

This submission focuses on automated vehicles for uses including road mass transit and point-to-point transport. The NTC has a comprehensive national reform program for automated vehicles. Transport and Infrastructure ministers have agreed to a goal of having end-to-end regulation to support the safe, commercial deployment and operation of automated vehicles at all levels of automation.

1.1.1 Scope of this submission

The NTC does not intend to comment in detail on the subject of new energy sources for vehicles because regulatory reforms on this topic are not part of the NTC's current reform program.¹ As with automated vehicles, any approaches to new energy sources for vehicles should aim to ensure national consistency and international alignment, while allowing for a range of potential future technologies. The adoption of alternative energy sources for vehicles in Australia involves a range of policy considerations for state, territory and Commonwealth governments. The NTC notes that states and territories are considering potential infrastructure requirements for low or zero emissions vehicles.² The NTC also draws the attention of the Committee to the newly established Commonwealth Office of Future Transport Technologies and notes its potential role in coordinating or leading policy work on low emission vehicles.

The NTC does not intend to comment in detail on rail mass transit. As part of our initial work on barriers to automated vehicles in 2016, the NTC examined the impact of automated rail, but found that "There are no regulatory barriers to automated rail (including light rail) in Australia, and the NTC project will not be considering automated rail further."³

1.2 About the NTC

The NTC is established under the *National Transport Commission Act 2003* (Cth). In accordance with that Act and the Intergovernmental Agreement for Regulatory and Operational Reform in Road, Rail and Intermodal Transport developed under that Act, the NTC has ongoing responsibility to develop uniform or nationally consistent regulatory and operational reforms for road, rail and intermodal transport.

¹ The NTC's work program is endorsed by Transport and Infrastructure Ministers. We publish an annual information paper on Carbon Dioxide Emissions Intensity for New Australian Light Vehicles which includes emission figures on electric vehicles. See <https://www.ntc.gov.au/roads/environment/light-vehicle-emissions/>.

² See for example Infrastructure Victoria's Advice on automated and zero emissions vehicle infrastructure available at <http://www.infrastructurevictoria.com.au/sites/default/files/files/AVZEV/Advice%20on%20automated%20and%20zero%20emissions%20vehicles%20-%20October%202018.PDF>

³ See [https://www.ntc.gov.au/Media/Reports/\(32685218-7895-0E7C-ECF6-551177684E27\).pdf](https://www.ntc.gov.au/Media/Reports/(32685218-7895-0E7C-ECF6-551177684E27).pdf)

The NTC is charged with improving productivity, safety, environmental outcomes and regulatory efficiency across Australia’s road, rail and intermodal transport systems with an aim to achieve national transport reform. As an independent statutory body, the NTC develops and submits reform recommendations for approval to the Transport and Infrastructure Council, which comprises federal, state and territory transport, infrastructure and planning ministers.

More Information about the NTC can be viewed online at:
<https://www.ntc.gov.au/about-ntc/who-we-are-what-we-do/>

1.3 Levels of automation

Vehicles may operate at different levels of automation, with different expectations for a human driver. This has implications for policy, safety, regulation and infrastructure. The NTC use the levels of automation set out in Society of Automotive Engineers (SAE) International Standard J3016, *Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles*. These SAE levels are currently being used to develop legislative and regulatory responses to automated vehicles in the United States and the European Union. A simplified version of these levels of automation is set out in the below diagram.

Levels of vehicle automation						
	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Vehicle's role	Nothing	Accelerates and brakes OR steers e.g. cruise control	Accelerates and brakes AND steers e.g. automated reverse parking	Everything, only under certain conditions e.g. specific locations, speed, weather, time of day	Everything, only under certain conditions e.g. specific locations, speed, weather, time of day	Everything
Human driver's role	Everything	Everything but with some assistance	Remains in control, monitors and reacts to the driving environment	Must be capable of regaining control on request when vehicle is driving	Nothing when vehicle is driving, but everything at other times	Nothing

1.4 The NTC’s automated vehicle reform program

The NTC has a comprehensive reform program, which aims to have a nationally consistent regulatory framework in place to support the safe, commercial deployment and operation of automated vehicles. The reform program will help ensure Australians gain the potential opportunities and benefits of automated vehicles. National consistency will provide certainty and reduce costs to industry and government. It will help ensure Australians have early and safe access to automated vehicles. The reform program is intended to provide a regulatory framework that is sufficiently flexible to support a variety of potential applications and business models. This would encompass a safety assurance approach for ensuring that automated vehicles used for mass transit and point-to-point are safe at first supply and in-service.

The NTC's reform program has four key streams of work aimed at achieving this goal. These will identify and address potential gaps and barriers in Australia's regulatory system to the safe introduction of automated vehicles:

1. Driving responsibility—ensuring that there is a legal entity accountable for the automated vehicle when the automated driving system (ADS) is performing the driving task and clarifying the relevant responsibilities of various entities
2. Assuring the safety of the vehicle —ensuring that automated vehicles can operate safely on Australian roads from first supply to end of life and corporate responsibilities are appropriately allocated to the automated driving system entity.
3. Insurance—ensuring that someone injured in an accident with an automated vehicle is not disadvantaged compared to someone in an accident with a conventional vehicle who is covered by compulsory third party (CTP) insurance
4. Government access to data—ensuring that privacy and surveillance protections around government access to data are appropriate for the new and increased types of data generated by automated vehicles.

1.5 The NTC's progress in developing policy and regulation for automated vehicles

The NTC develops its recommendations for transport and infrastructure ministers through research, industry and government engagement and public consultation. Consultation documents, submissions to consultations, and policy papers with recommendations for ministers are publicly available on the NTC website.⁴ The NTC undertakes extensive public consultations to engage with a wide variety of stakeholders including state and territory governments, local governments, police, academics, legal firms and legal industry peak bodies, motoring clubs, insurers, manufacturers and industry. A list of our most recently published papers is at Appendix C of this report.

As of December 2018, key milestones in the program include:

- In May 2017, transport ministers endorsed the NTC *National Guidelines for Automated Vehicle Trials* (a joint publication with Austroads). All state and territory governments are using these guidelines for the testing of automated vehicles.
- In November 2017, ministers endorsed NTC *National Enforcement Guidelines for Automated Vehicles*, providing greater certainty to industry and consumers on the application of current Road Rules.
- In May 2018, ministers agreed to recommendations on *Changing driving laws to support automated vehicles*. Transport ministers agreed to the remove barriers to automated vehicles in Australia through the development of a purpose-built national law. The national law will allow an automated driving system to drive and ensure there is always a legal entity responsible when a system in an automated vehicle, rather than a human, is driving. The NTC's work on changing driving laws was shortlisted for the ITS Australia National Awards 2018.
- In November 2018, ministers endorsed the safety assurance approach for the first supply of automated vehicles. This approach uses the existing certification framework for vehicles introduced into the Australian market. It includes mandatory self-certification by the company bringing the technology to market (the Automated Driving System Entity or "ADSE") and a clear set of performance-based safety criteria against which companies

⁴ <https://www.ntc.gov.au/publications/>

must provide evidence. The NTC published a *Safety assurance for automated driving systems: decision regulation impact statement* (Decision RIS) outlining the key risks that need to be addressed to ensure the safe commercial deployment of automated vehicles in Australia.

In addition, the NTC has recently published the following papers for public consultation:

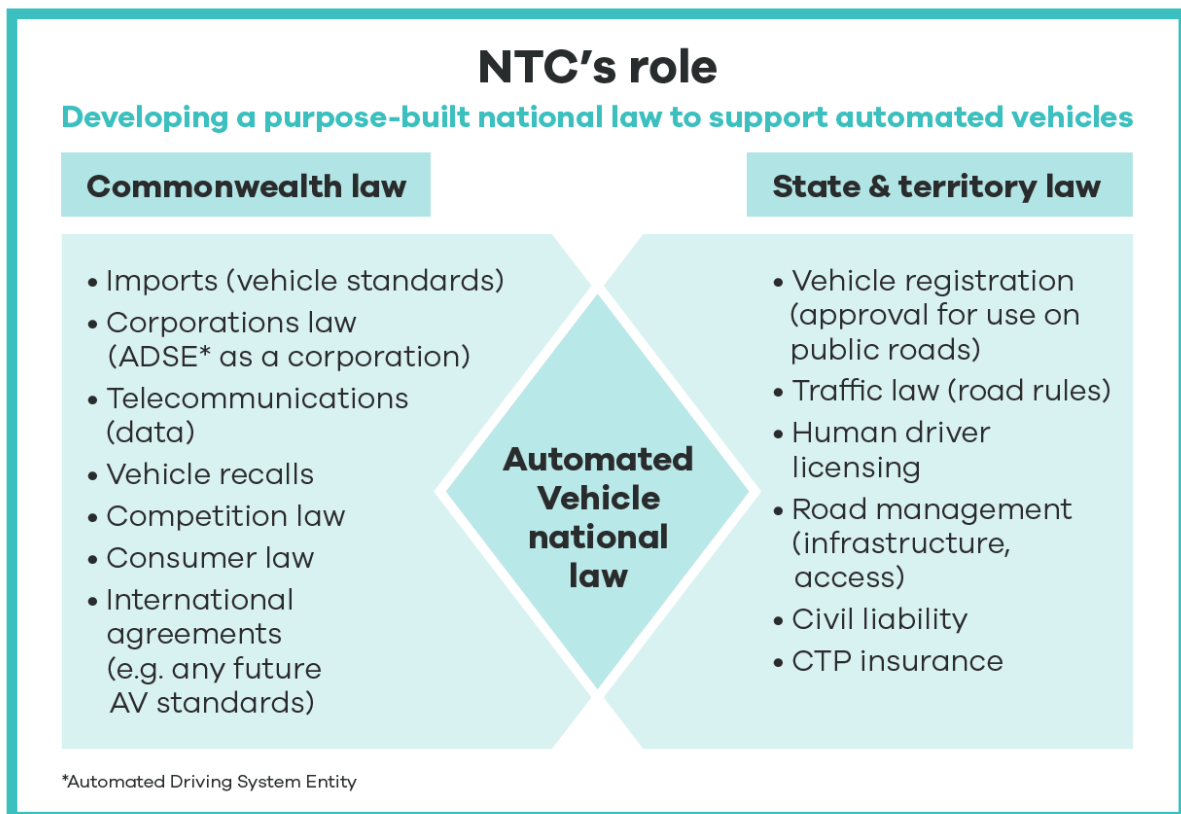
- A discussion paper on privacy challenges associated with government access to information generated by automated vehicles (September 2018). The paper focuses on the new privacy challenges of these technologies and whether additional privacy protections are needed to protect users' data. The NTC's aim is to balance road safety and network efficiency outcomes and efficient enforcement of traffic laws with sufficient privacy protections for Cooperative Intelligent Transport Systems (C-ITS) and automated vehicle users. The consultation period has recently closed and the NTC is reviewing submissions.
- A discussion paper examining whether there is a need to change existing legislation around motor accident injury insurance schemes (October 2018). The paper identifies barriers to accessing compensation under existing Motor Accident Injury Insurance schemes and seeks views on whether such schemes or other insurance options should provide cover for injuries caused by an automated system. The consultation period for this reform closes on 12 December 2018.

1.6 Next steps for the NTC in developing regulation for the safe deployment of automated vehicles

In November 2018, transport ministers agreed that the NTC would lead further work to determine appropriate safety obligations once vehicles are on the road. The NTC will work closely with stakeholders to ensure that any new safety obligations in an automated vehicle national law interact appropriately with existing legislation. This will be the next steps for the NTC in developing the purpose-built national law agreed to by transport Ministers in May 2018.

The new purpose-built national law needs to work with existing legislation that regulates vehicles and drivers. Figure 1 outlines some of these interactions. In addition to the types of interactions outlined below in Figure 1, a new national law will also need to work with point-to-point legislation and other passenger transport legislation, which is found in state and territory law.

Figure 1. National law for automated vehicles



More Information about our Automated Vehicles program can be viewed online at:
<https://www.ntc.gov.au/roads/technology/automated-vehicles-in-australia/>

2 The NTC’s understanding of automated vehicles development

Key points

Vehicle manufacturers have announced that Level 3 and 4 vehicles are expected to become commercially available in international markets between 2019 and 2021.

Some analysts predict that shared vehicle ownership, including point-to-point transport using automated vehicles will become more common and replace private ownership.

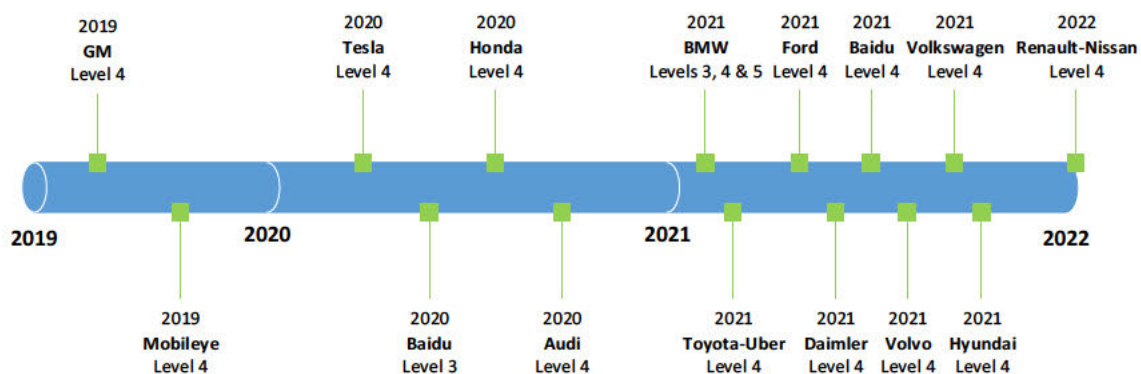
The NTC regularly engages with stakeholders and undertakes research on automated vehicles. Below is an overview of our understanding of potential uptake rates of automated vehicles.

2.1 Automated vehicle uptake including point-to-point transport usage

Our understanding is that major vehicle manufacturers and technology companies expect initial ADS models (SAE level 3 or above) to be commercially available to overseas markets between 2019 and 2021. It is not known when ADS models will be made available in the Australian market. There is even less certainty about when ADS will become a mainstream product offering, or even a standard feature in new vehicle models.

Figure 2 shows a timeline of predicted international release dates of ADS models as announced by the respective manufacturers.

Figure 2. Timeline of manufacturers predicted release of automated vehicles



Traditional automobile makers such as General Motors expect to have vehicles capable of operating at high levels of automation in 2019 in big cities (CNBC, 2018). Volvo has announced it aims to have ‘fully autonomous’ vehicles commercially available in 2021 (Volvo, 2017). BMW has also announced it aims to deploy a vehicle capable of operating at high levels of automation in 2021 (The Verge, 2018). As shown above in Figure 2, most traditional automobile makers are aiming to commercialise vehicles equipped with high automation by 2021; however, there is a large degree of uncertainty in these timelines.

It is unclear how many people will use automated vehicles. It is also unclear if private vehicle ownership will be common for automated vehicles as is the case with conventional vehicles.

Some analysts predict that shared vehicle ownership (including point-to-point transport using automated vehicles) will become more common and replace private ownership which could reduce the costs of travel by up to 78 per cent on a per mile basis (based on US modelling) (Accenture Digital, 2014, p. 4). Many companies have indicated that they would deploy vehicles as part of a shared fleet rather than selling vehicles to individuals.

The NTC analysed potential take up rates for automated vehicles in Australia as part of our *Safety Assurance for automated driving systems: decision regulation impact statement* (Decision RIS) (attached to this submission).

One of the aspects that we analysed was predicted Australian passenger vehicles and all vehicle fleet (excluding motor cycles) estimates for 2020 and 2030.⁵ This analysis applies the forecasted US uptake rates to the Australian context showing maximum and minimum market penetration numbers. It shows Australian passenger vehicle estimates for 2020 and 2030⁶. The results suggest there could be a minimum of 2,625,378 and a maximum of 7,485,877 passenger vehicles with level 3 or 4 automation in the Australian fleet by 2030.

Figure 3. Forecasted Australian market penetration of automated vehicles with level 3 or level 4 automation

	2020		2030	
	Minimum	Maximum	Minimum	Maximum
Predicted passenger vehicle fleet size	14,923,322		17,739,043	
Predicted all vehicle fleet (excluding motorcycles)	19,007,822		22,594,204	
Level 3 – passenger vehicles	283,543	522,316	798,257	1,490,080
Level 3 – all vehicle types (excluding motorcycles)	361,149	665,274	1,016,739	1,897,913
Level 4 – passenger vehicles	298,466	820,783	1,827,121	5,995,797
Level 4 – all vehicle types (excluding motorcycles)	380,156	1,045,430	2,327,203	7,636,841
Combined levels 3 and 4 – passenger vehicles	582,009	1,343,099	2,625,378	7,485,877
Combined levels 3 and 4 – all vehicle types (excluding motor cycles)	741,305	1,710,704	3,343,942	9,534,754

On face value, these estimates appear optimistic in terms of the penetration rates and/or timing. However, as there is no specific research of automated vehicle uptake or penetration in the Australian market, the NTC has assumed that automated vehicle uptake in Australia could occur along similar projections to those presented in the international research. The NTC recognises there may be a slight delay as some manufacturers may choose to initially focus their product offerings in the larger markets such as the US, Europe and China. The

⁵ Vehicle population estimated use Australian Bureau of Statistics 2017 vehicle population estimates and a 2 per cent per annum growth rate.

⁶ Vehicle population estimated use Australian Bureau of Statistics 2017 vehicle population estimates and a 2 per cent per annum growth rate.

NTC emphasises that the projections and estimates are only theoretical baselines to assess impacts against.

3 Roles and responsibilities in the development of automated vehicle regulation

Key points

The NTC automated vehicle program operates in parallel with Commonwealth, state and territory government and Austroads projects to support the deployment of automated vehicles. The NTC works collaboratively to ensure the related projects are co-ordinated and to support sharing of knowledge, risks and issues.

While the NTC leads the regulatory reform for automated vehicles, the Commonwealth government is responsible for leading and coordinating Australian Government work to prepare Australia for emerging transport technology.

3.1 Government roles in automated vehicle reform

The regulation of vehicles and drivers today involves multiple levels of government. The federal government regulates the first supply (or market entry) of vehicles; states and territories manage obligations whilst the vehicle is in-service, including vehicle maintenance and registration, driver licensing and driver obligations. The Australian Road Rules are a national model law; the NTC manages the reform process and states and territories then implement changes in their own legislation.

Austroads is the peak organisation of Australasian road transport and traffic agencies. It plays a crucial role in planning and supporting the operational needs for the introduction and use of future vehicle technologies as part of its Connected and Automated Vehicles (CAV) program.⁷

The NTC leads the regulatory reform process for automated road vehicles in Australia. We work closely with state, territory and federal agencies along with Austroads to ensure a national approach. We note the recent Austroads report *Implications of traffic sign recognition systems for road operators*⁸ which indicates a potential need for greater consistency in road traffic signage to support more automated systems. The Austroads report *Future data requirements for automated vehicles*⁹ should also be considered in assessing digital infrastructure requirements.

Each state and territory Government is collaborating with the NTC on the development of regulatory reform for automated vehicle including legislation to allow for automated vehicle reform. The newly established Office of Future Transport Technologies (the Office) within the Commonwealth Department of Infrastructure and Regional Development and Cities is responsible for leading and coordinating Australian Government work to prepare Australia for emerging transport technology including AVs. In addition to first supply of vehicles the office is leading policy development within the Infrastructure, Transport, Regional Development and Cities portfolios on automated vehicles on C-ITS. The Office also plays an

⁷ See: <https://austroads.com.au/drivers-and-vehicles/connected-and-automated-vehicles>

⁸ The report may be accessed at: <https://www.onlinepublications.austroads.com.au/items/AP-R580-18>

⁹ The report may be accessed at: <http://www.austroads.com.au/news-events/item/561-future-data-requirements-for-automated-vehicles>

important role in a cross-portfolio issues including cyber security, critical infrastructure resilience, consumer and competition issues and future workforce and skills needs.

3.2 International engagement

The Transport and Infrastructure Council has noted the ‘importance of not getting ahead of international developments’ (Transport and Infrastructure Council, 2018a). Different jurisdictions are at different stages of developing safety assurance systems for automated vehicles.

The NTC is monitoring international regulatory development by the UN Global Forum for Road Traffic Safety (WP.1) and the UN World Forum for the harmonization of vehicle regulations (WP.29).

The Commonwealth Department of Infrastructure, Regional Development and Cities participates in the development of United Nations vehicle standards through the UN World Forum for the harmonization of vehicle regulations (WP.29).

3.3 The role for the Commonwealth in assuring automated vehicle safety at first supply

As described at 1.5, in November 2018 transport ministers endorsed the safety assurance approach proposed by the NTC in the Decision RIS. It uses the existing certification framework for vehicles introduced into the Australian market. Entities bringing the technology to market (the automated driving system entity) will self-certify against performance-based safety criteria. As a result, the Department of Infrastructure and Regional Development and Cities will be the regulatory for first supply of automated vehicles, as an extension of its role as regulator for first supply of vehicles today.

The NTC will work with the Department as it develops any changes to legislation required to implement safety assurance at first supply.

The next stage of work for the NTC will be to consider the appropriate regulation of in-service safety, which will include examining supporting institutional arrangements. In-service vehicle safety is today covered by state and territory legislation through roadworthiness and vehicle maintenance requirements.

3.4 State and territory governments are regulating point to point transport

The NTC notes that states and territories regulate point to point transport, which will be an important element of automated mass transit. A number of states have recently reformed their laws in relation to taxi services and rideshare, as a result of the entry of new rideshare companies into Australia. For example, the New South Wales Government has established the Point to Point Transport Commissioner to administer the authorisation and licensing schemes for point to point transport.

4 Conclusions

A collaborative approach is being taken at a national level towards achieving a consistent and timely regulatory framework to support automated vehicles. A clear regulatory framework is a prerequisite for commercial deployments of automated vehicles on Australian roads, including for mass transit. The NTC continues to consult closely with governments, industry and other stakeholders as reforms are developed. The NTC is also working to align reforms with evolving technology.

The NTC appreciates the opportunity to provide a submission to the committee to help inform its consideration of automated mass transit. We would be pleased to provide further information as required.

Appendix A Glossary

Term	Definition
automated driving system (ADS)	In-vehicle operating system that controls a vehicle's automated functions.
automated driving system entity (ADSE)	The legal entity responsible for the automated driving system.
automated vehicles	<p>Vehicles that include an 'automated driving system' capable of performing the entire dynamic driving task including steering, acceleration, braking and monitoring the driving for sustained periods of time. This term encapsulates vehicles with conditional, high and full automation.</p> <p>All of the real-time operational and tactical functions required to operate a vehicle in on-road traffic, excluding the strategic functions such as trip scheduling and selection of destinations and waypoints, and including without limitation:</p> <ol style="list-style-type: none">1. Lateral vehicle motion control via steering (operational);2. Longitudinal vehicle motion control via acceleration and deceleration (operational);3. Monitoring the driving environment via object and event detection, recognition, classification, and response preparation (operational and tactical);4. Object and event response execution (operational and tactical);5. Manoeuvre planning (tactical); and6. Enhancing conspicuity via lighting, signalling and gesturing, etc. (tactical).
dynamic driving task	

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Appendix C Select NTC Publications

The Committee may find the following papers, available on the NTC website <http://www.ntc.gov.au>, relevant to automated vehicles:

- National Transport Commission 2016, *Regulatory barriers to more automated road and rail vehicles: issues paper*, Melbourne.
- National Transport Commission 2016, *Regulatory options for automated vehicles: discussion paper*, Melbourne.
- National Transport Commission 2016, *Regulatory reforms for automated vehicles: policy paper*, Melbourne.
- National Transport Commission 2017, *National guidelines for automated vehicles: policy paper*, Melbourne.
- National Transport Commission 2017, *Regulatory options to assure automated vehicle safety in Australia: discussion paper*, Melbourne.
- National Transport Commission 2017, *Changing driving laws to support automated vehicles: discussion paper*, Melbourne.
- National Transport Commission 2017, *Assuring safety of automated vehicles: policy paper*, Melbourne.
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