Submission No 6

DRIVERLESS VEHICLES AND ROAD SAFETY

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Date Received: 11/04/2016

NTC AUSTRALIA

National Transport Commission

11 April 2016

Mr Gregory Aplin, MP
Chair, Joint Standing Committee on Road Safety (Staysafe)
C/O Vedrana Trisic
Parliament House
Macquarie Street
Sydney NSW 2000

Dear Mr Aplin,

Please find attached the National Transport Commission (NTC) submission to the Staysafe (Joint Standing Committee on Road Safety) Parliamentary Inquiry into Driverless Vehicles and Road Safety in New South Wales (NSW). The NTC appreciates the opportunity to provide a submission on this important topic. Transport technology in these areas has been developing at a rapid pace over recent years with great potential for both improvements and disruption to transport systems.

The NTC is working with Austroads and the Commonwealth government as part of a wider program of work on automated vehicles. The NTC is reviewing the regulatory barriers to more automated vehicles at a national level. We released an issues paper in February 2016 and will release a discussion paper, including options analysis, later in April 2016. We will report to the Transport and Infrastructure Council with policy recommendations in November 2016.

Following the issues paper we received over 30 submissions from a wide range of stakeholders including road agencies, law societies, insurers and manufacturers. There was broad consensus among stakeholders that national consistency was crucial to the successful realisation of automated vehicles in Australia.

The NTC supports the development of a consistent national regulatory framework in order to provide certainty to the market and remove unnecessary barriers. In this context we would also encourage NSW to continue their strong involvement in national automated vehicle reforms.

A copy of our issues paper is included as an appendix and we will provide a copy of our discussion paper to the Committee when it is released. We are available to provide evidence to the Committee hearing if required. Please contact Marcus Burke, Project Director, [redacted] or [redacted]

Yours sincerely

[redacted]

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NTC Submission to the Staysafe Parliamentary Inquiry into Driverless Vehicles and Road Safety in New South Wales

April 2016

NTC AUSTRALIA

National Transport Commission

Report outline

Title	National Transport Commission submission to the Staysafe (Joint Standing Committee on Road Safety) Parliamentary Inquiry into Driverless Vehicles and Road Safety in New South Wales
Type of report	Submission
Abstract	The National Transport Commission (NTC) is providing this submission in light of our current project into more automated vehicles. The NTC hopes that this inquiry encourages national coordination in research and trials of automated vehicles.
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1 Introduction

1.1 Who we are

The National Transport Commission (NTC) is an inter-governmental agency charged with improving the productivity, safety and environmental performance of Australia's road, rail and intermodal transport systems. 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.

The Transport and Infrastructure Council is a ministerial council formed under the Council of Australian Governments (COAG) with the objective of achieving "a co-ordinated and integrated national transport and infrastructure system that is efficient, safe, sustainable, accessible and competitive."[1]

The NTC was formed by the Inter-Governmental Agreement for Regulatory and Operational Reform in Road, Rail and Intermodal Transport. Under this Agreement, all Australian governments affirmed their commitment to "improving transport productivity, efficiency, safety and environmental performance and regulatory efficiency in a uniform or nationally consistent manner."[2]

The NTC manages ongoing reform of various national law schemes, including the Australian Road Rules and the Heavy Vehicle National Law. The NTC conducts extensive consultation with industry, government and community stakeholders in developing our reforms.

1.2 Automated Vehicles

Automated vehicles could lead to huge safety and mobility improvements, however these benefits will not be realised without appropriate nationally consistent laws. Driverless cars offer a future with a fraction of the road deaths and injuries that occur today, as well as increased mobility for the elderly and infirm. However, their introduction and regulation also creates many issues for regulators around systems as drivers, liability, security, enforcement and safety standards.

In addition to these issues, there is also a lack of clarity in the terminology related to 'driverless cars'. The NTC describes this technology as 'more automated vehicles' recognising that automation exists on a spectrum from driver assistance through to fully driverless vehicles. Automated vehicles can use a range of technologies. These could include on-board vehicle sensors such as radar, ultrasound, laser and optical technology, in addition to satellite position receivers combined with accurate mapping and communications.

There is a range of possible driving tasks that vehicles can assist in such as 'valet parking', 'lane change assist' or 'highway driving'. The level of involvement of a human driver for each of these can vary significantly depending on the brand of vehicle. We look at these issues in some detail in our issues paper discussed below.

1.3 Current automated vehicle projects in Australia

The NTC is investigating ways to remove the regulatory barriers to more automated vehicles as part of a wider program of work by Australian governments on connected and automated vehicles. This program also involves Austroads (the association of Australian and New Zealand road transportation and traffic agencies) and the Commonwealth government.

At a federal level the Commonwealth Department of Infrastructure and Regional Development (DIRD) is reviewing the policy framework for Intelligent Transport Systems (ITS) in Australia. C-ITS refers to a subset of intelligent transport systems in which the different elements of the transport network – vehicles, roads, infrastructure – share information with each other by broadcasting signals. Shared information on conditions, incidents and traffic enables the coordination of vehicle

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[1] See http://transportinfrastructurecouncil.gov.au/about/

[2] See http://www.ntc.gov.au/Media/Reports/(0AAD626F-5961-0DFA-6508-258B5697EBBD).pdf.

movements and the avoidance of collisions. In this context DIRD is looking to provide policy principles related to innovation and competition to ensure there no undue obstacles to market-driven take-up of ITS products and services.

Austroads is undertaking four projects related to automated road vehicles as part of the Austroads Safety program. These cover:

- potential issues around registration and licensing
- assessments of safety benefits of autonomous vehicles and C-ITS
- a review of the potential impacts of automated vehicles on road network operations
- establishing an operational framework for C-ITS

Austroads is producing the overarching framework for C-ITS. Figure 1 shows some of the projects and trials currently being undertaken. As well as investigating key issues, these projects will provide guidance to road agencies and other key stakeholders. This will include options to support the testing of automated vehicles, and issues that should be addressed consistently across jurisdictions to support the deployment of automated vehicles.

The NTC is working with NSW and other jurisdictions through the Austroads C-ITS and Automated Vehicle Steering Committee and on the NTC Automated Vehicle Regulatory Advisory Group. Australia is also engaging with the United Nations Economic Commission for Europe (UNECE) Inland Transport Committee which is examining regulatory issues and options for more automated vehicles.

Figure 1: Existing projects and trials, with NTC review in bold.

1.4 NTC review of barriers to more automated vehicles

In November 2015, the Transport and Infrastructure Council asked the NTC to identify regulatory barriers relating to the safe introduction of more automated road and rail vehicles in Australia. The Council includes as its NSW members, the Hon Andrew Constance MP, Minister for Transport and Infrastructure and the Hon Duncan Gay MLC, Minister for Roads, Maritime and Freight. We will deliver a policy paper with final recommendations to the Transport and Infrastructure Council in November 2016.

This project is to assess whether our current regulatory framework can support automated vehicles and to investigate possible solutions. We released an issues paper in February 2016 and we will publish a discussion paper with options analysis in late April 2016.

The issues paper looked at some of the major areas impacted by more automated vehicles and highlighted the specific regulatory and operational issues. In particular the issues paper included discussion of the following topics:

- What are automated road vehicles?
- Role of government
- Issues with regulating the driver
- Issues with regulating light vehicles
- Issues with regulating heavy vehicles
- Liability
- Privacy and access to data
- Supporting on-road trials
- Supporting more automated rail

We received over 30 submissions from a wide range of stakeholders including road transport agencies, the New Zealand Ministry of Transport, insurers, vehicle manufacturers, enforcement agencies and law institutes (http://www.ntc.gov.au/submissions/history/?rid=90994&pid=8247). We received a detailed and considered submission from Transport for NSW (TfNSW), as well as responses from NSW Police (as part of a submission from the Australia and New Zealand Policing Advisory Agency) and from the Law Society of NSW.

The response overall was that the issues paper raised the key regulatory issues in relation to automated vehicles. Some of the key concerns raised by stakeholders in their feedback are set out below.

1.5 Key regulatory barriers to automated vehicles

National Consistency

Stakeholders across multiple industries seek improved national consistency, such as better harmonising the road rules. Inconsistency between states or with international standards could be a market barrier if manufacturers have to write multiple profiles for Australia. Safety could also be compromised if vehicles do not adjust to road rules when they cross state or territory borders.

TFNSW noted this issue in their submission: "While TfNSW is keen to encourage innovation, it endorses the need for a nationally consistent set of regulatory arrangements for [connected and automated vehicles], noting that Australia is a single vehicle market and it would be undesirable to erect legal or technical barriers between States."[3]

National consistency has also been raised as an issue in the United States. Google have stated a Senate Committee that "If every state is left to go its own way without a unified approach, operating self-driving cars across state boundaries would be an unworkable situation and one that will significantly hinder safety innovation, interstate commerce, national competitiveness, and the eventual deployment of autonomous vehicles."[4]

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[3] Transport Cluster Submission, National Transport Commission Issues Paper on Regulatory Barriers to more automated road and rail vehicles, March 2016, p. 1. Available at http://www.ntc.gov.au/Media/Reports/(27E4AF67-E5BA-422F-9522-E35D7206AB6D).pdf.

[4] Dr. Chris Urmson, Director, Self Driving Cars, Google [x] Before the Senate Committee on Commerce, Science and Technology Hearing: "Hands Off: The Future of SelfDriving Cars" March 15, 2016. http://www.commerce.senate.gov/public/_cache/files/5c329011-bd9e-4140-b046-a595b4c89eb4/BEADFE023327834146FF4378228B8CC6.google-urmson-testimony-march152016.pdf

Liability

Insurers and enforcement agencies were both particularly concerned with how liability could be proven in the case of a crash. In particular, there were concerns with operational issues around what information the vehicle records and who could access it.

Vehicle regulation

Current regulation of vehicles entering Australia was raised as a potential market barrier. Most respondents favoured maintaining current government policy of aligning Australian Design Rules with international vehicle standards. No country has adjusted its vehicle standards to accommodate highly or fully automated vehicles yet.

Security and data privacy

The development of automated vehicle technology means that current in-vehicle systems are considerably more complex. Many respondents noted that ensuring that these systems are secure from hacking would be crucial for a safe deployment. Equally, managing the privacy of vehicle owners and users would also be critical given the increase in data collected and held by each system.

Based on feedback from the submissions process, the NTC is currently developing a discussion paper setting out options for reform. This will includes a review of existing legislative barriers across Commonwealth and state legislation, including NSW legislation.

2 NTC comments on the Committee's questions

1. The capacity of driverless vehicle technology to deliver improved road safety outcomes including a lower road toll, and fewer accidents and injuries to drivers, pedestrians and other road users

It is expected that automated vehicles technology can significantly reduce the current road toll, given that most crashes are caused by human error. However research is still proceeding internationally. As noted above, Austroads is currently investigating the safety benefits of autonomous vehicles and C-ITS and will report mid-2016.

Google reported in May last year, that in six years of operation, "we've been involved in 11 minor accidents (light damage, no injuries) during those 1.7 million miles of autonomous and manual driving with our safety drivers behind the wheel, and not once was the self-driving car the cause of the accident." However, it has been recently reported that a collision between a Google vehicle and a bus was the fault of the self-driving car."[5]

A University of Michigan study in October 2015, found that self-driving cars were more likely to be involved in crashes than conventional vehicles however the severity of the crashes was lower and the self-driving vehicles were not at fault in any of the crashes.[6] Whilst the sample size remains small, this may indicate a need for further research on the interaction between human drivers and self-driving vehicles.

2. The extent to which current road safety policies and regulations in NSW anticipate the introduction of driverless vehicle technology, including driverless heavy vehicles, and any regulatory and policy changes which will be required

As part of the research completed for the discussion paper we have found that there are a number of potential barriers to automated vehicles in current legislation and regulations at both Commonwealth and state and territory levels. Current road safety policies and laws generally assume a human driver and do not anticipate the introduction of more automated vehicles or driverless vehicles. The issues come primarily from the road rules, heavy vehicle laws and public transport regulation. There are many instances where broadening the definition of 'driver' could solve the issue, however more substantial changes are required in some instances. The NTC discussion paper will include a detailed analysis of state and territory regulations in relation to automated vehicles.

It is also important that any changes consider the policy position that a regulator or government wants to take. Until now government has taken on the role of ensuring safety standards through vehicle design and on road behaviour. In the issues paper we investigate what the role of government will be as vehicles become more highly automated.

3. The preparedness of NSW road safety regulators to meet the challenges extended by driverless vehicle technology

Whilst we are not able to comment specifically on the preparedness of NSW regulators, new technology creates challenges for all transport agencies. This includes having the right skills and knowledge within the agency and ensuring that policies allow for future innovation.

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[5] Chris Urmson, *The View from the Front Seat of the Google Self-Driving Car*, Backchannel, May 2015 https://backchannel.com/the-view-from-the-front-seat-of-the-google-self-driving-car-46fc9f3e6088#.ylbby27bo.

[6] Brandon Schoettle and Michael Sivak, *A Preliminary Analysis of Real-World Crashes Involving Self-Driving Vehicles*, October 2015, available at http://www.umich.edu/~umtriswt/PDF/UMTRI-2015-34_Abstract_English.pdf

We received a positive and considered submission to our issues paper from TfNSW and are aware of projects and trials that are being run in anticipation of technology developments. This submission noted the need for a nationally consistent approach to automated vehicles as well as the need to ensure that technology improves road safety.

4. The experience of other jurisdictions in Australia and overseas in adopting and adapting to driverless vehicle technology

We are aware that many countries are examining the policy issues raised by automated vehicles, including implications for safety, regulation and infrastructure. Automated vehicle trials of various levels are also taking place around the world.

Australia is also in the process of trialling diverse forms of more automated transport. We are keen to see effective coordination and consistency across Australia to ensure efficiency of time and funding. Use of forums such as the Austroads C-ITS and Automated Vehicle Steering Committee and as well as on the NTC run Automated Vehicles Regulatory Advisory Group are effective for this purpose. NSW is a member of both of these groups.

Working groups within the UNECE are considering implications of automated vehicles, in particular through Working Party 29. Australia's vehicle design rules are based on the UNECE standards and it is Commonwealth Government policy to continue to harmonise with them where possible. The Department of Infrastructure and Regional Development is also engaging with the UNECE on these issues.

In the US the National Highway and Traffic Safety Administration (NHTSA) has also been working on policy and regulation for more automated vehicles. NHTSA recently highlighted the issue of the safety case for driverless vehicle technology in a letter to Google. The safety standard of new vehicle technology is a crucial issue and NHTSA have said that until a safety case of a sufficient standard could be presented to and analysed by them, certain existing standards for vehicles would be maintained.

5. Other related matters.

The NTC will continue to work with state and territory governments to develop national solutions to address regulatory barriers to automated vehicles. This will help ensure that Australia benefits from this technology as it becomes available in order to improve mobility and reduce the road toll.

3 Conclusion

The NTC welcomes the Staysafe Parliamentary Inquiry into Driverless Vehicles and Road Safety in New South Wales and looks forward to the committee's findings. We have provided a copy of the NTC's issues paper and will provide a copy of the discussion paper once it is released. This will include the review of state legislation, including that of NSW.

As noted, we will be providing recommendations and a final policy paper to the Transport and Infrastructure Council in November 2016. We are happy to provide further information to the Inquiry if required. Finally, the NTC encourages NSW to continue their strong involvement in national automated vehicle projects. We look forward to continuing to work with TfNSW on this important reform to help reduce the road toll both in NSW and across Australia.

Appendix 1 – NTC Issues Paper "Regulatory barriers to more automated road and rail vehicles" February 2016

Regulatory barriers to more automated road and rail vehicles

Issues paper

February 2016

NTC AUSTRALIA
National Transport Commission

Report outline

Title	Regulatory barriers to more automated road and rail vehicles
Type of report	Issues paper
Purpose	For consultation
Abstract	The purpose of this paper is to review regulations in Australia to identify any regulatory barriers associated with the introduction of more automated road and rail vehicles. This paper provides an overview of current rules, identifies issues and potential solutions and scopes the parameters of the project. Key issues for road vehicles relate to: • clarity over control of the vehicle and compliance with traffic laws • vehicle standards and safety assurance • liability and responsibility for the actions of an automated vehicle; and • data access and privacy protection – including access for enforcement purposes.
Submission details	Submissions will be accepted until **Tuesday, 8 March 2016** online at www.ntc.gov.au or by mail to: Att: Automated Vehicle Team National Transport Commission Level 15/628 Bourke Street Melbourne VIC 3000
Key words	automated vehicles, road, rail, regulation, Australian Design Rules, vehicle standards, Australian Road Rules, liability, privacy, security
Contact	National Transport Commission Level 15/628 Bourke Street Melbourne VIC 3000 Australia Ph: +61 (03) 9236 5000 Email: enquiries@ntc.gov.au www.ntc.gov.au
ISBN	978-1-921604-85-0

Contents

1 Context

KEY POINTS

- The National Transport Commission (NTC) is reviewing regulations in Australia to identify unnecessary barriers to the introduction of more automated road and rail vehicles.
- This paper provides an overview of the current regulatory framework, identifies issues and potential solutions and scopes the parameters of the regulatory review.

1.1 Objectives

In November 2015, the Transport and Infrastructure Council asked the NTC to identify regulatory barriers relating to the safe introduction of more automated road and rail vehicles in Australia.

Assessing whether our current regulatory framework allows or can support automated vehicles enables:

1. Improved understanding of the current regulatory system and its ability to continue to support increased vehicle automation (both road and rail).
2. Identification of any regulatory or operational barriers to be removed or overcome and potential time pressures or options (including trials of automated vehicles).
3. A nationally-consistent approach for increased vehicle automation.

We will deliver a policy paper with final recommendations to the Transport and Infrastructure Council in November 2016. Before a detailed analysis of current laws and design rules occurs in mid-2016, this paper:

- provides an overview of relevant regulatory frameworks
- scopes project parameters of regulations, assumptions and scenarios; and
- introduces the identified issues and potential solutions.

We are seeking your feedback to assist us with identifying the relevant regulatory frameworks, and on whether we have captured the key issues and identified potential solutions.

1.2 Problem definition

Increasingly automated road vehicles

Motor vehicle manufacturers are progressively introducing increasing levels of automated driving controls in their vehicles. Manufacturers are progressing along different paths and there is no certainty as to how automated vehicles will be developed and commercialised in the future. For example, some manufacturers are focused on conditional automated vehicles that will require a human driver to monitor the vehicle and to intervene if required. Others are focused on developing highly automated vehicles that do not require any human driver but only operate on clearly defined low-speed pedestrian zones with no interaction with other vehicles, such as a university campus or airport precinct.

These trends have raised questions from industry and governments about whether Australia's current regulatory frameworks can support conditional, highly and/or fully automated vehicles on public roads.[1] Our regulations need to support a mixed environment with a variety of automated vehicle types, while also supporting conventional vehicles with human drivers.

Issues such as interaction between road transport and consumer protection laws, as well as liability and insurance, and common law requirements need to be addressed (Glancy et al, p.58).

[1] The classification of automated vehicles is explained in **chapter 3.**

Vehicle manufacturers are primarily focused on the development of more automated light and heavy road vehicles, rather than other road vehicles such as powered two-wheelers. For this reason, the NTC review of regulatory barriers is also focused on light and heavy road vehicles, but we will consider other road vehicle types if there are unique regulatory issues or barriers that need to be addressed.

Increasingly automated trains

Fully automated trains are already operating in many countries overseas, and are planned to be introduced in Australia. These developments necessitate an investigation of whether there are regulatory or operational impediments to more automated trains in Australia. For example, ensuring that more automated trains can operate safely on shared systems with other types of trains, other modes and vulnerable road users.

1.3 Overview of current regulatory frameworks

The regulatory framework for road vehicles

Over the last one hundred years, a regulatory framework has evolved at a state, national and international level to regulate the safe use of motor vehicles. Vehicle design rules, road safety laws, product liability, statutory accident compensation funds and common law principles of tort and contract have produced a complex and enduring regulatory framework.

Figure 1 illustrates the current regulatory framework for road vehicles. It reflects the various types of regulation based on the National Road Safety Strategy's safe systems framework approach.

Figure 1: the current regulatory framework for road vehicles

SAFE ROADS	SAFE VEHICLES	SAFE SPEEDS	SAFE PEOPLE
Infractstruture investment and maintenance: *Commonwealth funding, state, territory, local government and commercial road managers*	International conventions	Australian road rules: *state and territory laws*	International conventions
Road manager liability	Australian design rules: *Commonwealth*	Speed zones established by state and territory law	Australian road rules: *state and territory laws*
	Consumer protection laws: *Commonwealth*	State and territory crimminal codes	Driver licensing: *state and territory laws*
	In service vehicle standards: *state and territory laws*	Driver licensing restrictions: *state and territory laws*	
	Vehicle registration: *state and territory laws*	Vehicle restrictions: *state and territory laws and the Heavy Vehicle National law*	

The broader regulatory framework for road vehicles covers vehicle emissions, theft, security and privacy, road access and consumer protection.

The key question for policy makers, manufacturers and the community is whether there is anything *different* about automated vehicles that warrants a departure from the existing regulatory framework. This might involve changing existing rules, creating new and parallel rules that sit within the current framework or developing an entirely new framework.

Figure 1 also illustrates that a division of responsibility exists between the Commonwealth and states and territories within the current regulatory framework. Broadly speaking:

- The Commonwealth legislation aims to ensure the vehicle (the physical thing) is designed to a minimum standard consistent with international standards and that consumers are protected.
- States and territory legislation aims to ensure:
  - the vehicle continues to comply with the design rules while it is used on roads
  - there are rules for safe driving
  - vehicle operators are licensed
  - vehicles can be identified for compliance and enforcement purposes
  - citizens are protected from criminal behaviour and negligence.
- Commonwealth, state and territory policies aim to ensure that road rules and vehicle standards are consistent with international conventions and standards wherever possible.

- Heavy vehicles are subject to the same road rules as light vehicles. In most states and territories, heavy vehicles over 4.5 tonnes (gross vehicle mass) are also subject to the Heavy Vehicle National Law (HVNL), which covers areas such as vehicle standards, mass dimension and loading, and driver fatigue.
- Common law principles of tort and contract underpin product liability and consumer protection legislation.

States and territories are responsible for road rules and the safe operation of road vehicles. The Australian Road Rules are based on international conventions. They are model laws that are developed nationally and cooperatively by states and territories and are subsequently applied in each jurisdiction.

Many aspects of the current regulatory framework are sufficiently flexible that they are unlikely to be barriers to automated vehicles. For example, common law principles of tort and contract, and the application of consumer protection legislation, will continue to be relevant.

However, because the automated vehicle system will take on more of the driving task, we could see a readjustment in the current Commonwealth-state distinction between *regulation of the vehicle and regulation of the driver*. Australian Design Rules (ADRs) and vehicle standards could have a larger regulatory role if safety assurance related to the physical vehicle extends to safe driving of the vehicle in compliance with road rules.

The regulatory framework for rail

Unlike road vehicles, the rail sector has adopted a safety management system approach to manage safety risks. The existing regulatory framework does not have prescriptive rules and there are unlikely to be any significant regulatory barriers to introducing more automated trains in Australia.

The Rail Safety National Law (RSNL) has now been adopted by all states and territories except Queensland.[2] The RSNL provides a framework for safety management without prescribing what a particular operator must do to ensure its operations are safe. This approach allows for different types and sizes of operations and for industry innovation.

The RSNL requires rail transport operators to ensure the safety of their operations by eliminating or minimising risks so far as is reasonably practicable.

Rail transport operators must be accredited by the Office of the National Rail Safety Regulator (ONRSR). The purpose of accreditation is for the operator to demonstrate to the ONRSR its competence and capacity to manage risks safely. To satisfy the duty to ensure safety, operators are required to consider relevant standards, including international standards and industry best practice.

The RSNL's safety management system approach could be considered an alternative way to regulate automated road vehicles in the future, by placing this responsibility on the entity responsible for the systems controlling the operation of the vehicle.

1.4 Overview of the key issues

This section provides an overview of the key issues explored in detail in the following chapters.

Automated road vehicles

1. Australian Road Rules implicitly require the driver to be human

The Australian Road Rules do not state that the driver of a vehicle must be a human, but it is clearly assumed. For example, throughout the Australian Road Rules the driver of the vehicle has a lap, a hand to make signals with, and must not view a television screen or use a mobile phone while driving. These rules and concepts reinforce a guiding principle of the Vienna Convention on Road Traffic that human drivers exercising their judgement are accountable for driving the vehicle.[3]

The concept of the driver being human in the Australian Road Rules could be the most significant barrier to introducing highly and fully automated vehicles. The rules are structured around the concept of what a driver can and cannot do: *a driver* must not drive over the speed-limit and *a driver* must stop at a stop sign. An automated vehicle without a human driver could not therefore comply with the Australian Road Rules or lawfully operate on public roads without an exemption.

An initial review would suggest that to allow highly or fully automated vehicles will require amendments to the Australian Road Rules to clarify that a driver with proper control of the vehicle could be the automated vehicle system.

> see section 5.1.

2. It is not clear whether monitoring the driving task constitutes control

A clearly-defined legal entity must always be responsible for the vehicle. A key issue is who is in control in a conditional automated vehicle. Does the human driver remain in control if he or she only monitors the automated vehicle system and only intervenes if required?

[2] The Queensland Transport (Rail Safety) Act 2010 applies similar principles. In December 2015, the Queensland Government announced it would join the national scheme.

[3] The Vienna Convention on Road Traffic is described in more detail in **section 5.1.**

Aviation has conditional automated aircraft in operation today and the industry has clearly established principles that a pilot with monitoring and intervention responsibilities must be in control of the aircraft. This remains to be determined for automated road vehicles.

A solution may be to clarify in the Australian Road Rules that monitoring and intervention responsibilities constitute control for the purposes of the rules.

> see section 5.1.

3. *Proper control* is interpreted to mean a hand on the steering wheel

In the Australian Road Rules, a driver must have proper control of the vehicle. There is no requirement in the rules that this is met in a particular way, but enforcement agencies generally interpret proper control to mean that the driver is in the driver's seat and has at least one hand on the steering wheel. This is a compliance and enforcement issue.

If governments agree that automated vehicles can operate safely without the human driver holding the steering wheel or similar requirements, the interpretation of proper control will need to be reviewed so the benefits of automated vehicles can be achieved.

To provide certainty to the market, the meaning of proper control could be clarified in an amendment to the Australian Road Rules, or through national enforcement guidelines.

> see section 5.1.

4. Many state and territory laws assume the driver is human

Similar to the Australian Road Rules, many state and territory road safety and traffic laws assume the driver is human. The definition of driving in state and territory legislation does not expressly require a human driver, but the assumption of a human driver means that a number of provisions could be unworkable with the introduction of automated road vehicles. For example, how does an automated vehicle comply with requirements to hold a driver's licence, respond to directions of an Authorised Officer, or give assistance when a person is injured?

Principle- or performance-based provisions could be introduced in state and territory legislation to accommodate automated vehicles in road safety and traffic laws. Alternatively, road safety and traffic laws could be amended to remove implicit requirements for a human driver where it is relevant to do so, or redefine 'driver' to capture automated vehicle systems.

> see section 5.2.

5. Effective operation of traffic laws will need to identify responsibility for the vehicle at a given point in time

In a highly automated vehicle there could be times when the driver is in control and times when the automated vehicle system is in control. Enforcement agencies and the courts will have to be able to identify who was in control of the vehicle at any particular time.

There are existing owner onus provisions for camera-detected offences and parking offences that place the obligation on the owner to demonstrate that he or she was not responsible for the vehicle at the time of the alleged infringement. This approach might provide a model for holding automated vehicle owners responsible for any breach of traffic laws. Alternatively, the human driver could be prime facie in control at all times and have as a defence to an alleged offence that the automated vehicle system was in control of the vehicle at the time of the incident.

> see section 5.2.

6. New design rules may be needed for different types of automated vehicles

It is possible that some highly or fully automated vehicles may not be allowed to be imported into Australia without an ADR exemption. The ADRs could be a regulatory barrier to wide-scale commercial importation of automated vehicles because some ADRs are not relevant to automated vehicles and would not be met. For example, a highly or fully automated vehicle may not require a steering column or brake pedals to operate safely.

Additional vehicle design rules could also introduce new standards related to technology performance. For example, security standards for automated vehicle systems could be included in the design rules to ensure trusted systems can cooperate, can protection privacy and can prevent hacking.

> see section 6.1.

7, New design rules could capture more of the driving task

The ADRs capture the physical vehicle (such as the structure of the vehicle) and the performance of the physical vehicle (such as braking and headlight luminosity). The ADRs do not ensure road rules compliance, given that road rules – and how the vehicle behaves on the road – are the responsibility of the human driver.

As a consequence of automated vehicles, the ADRs or other regulatory mechanisms may need to be amended to ensure that new vehicles are safe and will comply with the Australian Road Rules when in operation.

> see section 6.1.

8. Some in-service vehicle standards assume a human driver

States and territories are responsible for regulation of in-service use and the operation of light vehicles after they have been supplied to the market. The model law upon which in-service vehicle standards are based is the Australian Light Vehicles Standards Rules (ALVSRs). The ALVSRs require vehicles that are subject to ADRs when they are manufactured or imported to continue to comply with those rules while they are in service.

As with ADRs, some of these standards assume a human driver and could be regulatory barriers to more automated vehicles. For example, the ALVSRs provide that a motor vehicle must be built 'to allow the driver a view of the road and of traffic to the front and sides of the vehicle so the driver can drive the vehicle safely.'

This standard appears to have been drafted in the context of a human driver, given that automated vehicle systems do not 'view' the road in the same way that humans do. The ALVSRs could be amended to ensure each standard can operate effectively without the assumption of a human driver.

> see section 6.2.

9. Vehicle modification may require increased regulatory oversight

As vehicles become increasingly automated, there is a risk that modifications to the physical vehicle or software could impact the safe operation of the automated vehicle system.

Manufacturers and technology providers manage modification issues today through the development of accredited repairer networks and codes of practices. Vehicle modification could continue to be self-regulated within the context of consumer laws and product liability, and there may not be any regulatory barriers to address. However, because highly and fully automated vehicles may undertake the driving task without human intervention, governments may seek increased regulatory oversight, particularly in relation to vehicle modifications that are privately undertaken and outside the scope of consumer law.

> see section 6.2.

10. Some HVNL provisions and heavy vehicle standards assume a human driver

Some provisions in the HVNL assume a human driver. This includes provisions relating to the driver's responsibility to keep certain documents in his or her possession while driving, or to follow requests made by an Authorised Officer. As with state and territory road safety and traffic laws, the human driver assumption may be an operational barrier to the effective regulation of heavy vehicles that are fully or highly automated.

The HVNL could be amended to ensure each provision can operate effectively without the assumption of a human driver.

> see section 7.

11. Some in-service standards for heavy vehicles assume a human driver

National in-service standards have been developed by the NTC to ensure that heavy vehicles continue to comply with design rules while they are in service. Some in-service standards for heavy vehicles assume a human driver. For example, there is a requirement in the Heavy Vehicle (Vehicle Standard) National Regulation (HV-VSNR) that the heavy vehicle allows a safe view of the road and traffic to allow the driver in the normal driving position a view of the road and of traffic to the front and sides of the vehicle so the driver can drive the vehicle safely.

Standards such as this would remain relevant to automated heavy vehicles with a human driver in control of the vehicle, but not to a highly or fully automated vehicle that did not have a human driver. However, the principle underpinning the standard – driving safely with no visual interference – remains an important design principle that could still apply to all heavy vehicles. To ensure there are no barriers to highly or fully automated heavy vehicles, the HV-VSNR in-vehicle standards could be amended to ensure the safe design principles are retained but without the assumption of a human driver.

> see section 7.

12. Safe distance rules could limit the uptake of heavy vehicle platooning

Platooning allows vehicles to travel close together by accelerating or braking simultaneously and enables a closer headway between vehicles by eliminating human driver reaction times. Heavy vehicle platooning could provide fuel efficiency and safety benefits and is a potential early application of automated technology.

Safe distance rules in the Australian Road Rules provide that a safe distance for long vehicles must be a minimum distance of 60 metres. There is an exemption for vehicles operating on multi-lane roads or in built-up areas, but a significant part of Australia's freight network is single lane roads which may be safe and appropriate for heavy vehicle platooning.

If governments agree that heavy vehicle platoons can safely operate on single lane roads in some conditions, the current safe distance rules could be a barrier to more automated heavy vehicles. A solution may be to adopt a performance-based approach to the safe distance rule, or states and territories could use the current exemption framework to allow platooning on specific roads that are not multi-lane or in an urban area.

> see section 7.

13. Liability is well established but assigning fault could be more complex

The regulatory framework for liability of road vehicles is well-established. The liability regime in Australia is primarily based on common law approaches, supplemented by explicit legislation in certain areas, including fault or no-fault compensation schemes covering personal injuries. Manufacturers are already subject to product liability, which could increase in importance as automated vehicles develop.

While the current regulatory framework for liability is unlikely to be a barrier, assigning fault could become more complex. For example, if a vehicle is automated for extended periods of time and there are no, or limited, vigilance controls, the courts may consider that manufacturers have shared liability in the event the human driver does not take back control of a vehicle in time to avoid a crash.

To increase certainty and to avoid costly legal arguments, legislation could specify who is in control of a conditional, highly or fully automated vehicle, therefore clarifying who is responsible for any liability or road transport breach.

> see section 8.1.

14. Government access to automated vehicle data may warrant additional legislative privacy protections

The benefits of automated vehicles may not be realised if consumers are uneasy about government access to their location information, which may relate to a person's political views, medical issues and social matters. Location information can therefore be sensitive information and uncertainty about government access to identifiable location information – if any – could be a regulatory barrier.

Consumers will seek clarity regarding the circumstances when this information might be accessed for enforcement purposes. Equally, government agencies need certainty in regard to accessing information when it is reasonable and beneficial to the community to do so.

In other regimes, such as the HVNL, governments in Australia have recognised the sensitivity of technology that generates location information and could be used for a regulatory or enforcement purpose, and have legislated or agreed to legislate additional privacy protections. These provisions require enforcement agencies to obtain a warrant to access the relevant information unless it is for a reason defined in the legislation in what circumstances enforcement agencies may access personal information A similar model could be considered to protect personal information generated by automated vehicles.

Where it is appropriate to do so, privacy regulations should be harmonised with international outcomes.

> see section 9.2

Summary of issues relating to automated road vehicles

The extent to which these issues are regulatory barriers will depend on the type of automated vehicle. **Table 1** identifies which of the above issues are most relevant to different automated vehicle functions. The classification system for automated vehicles is explained in **chapter 3**.

Table 1: Summary of potential regulatory issues and automated road vehicle functions

POTENTIAL REGULATORY ISSUE	AUTOMATED VEHICLE FUNCTION			
	Conditionally automated	Highly automated – all the time, limited network	Highly automated – some of the time, all the network	Fully automated
1 Road rules and a human driver		■	■	■
2 Monitoring and control	■			
3 Meaning of proper control	■	■	■	■
4 Human driver in road safety and traffic laws		■	■	■
5 Identifying the responsible person		■	■	■
6 ADRs for different automated applications		■		■
7 ADRs for more of the driving task		■	■	■
8 Human driver in vehicle standards		■	■	■
9 Oversight of vehicle modification	■	■	■	■
10 Human driver assumed in the HVNL		■	■	■
11 Human driver in heavy vehicles standards	■	■	■	■
12 Heavy vehicle platooning	■	■	■	■
13 Liability complexity	■	■	■	■
14 Privacy – access to data by government agencies	■	■	■	■

This issues paper also identifies other issues related to automated road vehicles that may be policy issues but do not appear to be regulatory barriers or necessarily require a role for government. These are discussed in **chapter 12** and include human factors, vulnerable road users, assessing the safety and security of automated vehicles, driver training and licensing and the changing nature of vehicle ownership.

Automated trains

15. The safety case for automated trains may be more challenging on shared systems

The rail sector has adopted a safety management system approach to manage risks to safety. The regulatory framework does not necessitate prescriptive rules and there are unlikely to be any significant regulatory barriers to introducing more automated trains in Australia.

However, automated trains are currently only operating on closed systems, such as metropolitan systems and in the mining sector. The challenge for rail operators may be establishing a safety case for automated trains that operate on shared systems that interact with other types of trains, other modes or vulnerable road users.

> see section 11.2

1.5 Strategic context

Australia is already undertaking a number of road and rail automated vehicle trials and research. Our project to address regulatory barriers of more automated road and rail vehicles therefore supports other research and project activities undertaken by the Australian Government, Austroads and state and territory road agencies.

The Commonwealth Department of Infrastructure and Regional Development is reviewing the *Policy Framework for Intelligent Transport Systems (ITS) in Australia.* The Policy Framework was endorsed by the then Standing Council on Transport and Infrastructure in 2011 and supports the consistent implementation, integration and uptake of ITS. The Policy Framework embeds policy principles related to innovation and competition to ensure no undue obstacles to market-driven take-up of ITS products and services.

Austroads is undertaking three projects related to automated road vehicles to examine:

- the safety benefits of automated vehicles
- the impacts of automated vehicles on registration and licensing processes
- a review of the potential impacts of automated vehicles on road network operations.

The NTC is working closely with the Australian Government and Austroads to ensure we adopt consistent assumptions and share experiences and findings across projects.

We understand that other organisations are planning technical research, trials or demonstrations in the near future. The NTC welcomes feedback on any new regulatory issues that emerge as a result of these further trials and research.

1.6 Method

Australia is already undertaking a number of road and rail automated vehicle trials and research. Our project to address regulatory barriers of more automated road and rail vehicles therefore supports other research and project activities undertaken by the Australian Government, Austroads and state and territory road agencies.

Project timeframes

We will undertake a public consultation on the regulatory issues in early 2016. A discussion paper with options analysis will be released for public consultation in mid-2016. The NTC aims to deliver recommendations to the Transport and Infrastructure Council in November 2016.

Proposed approach

The purpose of this paper is to review regulations in Australia to identify any regulatory barriers relating to the introduction of more automated road and rail vehicles. This paper provides an overview of current rules, identifies issues and potential solutions and scopes the parameters of the project.

In relation to road vehicles, the discussion paper will detail a thorough review of relevant Commonwealth, state and territory legislation and propose a range of options for stakeholder consideration and feedback.

The approach to the discussion paper is guided by the 12 stages in the lifecycle of a road vehicle, set out in **Table 2.** Each stage may raise different issues, some of which have been identified in this paper, and in some cases there is a mix of international, Commonwealth and state and territory frameworks. We will ask the following questions at each of stage in the lifecycle:

1. What is the current regulatory framework?
2. Is there a need to regulate or address regulatory barriers in relation to automated vehicles?
3. How can these barriers be addressed?
4. Do other projects cover this issue?

Table 2: Regulatory areas in the life-cycle of a road vehicle

Regulatory area	Regulatory instruments or domains
Vehicle design and performance	Australian Design Rules (based on international UN Regulations) Other international standards (e.g. ISO, IEC and SAE standards) Radiocommunications licensing (e.g. Australian Communications and Media Authority (ACMA) for auto radar sensors, lidar, data communications and global satellite navigation systems (GNSS) Consumer laws and product liability (e.g. *Competition and Consumer Act 2010* (Cwlth))
Vehicle compliance	Individual approval, type approval and self-certification (e.g. international standards for testing)
Sale of the vehicle	Consumer laws (e.g. *Competition and Consumer Act 2010* (Cwlth)) Product liability
Modification	In-service vehicle standards (e.g. Australian Light Vehicle Standards Rules, or ALVSRs) Product liability
Registration	Requirements for registration and processes Compulsory third party insurance (e.g. *Transport Accident Act 1986* (Vic))
Licensing of users	Requirements for driver licenses and licensing processes
Use of the vehicle	Traffic laws Drink and drug driving laws Liability (e.g. liability for road managers in the *Civil Liability Act 2002* (NSW)) Compliance and enforcement Mass, dimension and loading (e.g. Heavy Vehicle National Law)
Operation of the vehicle	Security requirements Infrastructure requirements, including the protection of vulnerable road users Regulation of the operating system Accreditation (e.g. Heavy Vehicle National Law)
Systems monitoring and data access	Privacy laws (e.g. *Privacy Act 1988* (Cwlth)) Compliance with surveillance device laws (e.g. *Surveillance Devices Act 1999* (Vic)) Access to and control of data
Maintenance	In-service standards (e.g. ALVSRs) Right to repair
Recall	Consumer laws and product liability
Disposal	Register of written-off vehicles

Not every aspect of the lifecycle will be analysed by the NTC in the discussion paper. Regulatory areas such as licensing and registration will be covered by an Austroads project.

The analysis of barriers to more automated rail vehicles will be undertaken through the perspective of the rail sector's safety management system approach.

2 Consultation

KEY POINTS

- Any individual or organisation can make a submission to the NTC.
- We are seeking submissions on this issues paper by **Tuesday 8 March 2016.**

The views of a broad range of stakeholders is crucial to guide the policy discussion. As such we are asking stakeholders to consider the following questions based on the issues identified in the following chapters:

What are automated vehicles?

Question 1 – Do you support the use of the Society of Automotive Engineers (SAE) International Standard to classify automated road vehicle functions? Do you have any issues with using the SAE International Standard?

Role of government

Question 2 – What do you think the regulatory role of governments should be to support the introduction of automated vehicles in Australia?

Issues with regulating the driver

Question 3 – Have we identified the key issues relating to the Australian Road Rules and state and territory road safety and traffic laws? Are there other issues that should be assessed as part of the NTC review?

Issues with regulating the road vehicle

Question 4 – Have we identified the key issues relating to the Australian Design Rules and other vehicle standards? Are there other issues that should be assessed as part of the NTC review?

Issues with regulating heavy vehicles

Question 5 – Have we identified the key issues relating to heavy vehicles? Are there other issues that should be assessed as part of the NTC review?

Liability

Question 6 – Have we identified the key issues relating to the liability of drivers, manufacturers, service providers and road managers? Are there other issues that should be assessed as part of the NTC review?

Privacy and access to data

Question 7 – Have we identified the key issues relating to privacy and access to data by government agencies? Are there other issues that should be assessed as part of the NTC review?

Supporting on-road trials

Question 8 – Have we identified the key issues relating to on-road trials of automated road vehicles? Are there other issues that should be assessed as part of the NTC review?

More automated rail

Question 9 – Have we identified the key issues relating to more automated rail operations? Are there other issues that should be assessed as part of the NTC review?

Other issues

Question 10 – Are there additional issues or risks that should be considered in the NTC's assessment of regulatory barriers to more automated vehicles?

Consultation questions are provided as a guide only. Stakeholders are welcome to provide us with feedback on any aspect of the issues paper or regulatory barriers to more automated road and rail vehicles.

You may wish to consider:

- is the definition of the problem accurate?
- what are likely to be the costs and operational impacts of the problem for businesses/operators and other organisations?
- what are likely to be the costs and operational impacts of the problem on the broader community?
- what regulatory oversight is needed for modification, repairs or aftermarket fitment?
- what are the broad options for reform?

When to submit

We are seeking submissions on this issues paper by **Tuesday 8 March 2016.**

How to submit

Any individual or organisation can make a submission to the NTC.

To make an online submission, visit www.ntc.gov.au and select 'Submissions' from the top navigation menu.

Or post your comments to:

Att: Automated Vehicle Team
National Transport Commission
Level 15/628 Bourke Street, Melbourne VIC 3000
Australia

Where possible, you should provide evidence to support your views, such as data and documents.

Unless you clearly ask us not to, the NTC will publish your submission online. However, we will not publish submissions that contain defamatory or offensive content.

The *Freedom of Information Act 1982* (Cwlth) applies to the NTC.

Next steps

We will consider your feedback in the analysis and development of options in an NTC discussion paper, which will be published in mid-2016. The discussion paper provides a second opportunity for stakeholders to provide additional feedback on regulatory barriers and proposed options.

We will consider your submissions in the development of a final policy paper to the Transport and Infrastructure Council.

3

What are automated road vehicles?

KEY POINTS

- The key to a flexible and performance-based regulatory framework is an agreed classification system for automated driving.
- The key point of difference between different automated driving functions is whether a human driver is responsible for monitoring the automated vehicle system and/or required to intervene to ensure the vehicle can some to a safe stop.

Automated road vehicles are vehicles that have some level of system automation which do not require a human driver for at least part of the driving task.

Automated vehicles are anticipated to use a range of technologies. These could include on-board vehicle sensors such as radar, ultrasound, laser and optical technology, in addition to satellite position receivers combined with accurate mapping, communications and cooperative intelligent transport system (C-ITS) technology. C-ITS refers to a subset of intelligent transport systems in which the different elements of the transport network – vehicles, roads, infrastructure – share information with each other by broadcasting signals. Shared information on conditions, incidents and traffic enables the coordination of vehicle movements and the avoidance of collisions.

Manufacturers are also likely to offer different automated functions and the market is therefore expected to have vehicles with different automation functions for many years:

> From a technical point of view, current technology for highly automated driving in controlled environments is quite mature. These vehicles use state-of-the-art sensors (radar, lidar, GPS and camera vision systems) combined with high accuracy maps allowing on-board systems to identify appropriate navigation paths, as well as obstacles and relevant signage. These prototypes operate with a driver that must stand ready to take control of the vehicle though reports from trials indicate that this option is rarely acted upon. As of 2015, there is yet no consensus on the commercial maturity of highly automated and ultimately fully automated driving (International Transport Forum, page 12).

There is no single roadmap towards higher levels of automation. The regulatory framework for automated vehicles will need to be sufficiently flexible and performance-based to accommodate various types of automated vehicles and deployment pathways, while continuing to maintain the current regulations for other vehicles. The key to a flexible and performance-based regulatory framework is an agreed classification system for automated driving. An agreed classification system will assist policy-makers, regulators, manufacturers and consumers to accurately group and make sense of different automated vehicle functions.

The key to a flexible and performance-based regulatory framework is an agreed classification system for automated driving

3.1 Automated driving functions

There are competing classification systems of vehicle automation, reflecting the various functions and technologies that have led to the development of automated vehicles. Of these, the SAE Levels of Driving Automation is the most commonly used.

Subject to stakeholder feedback, the NTC will adopt the SAE International Standard J3016 *Taxonomy and Definitions for Terms related to On-Road Motor Vehicle Automated Driving Systems* to describe and categorise levels of automation.

The SAE International Standard has six levels of driving automation from no automation (level 0) to full automation (level 5). **Figure 2** reproduces the SAE International Standard, which is based on distinguishing whether the human driver monitors the driving environment (levels 0-2) or the automated driving system monitors the driving environment (levels 3-5).

Figure 2: Levels of driver automation defined in SAE International Standard J3016[4]

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/ Deceleration	*Monitoring* of Driving Environment	Fallback Performance of *Dynamic Driving Task*	System Capability *(Driving Modes)*
***Human driver* monitors the driving environment**						
0	No Automation	the full-time performance by the *human driver* of all aspects of the *dynamic driving task*, even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the *driving mode*-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task*	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the *driving mode*-specific execution by one or more driver assistance systems of both steering and acceleration/ deceleration using information about the driving environment and with the expectation that the *human driver* perform all remaining aspects of the *dynamic driving task*	**System**	Human driver	Human driver	Some driving modes
***Automated driving system* ("system") monitors the driving environment**						
3	Conditional Automation	the *driving mode*-specific performance by an *automated driving system* of all aspects of the dynamic driving task with the expectation that the *human driver* will respond appropriately to a *request to intervene*	System	**System**	Human driver	Some driving modes
4	High Automation	the *driving mode*-specific performance by an automated driving system of all aspects of the *dynamic driving task*, even if a *human driver* does not respond appropriately to a *request to intervene*	System	System	**System**	Some driving modes
5	Full Automation	the full-time performance by an *automated driving system* of all aspects of the *dynamic driving task* under all roadway and environmental conditions that can be managed by a *human driver*	System	System	System	**All driving modes**

SAE International guidance states that these levels are descriptive rather than normative and technical rather than legal. **They imply no particular order of market introduction**. The definitions indicate minimum rather than maximum system capabilities for each level. A particular vehicle may have multiple driving automation features such that it could operate at different levels depending upon the features that are engaged or the environment in which it is operating.

Based on SAE International guidance, the 'dynamic driving task' includes the operational (steering, braking, accelerating, monitoring the vehicle and roadway) and tactical aspects of the driving task (such as responding to events, determining when to change lanes, turn, or use signals), but not the strategic aspect of the driving task (such as determining destinations and waypoints).

Partially automated

Partial automation exists in the road vehicle fleet today. While the system may take control of executing steering, acceleration and braking in defined circumstances, the human driver must continue to monitor the driving environment and the driving task and intervene if required:

- **The system** executes some of the dynamic driving task.
- **The human driver** monitors the driving environment.
- **The human driver** monitors the dynamic driving task and must respond appropriately to a request to intervene.

In a partially automated vehicle, the human driver continues to have monitoring and intervention responsibilities, and therefore the human driver continues **to have control of the vehicle.** By having control of the vehicle, the human driver remains responsible for the actions of the vehicle and the current legal framework can apply.

[4] Copyright © 2014 SAE International. The summary table may be freely copied and distributed provided SAE International and J3016 are acknowledged as the source and must be reproduced AS-IS.

Examples of partially automated vehicles

- **Auto Parking Assist:** the vehicle self-parks but the driver must monitor the environment during the automation mode and intervene if required.
- **Highway Driving Assist:** the vehicle can maintain an appropriate speed, safe distance to other vehicles and lane position, but the driver must monitor the environment during the automation mode and be ready to intervene if required.

Because partial automation exists in the road vehicle fleet today, the NTC suggests that partial automation should not be further considered in this project.

Conditionally automated

Manufacturers are developing prototype or limited release vehicles with conditional automation. In a conditionally automated vehicle:

- **The system** drives the vehicle for a sustained period of time.
- **The system** monitors the driving environment while in automated driving mode.
- **The human driver** monitors the automated driving system and must respond appropriately to a request to intervene.

In a conditionally automated vehicle, the human driver remains engaged in monitoring the automated driving system, while not having to drive the vehicle or monitor the driving environment.

There are some unique regulatory challenges with conditional automation. For example, if 'proper control' of the vehicle is interpreted by enforcement as meaning the human driver must keep at least one hand on the steering wheel, and the conditional automated feature enables the driver not to do so, the human driver may be accused of being in breach of state or territory road rules.

Conditional automation also raises important questions about what constitutes control. As discussed in **chapter 5**, it is yet to be determined whether monitoring the automated driving system means the driver has control of the vehicle and is therefore responsible for its actions.

Examples of conditionally automated vehicles

- **Automated Highway Driving:** system takes control of driving and monitoring the road environment on high-to-mid speeds on specific roads, but the driver monitors the automated driving system.
- **Heavy Vehicle Platooning:** system takes control of driving and monitoring the road environment on specific roads, and the driver monitors the automated driving system.

Highly automated

Vehicles with a high level of automation are already being trialled or demonstrated, with some prototypes currently under development. In a highly automated vehicle:

- **The system** drives the vehicle for sustained periods of time, or all of the time in defined places.
- **The system** monitors the driving environment.
- **The system** monitors the dynamic driving task and does not require a human driver to respond to a request to intervene.

What distinguishes high automation from conditional automation is that a highly automated vehicle is able to come to a safe stop ***without a human driver intervening***. For example, if a highly automated vehicle encounters inclement weather and its sensors fail, the vehicle must be able to come to a safe stop without requiring a human driver to intervene.

What distinguishes high automation from full automation is that a highly automated vehicle is limited in the roads, and or driving conditions, in which it is automated. Based on work undertaken by the United Nations Economic Commission for Europe (UNECE) World Forum for Harmonisation of Vehicle Regulations (WP.29) and the International Organisation of Motor Vehicle Manufacturers (OICA), a high level of automation can be achieved under two scenarios:

1. A vehicle that is always fully automated, but is limited in where it can operate.
2. A vehicle that is fully automated some of the time, but can drive everywhere at a lower level of automation.

Highly automated vehicles may be technologically advanced but are not necessarily operating in complex driving environments. For example, a driverless passenger carrier operating at low speeds in a pedestrian precinct, with no contact with other road vehicles and on a planned circuit, is highly automated from an SAE International perspective.

Examples of highly automated vehicles

- **Fully automated all the time, but on a limited network:** a human driver is not required to drive the vehicle, to monitor the driving environment or the driving task. EasyMile, for example, only operates on certified routes at low speed, in a controlled environment with no interaction with other motor vehicles.
- **Fully automated some of the time, but can drive everywhere at a lower level of automation:** Google has developed a prototype on-road vehicle that does not require a human driver to drive the vehicle, to monitor the driving environment or the driving task. It requires the route to be appropriately mapped before being driven by the automated vehicle, but a human can drive the vehicle on roads that have not been mapped.

Fully automated

Full automation requires all aspects of the driving task and monitoring of the driving environment and the dynamic driving task to be undertaken by the vehicle system. According to the SAE International Standard, full automation system capability is functioning across **all driving modes** and can therefore operate on all roads at all times. For these reasons, full automation is not anticipated in the short to medium term. In a fully automated vehicle:

- **The system** drives the vehicle at all times on all roads and under all conditions.
- **The system** monitors the driving environment at all times and under all conditions.
- **The system** monitors the dynamic driving task at all times and under all conditions and will not require a human driver to intervene.

SAE International states that current development and deployment necessarily focuses on conditional and high automation:

> This is because full automation, "the full-time performance by an automated driving system of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver," (SAE, 2014) remains elusive. Human drivers confront, and usually manage, an incredible variety of contexts—geographic areas, roadway types, traffic conditions, weather conditions, and events/incidents—for which automated vehicles have yet to be designed and demonstrated (International Transport Forum, page 13).

Full automation removes all elements of the human driver and in many respects creates a simpler regulatory environment because control of the vehicle, and responsibility for the actions of the vehicle, are clearly defined. But fully automated vehicles are potentially many decades from implementation, as there are many operational challenges. For example, a fully automated vehicle will require advanced sensors capable of operating in heavy rain or snow, and on poor quality roads.

3.2 Agreed automation functions is a critical success factor

While the SAE International Standard for levels of automation are explicitly technical rather than legal, agreeing on automation functions will be critical in the regulatory framework for automated vehicles.

For example, it is clear the difference between conditional and high automation has a direct impact on liability, given that a high automation vehicle will not require a human to respond appropriately to a request to intervene. Therefore, under high and full automation where humans are taken fully out of the loop and not required to intervene in the case of system failure or external events, such as a blizzard, there are increased requirements on manufacturers and services providers to ensure the safe operation of those vehicles.

An agreed classification of automation provides necessary clarity within the regulatory framework. This will enable legal instruments such as the ADRs, Australian Light Vehicle Standards Rules (ALVSRs) and Australian Road Rules to distinguish a multitude of different applications by reference to an automation function, rather than have to identify and address every specific application, where these are likely to develop and change over time.

A potential solution may be to legislate that the human driver is responsible for the actions of the vehicle where the driver has to monitor and intervene, including where the system requires the driver to respond to a request to intervene.

An agreed classification of automation will enable legal instruments to reference an automation function rather than identify and address every automated application

The continued monitoring function of the human driver will also have implications from a safety and productivity perspective. For example, if a heavy vehicle driver in a platoon is not required to monitor the dynamic driving task or respond to a request to intervene for the vehicle to come to a safe stop, a case could be made to regulate that period of high automation driving as a rest period for the purposes of work and rest hours in the HVNL. This would have significant safety and productivity benefits but is dependent on the safe operation of the system and the extent to which the driver can safely and genuinely not be required to monitor the vehicle.

Once we agree on the automation functions, the question arises of what the role of government should be. We explore these issues in the next chapter.

Automated driving functions – consultation question

Question 1 – Do you support the use of the SAE International Standard to classify automated road vehicle functions? Do you have any issues with using the SAE International Standard?

4 Role of government

KEY POINTS

- Government regulation must be responsive and proportionate.
- Government regulation should only be considered where a problem is high risk and significant, the community requires the certainty provided by legal sanctions or when universal application is necessary.
- Automated vehicles could support a safe system regulatory environment.

Should the evidence indicate that automated vehicles offer significant net benefits in terms of safety, mobility, productivity and environmental outcomes, a case exists that government should at a minimum ensure that the current regulatory framework does not impede their uptake (while ensuring other rights and benefits are not adversely affected).

State, territory and local governments will likely have a role in the facilitation of automated vehicles as road infrastructure owners and managers. For example, governments may have responsibilities as network operators to ensure that speed zone data is accurate and up-to-date. Beyond this role as infrastructure managers and owners, there is a question of what role governments should play through regulation, and what can be left to private sector self-regulation.

4.1 Government regulation must be responsive and proportionate

A number of the issues raised in this paper, including liability and privacy, could be resolved by the market, particularly through industry codes of practice and how the insurance industry responds to automated road vehicles within the existing regulatory framework. Ultimately, the courts will be arbiters on many of the issues, applying existing legislation and common law principles on a case-by-case basis.

However, there may be a role for governments to resolve the regulatory issues before the wide-scale introduction of conditional or highly automated road vehicles. Government action must be in response to, and proportionate to, a policy problem. Government action should also be based on an assessment of risk, such as a risk to safety, competition or consumer certainty.

While it is too early to comprehensively identify market failures, this paper is an opportunity to reflect on what the policy problems may be, and what is required to achieve the policy objectives of better safety, mobility, productivity and environmental outcomes.

The role of government to clarify the legal status of automated road vehicles would be warranted if the expected benefits related to automated vehicles do not eventuate, or eventuate at a slower pace, because of government inaction. Government action may be necessary because:

- the market is looking to governments to provide certainty that automated vehicles can operate legally in Australia
- consumers may receive contradictory information about the legality of automated vehicles
- enforcement agencies may interpret the road rules differently, resulting in inconsistent treatment of automated vehicles and generating more uncertainty in the marketplace
- governments may have a direct role to establish regulatory frameworks specifically for automated vehicles, including in relation to registration systems, accident compensation funds and enforcement guidelines
- litigation is retrospective and undertaken on a case-by-case basis and could result in piecemeal outcomes – relying on test cases may not resolve uncertainty.

4.2 Will regulation solve the problem?

Industry stakeholders have indicated to governments that the removal of doubt as to the legal status of automated road vehicles is important. But in the event there are legal barriers to vehicle automation, once they are removed, replacing them with other regulation is not the only option. The removal of regulatory barriers could be off-set by a range of alternative regulatory practices. The Australian Government *Best Practices Regulation Handbook* (2010) provides a range of options:

- **Self-regulation:** characterised by industry-formulated rules and codes of conduct, with industry responsible for compliance. This is a feasible option when there is no strong public interest concern (particularly no major public health and safety concerns), when the problem is a low-risk event, of low impact or significance, and the problem can be fixed by the market itself. However, self-regulation may be less effective if industry has an incentive not to comply with the rules.
- **Quasi-regulation:** characterised by a wide range of rules or arrangements, where governments influence businesses to comply, but without explicit government regulations. These include industry codes of practice developed with government involvement, guidance notes, industry-government agreements and accreditation schemes.
- **Co-regulation:** where industry develops and administers its own arrangements, but government provides legislative backing to enable the enforcement of the arrangements. Legislation may also provide for government-imposed rules if that industry does not meet its own responsibilities. This is the current approach with the rail industry through the RSNL.
- **Explicit government regulation:** characterised by direct regulation comprised of primary and subordinate legislation. Explicit government regulations should be considered where:
    - the problem is high risk, of high impact or significance (e.g. a major public health and safety issue)
    - the community requires the certainty provided by legal sanctions
    - universal application is required or judged necessary
    - there is a systemic compliance problem with a history of intractable disputes.

A future regulatory framework can include each of these forms of regulation, and as mentioned above, the courts will apply existing legislation and common law principles on a case-by-case basis.

The NTC discussion paper will consider regulatory options at each point in the lifecycle of the automated road vehicle, as set out in **section 1.6.** The best regulatory approach will depend on the merits of each option against the criteria outlined above.

4.3 When to regulate

Governments, industry and the community should also consider when to regulate. The optimum timing for regulation will be shaped by the progress of regulation overseas, including the development of international conventions and standards, growing clarity as to how the technology will develop, and manufacturer and consumer demand for regulatory certainty.

Broadly speaking, there are three phases in the development of any new or disruptive technology when it could be the optimum time to regulate:

- regulate when there is technology and implementation certainty
- regulate when there is an initial deployment
- regulate after market saturation.

It is important that governments and markets do not regulate too early if this stifles innovation or results in locking a technology path in regulation. In the context of automated vehicles, **it is important that regulations do not create artificial barriers between conditional, highly and fully automated vehicles.**

However, regulating after there is market saturation may be too late or impractical if regulatory barriers prevent the safe and legal operation of automated vehicles.

4.4 How to regulate

At a high level, there are three ways that governments can approach the regulation of automated road vehicles:

1. **Accommodate automated road vehicles within the existing exemption framework:** exemptions provide a flexible framework to support short-to-medium term uptake, but may not provide industry and consumers with sufficient certainty, or support significant volumes of automated vehicles.

   The current exemption frameworks for vehicle design standards and road rules compliance (outlined in **chapter 10**) can facilitate automated vehicles in the absence of specific automated vehicle regulation.

2. **Create a framework for automated road vehicles that sits alongside the current regulatory framework** – governments already have parallel regimes for certain vehicles. Some over mass heavy vehicles, for example, can only access certain parts of the road network as part of the Intelligent Access Program. This approach is dynamic and can support a larger scale introduction of automated vehicles without extensive amendments to the current laws.
3. **Amend current laws and remove barriers within the current regulatory framework** – a full-scale amendment of current laws is the most comprehensive but least flexible option. This approach is most effective when there is technology and market certainty.

Within these three broad approaches, governments, industry and the community will need to consider the following elements for any future regulatory framework for automated road vehicles:

Regulation of the broader operating system:

- Regulate the automated vehicle only, or regulate both the automated vehicle and the broader automated vehicle operating system?

Regulation based on positive obligations or liabilities:

- Regulate automated vehicles based on positive obligations (ex ante obligations) or rely on after the fact liability (ex post liabilities), or a mix of both?

Regulation to ensure enforcement certainty:

- Regulate to allow for exemptions to rules, or regulate to allow for Authorised Officer discretion?

Regulation based on performance standards or prescriptive rules:

- Regulate a performance-based approach to allow innovation, or prescribe rules to provide greater certainty?

Regulation to ensure safety assurance:

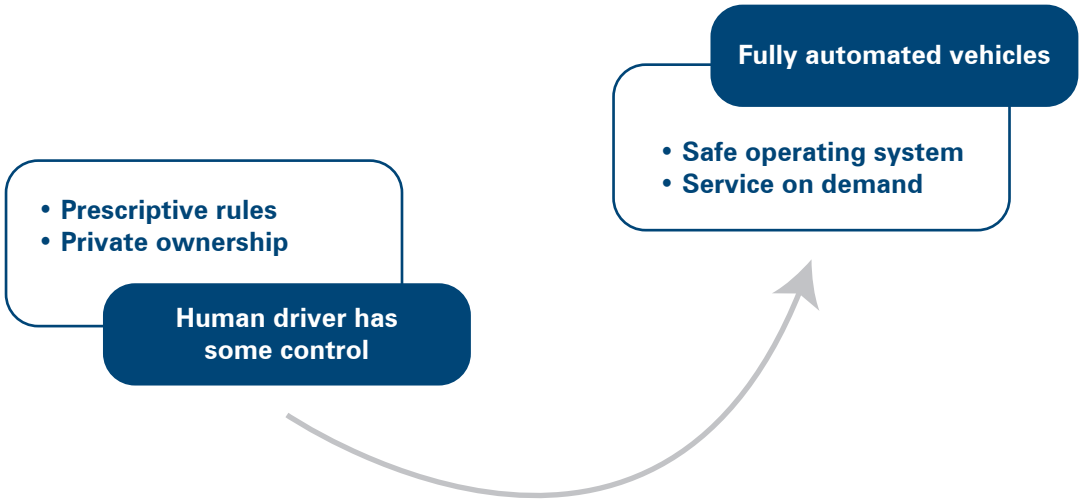
- Regulate based on the presumption of safe operations and reliance on international standards, or based on the presumption that automated vehicles will be dangerous?
- If regulating on the basis of danger, how will safety be assured? What forms of certification, type approval, or demonstration of compliance with standards should be required?

Automated road vehicles can support a safe system regulatory environment

Emerging technology and operating models provide opportunities to reconsider how society regulates traffic. Highly or fully automated vehicles could be managed by accreditation of the automated vehicle operation, similar to rail accreditation today.

Figure 3 illustrates how automation could significantly impact the regulatory framework for road vehicles.

Figure 3:
How fully automated vehicles could operate within a safe system regulatory environment



Prescriptive rules are specified road rules, such as driving within the speed limit, whereas a safe operating system is a risk-based approach where vehicle speed is based on the safety risks of the environmental conditions. As automated vehicle technology matures, there will be greater opportunities to operate automated vehicles within a safe system approach not reliant on prescriptive road rules. However, such an approach may not be compatible when the network is a mixed fleet of automated and non-automated vehicles.

Figure 3 above sets out one scenario. The future may hold a mix of prescription and safe system approaches, and a mix of private vehicle ownership and short-term hire of vehicles within a service-on-demand model.

Role of government – consultation question

Question 2 – What do you think the regulatory role of governments should be to support the introduction of automated vehicles in Australia?

5

Issues with regulating the driver

KEY POINTS

- The current Australian Road Rules require the driver be a human driver.
- It is unclear if monitoring a vehicle constitutes control.
- Enforcement interprets 'proper control' to mean at least one hand on the steering wheel – this may be a regulatory barrier if proper control can be safely achieved in other ways.
- Effective operation of traffic laws will need to identify who is responsible for the vehicle.

5.1 Australian Road Rules

Current regulatory framework

The Australian Road Rules are model law developed by the NTC which form the basis for state and territory road rules. The Road Rules only take effect once they are adopted into the law of a state or territory. For example, in Victoria the Road Rules are reflected in the Road Safety Road Rules 2009, made under the *Road Safety Act 1986.*

The Australian Road Rules are broadly consistent in each jurisdiction. However, road legislation in each state and territory is combined with other road safety or traffic laws which may have separate automated vehicle barriers or issues to assess. For this reason, **section 5.1** considers barriers or issues relating to the Australian Road Rules, while any additional barriers or issues with state and territory legislation are canvassed in **section 5.2.**

The origin of the Australian Road Rules is the 1949 Geneva Convention on Road Traffic which Australia is a signatory to. The Australian Road Rules intend to promote road safety by establishing uniform rules of the road for drivers and riders of motor vehicles, riders of bicycles, pedestrians, passengers and others.

In broad terms, the Australian Road Rules cover fundamental rules of driving on shared roads. They include:

- keeping left, overtaking, driving in lanes of traffic and merging
- making turns, including U-turns and hook turns
- what to do at roundabouts and level-crossings
- what to do when faced by traffic lights and arrows
- giving way in various situations (e.g. when not facing any lights)
- rules for persons travelling in or on vehicles.

Rule 297 provides that a driver must have proper control of the vehicle:

(1) A driver must not drive a vehicle unless the driver has proper control of the vehicle.

(1A) A driver must not drive a vehicle if a person or an animal is in the driver's lap.

(2) A driver must not drive a motor vehicle unless the driver has a clear view of the road, and traffic, ahead, behind and to each side of the driver.

The Australian Road Rules assume the presence of a human driver who is able to exercise human judgement, and a number of rules require a human driver to function. It is noted, however, that 'proper control' is not defined. For example, the Australian Road Rules do not specify that proper control requires the driver to have at least one hand on the steering wheel.

The Vienna Convention on Road Traffic

The 1968 Vienna Convention on Road Traffic supplements previous road traffic conventions, including the Geneva Convention on Road Traffic. While Australia is not a contracting party to the Vienna Convention, the Australian Road Rules are broadly consistent with the Vienna Convention.

The Vienna Convention covers the role of the driver. Like the Australian Road Rules, the current Convention requires that the driver must be in control of the vehicle, and it clearly implies that the driver is a human driver. Article 8 states that:

1. Every moving vehicle or combination of vehicles shall have a driver.
2. It is recommended that domestic legislation should provide that pack, draught or saddle animals, and, except in such special areas as may be marked at the entry, cattle, singly or in herds, or flocks, shall have a driver.
3. Every driver shall possess the necessary physical and mental ability and be in a fit physical and mental condition to drive.
4. Every driver of a power-driven vehicle shall possess the knowledge and skill necessary for driving the vehicle; however, this requirement shall not be a bar to driving practice by learner drivers in conformity with domestic legislation.
5. Every driver shall at all times be able to control his vehicle or to guide his animals.
6. A driver of a vehicle shall at all times minimize any activity other than driving. Domestic legislation should lay down rules on the use of phones by drivers of vehicles. In any case, legislation shall prohibit the use by a driver of a motor vehicle or moped of a hand-held phone while the vehicle is in motion.

Proposed changes to the Vienna Convention still require a human driver

Proposed changes to the Vienna Convention do not extend to highly or fully automated vehicles and the proposed changes would still require a human driver.

In March 2015, the Economic Commission for Europe Working Party on Road Traffic Safety (WP.1) released a report on behalf of the Economic and Social Council of the United Nations that proposed an amendment to Article 8 of the Vienna Convention. The proposed amendment would recognise that a driver is still in control of the vehicle, even if a vehicle system influences the way the vehicle is driven:

> Vehicle systems which influence the way vehicles are driven shall be deemed to be in conformity with paragraph 5 of this Article and with Article 10, when they are in conformity with the conditions of construction, fitting and utilization according to international legal instruments concerning wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles.

The Explanatory Note states that 'the driver's obligation to monitor and control any kind of action taken by a vehicle system is addressed by the guiding principle underlying all road traffic rules. The systems are not designed to overrule decisions taken by sane, accountable drivers.'[5] The proposed changes therefore only relate to partial or conditional automation where the human driver remains in control of the vehicle. The requirement for the driver to remain engaged in the driving function means that, while there can still be some automated functions like traffic jam assist or lane change assist, the driver is still responsible.

There must always be an entity responsible for the vehicle

The Vienna Convention requires a driver to be responsible for the vehicle. The Convention states *'every moving vehicle or combination of vehicles shall have a driver'* (Article 8.1), while in effect the Australian Road Rules require a driver to be responsible for most rules.

The first principle of the road rules is that a legal person must always be responsible for the vehicle. This is reflected in a range of rules that could not function without a legal person responsible for the actions of the vehicle.

Likewise, in civil tort and criminal law there must be a legal person responsible for the actions of the vehicle for any civil liability or criminal offence to be committed.

Issues with the current regulatory framework

Issue 1: Australian Road Rules implicitly require the driver to be human

The Australian Road Rules assume the driver is a human driver and there are currently no proposed changes to the meaning of driver in the Vienna Convention.

[5] Report of the 70th session of the Working Party on Road Traffic Safety, 2015, *Amendments to Article 8 and Article 22 of the Convention on Road Traffic (1949).*

Our initial review suggests that to allow highly or fully automated vehicles to be driven on the road would require amendments to the Australian Road Rules to clarify that a driver with proper control could be the automated vehicle system. Without amendments to the meaning of driver in the Australian Road Rules, it is possible that highly or fully automated vehicles could not operate in Australia.

There are also numerous Australian Road Rules that relate to the driver's responsibility in regards to speeding, turning, giving way, stopping and obeying signs and road markings that currently relate to drivers as humans. Without expanding the definition of driver to include an automated vehicle system, the following examples are rules that could not currently apply to a highly or fully automated vehicle. A driver:

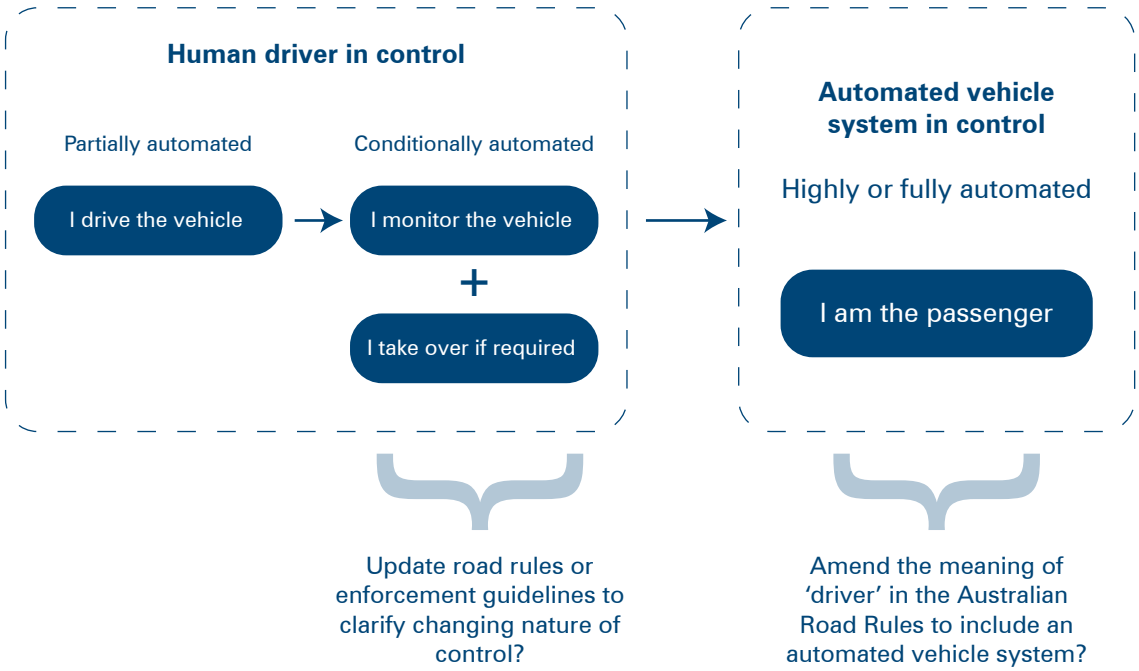
The concept of the driver in the Australian Road Rules is not a barrier for partial or conditional automated vehicles, but could be the most significant barrier to introducing highly or fully automated vehicles in Australia

- must not drive at a speed over the speed-limit applying to the driver for the length of road where the driver is driving
- turning right at an intersection with traffic lights and a hook turn only sign must turn right by making a hook turn in accordance with this rule
- approaching or at traffic lights showing a red traffic light must stop
- at an intersection with a stop sign or stop line, but without traffic lights, must stop and give way in accordance with this rule.

These rules may not necessarily require redrafting if the definition of driver was expanded to include the automated vehicle system.

Figure 4 illustrates how the Australian Road Rules could be a barrier to highly or fully automated vehicles when a human driver is no longer in control of the vehicle.

Figure 4:
The changing nature of control in automated vehicles and some potential solutions



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An expansion of the definition of driver to include an automated vehicle system will not resolve all issues in the Australian Road Rules, as a small number of the rules may also need to be redrafted. An example is Rule 54 which sets out how to give a stop signal. The rule states that:

> (1) The driver of a vehicle must give a stop signal by means of the vehicle's brake lights. (2) However, if the vehicle's brake lights are not in working order or are not clearly visible, or the vehicle is not fitted with brake lights, **the driver must give the stop signal by giving a hand signal** in accordance with rule 55, or using a mechanical signalling device fitted to the vehicle. [Emphasis added.]

The current drafting of Rule 54 is not necessarily a barrier to automated vehicles. However, it does provide an example of where the Australian Road Rules could be streamlined to take into consideration automated vehicle systems.

While criminal laws include manslaughter committed by an individual and corporate manslaughter, the NTC discussion paper will consider whether criminal laws are sufficiently flexible to allow for the driver to be a human or a vehicle system controlled by another legal entity. For example, if an automated vehicle system can commit reckless driving (Glancy et al, p.50).

Issue 2: it is unclear if monitoring a vehicle constitutes 'control'

Based on the SAE International Standard, an automated vehicle system in a highly or fully automated vehicle must have control of the vehicle. In a highly or fully automated vehicle the automated vehicle system is responsible for the driving task and monitoring the road environment and is not reliant on a human driver to intervene to come to a safe stop.

Who has control of the vehicle in a conditional automated vehicle needs to be clarified. A key issue is whether *monitoring* the automated system and *responding to a request to intervene* means the human driver is in control.

Figure 4 above makes a critical assumption that even if the human driver only has responsibility for monitoring the automated vehicle system and responding to a request from the system to intervene, the driver is in control of the vehicle. If this is correct, it is possible that the issue of automated vehicle control in the Australian Road Rules would only apply to highly or fully automated vehicles where – by definition – the automated vehicle system is in control.

The aviation sector has had conditional automation for many years which requires pilots to monitor the automated operating system. Aviation rules are clear that the pilot remains responsible for the safe operation of the aircraft.

Nonetheless, the assumption that monitoring and responding to a request to intervene by the system constitutes control of the vehicle remains to be tested and agreed for automated road vehicles. One solution may be to clarify in the Australian Road Rules whether monitoring and intervention responsibilities constitute control for the purposes of the Rules.

Issue 3: 'proper control' is interpreted to mean a hand on the steering wheel

The meaning of 'proper control' in the Australian Road Rules is not defined and hence the ordinary meaning of the terms *proper* and *control* would apply. According to the Macquarie Dictionary, *proper* means adapted or appropriate to the purpose or circumstances; fit; suitable. *Control* means to exercise restraint or direction over; dominate; command.

These terms and definitions are performance based. There is therefore no express requirement in the Australian Road Rules for a human driver to control the vehicle in a particular way, such as holding the steering wheel or sitting in the driver's seat. Clearly, an automated vehicle system should be able to command the vehicle in a way that is safe and appropriate for the intended purpose.

Subject to the definition of 'driver' being resolved, the requirement to have 'proper control' does not appear to create any barrier to introducing automated vehicles. However, in practice there may be a barrier in relation to how enforcement agencies interpret proper control. An example is a conditional automated function such as Automated Highway Driving: the system takes control of driving and monitoring the road environment on specific roads, but the driver continues to monitor the automated driving system. In this scenario, when the vehicle is on Automated Highway Driving mode it is arguable that the human driver is still in control without holding the steering wheel, braking or indicating a lane change.

Enforcement agency interpretation of 'proper control' to mean one hand on the steering wheel is a potential barrier to automated vehicles

In the future, many manufacturers offering conditional automation may advise or require the human driver to periodically monitor the driving system. As discussed in **chapter 7** on liability, this may be required as a vigilance control to ensure the driver remains alert and in a state of readiness to resume control of the driving task. Nonetheless, this is not required in the Australian Road Rules. The key question is: *should the definition of 'proper control' be clarified?*

There appear to be two ways that 'proper control' could be clarified for drivers in conditional automated vehicles:

1. The Australian Road Rules could be amended to clarify the meaning of proper control in automated and non-automated vehicles This approach would provide legal certainty, but could require the Australian Road Rules to use and define terms such as *monitor* and *intervene* to accommodate conditional automation.
2. National enforcement guidelines are a flexible alternative to amending the Australian Road Rules that would allow for the meaning of 'proper control' to be updated in a timely manner. However, national guidelines are not legally binding and may not provide manufacturers and consumers with a sufficient level of confidence that drivers can safely monitor a conditional automated system without keeping at least one hand on the steering wheel or other specific human-related control requirements.

There could also be an opportunity to clarify 'proper control' for highly or fully automated vehicles where the driver is the automated vehicle system, such as by reference to relevant vehicle standards.

5.2 State and territory road safety and traffic legislation

Current regulatory framework

Each state and territory has its own road safety and traffic legislation, within which sit the Australian Road Rules and other provisions, such as registration, licensing and requirements to obey directions from an Authorised Officer.

This section focuses on those elements of state and territory road safety and traffic legislation that could be a regulatory barrier to the introduction of automated vehicles. These are additional issues to those identified in relation to the Australian Road Rules.

Issues with the current regulatory framework

Issue 4: many state and territory laws assume the driver is human

Similar to the Australian Road Rules, many state and territory road safety and traffic laws assume the driver is human. The definition of driving in state and territory legislation does not expressly require a human driver, but the assumption of a human driver means that a number of provisions could be unworkable with the introduction of automated road vehicles. Requirements in the law to respond to directions of an Authorised Officer are an example of where the intent of the law may have to be achieved through alternative means.

Table 3 below illustrates how the current laws may contain regulatory barriers with examples drawn from South Australia's *Road Traffic Act 1961* (SA).

Table 3: Examples in the South Australian Road Traffic Act 1961 of how road traffic laws could create a barrier to the effective operation of automated vehicles

Road traffic law examples	Potential barrier to effective operation of the law
Section 40C **the meaning of qualified, fit or authorised to drive** – requires the qualified person to hold a driver's licence of the appropriate class to drive the vehicle	Only a natural person can hold a driver's licence – would mean that an automated vehicle system could not be qualified, fit or authorised to drive
Section 40D **the meaning of unattended vehicle** – a vehicle is unattended if an officer inspects the vehicle and there is apparently no person in or near the vehicle who appears to be the driver	It remains to be determined in what circumstances an automated vehicle is unattended'
Section 40L **manner of giving directions** – allows a direction to be given to a driver orally or by means of a sign or signal (electronic or otherwise), or in any other manner	This provision allows for the electronic direction of a vehicle, but it is directed to the driver, not an automated vehicle system
Section 43 **duty to stop and give assistance where person killed or injured** – the driver of a vehicle involved in a an accident must stop and give all possible assistance and within 90 minutes after the accident, 'present himself or herself to a police officer at the scene of the accident or at a police station for the purpose of providing particulars of the accident and submitting to any requirement to undergo a test relating to the presence of alcohol or a drug in his or her blood or oral fluid'	A highly or fully automated vehicle without passengers can stop after an accident, and may be able to give assistance in the form of an automatic emergency call, but is not capable of making a statement to a police officer or taking a drug or alcohol test

All Australian jurisdictions have similar issues. Principle- or performance-based provisions could be introduced in state and territory legislation to accommodate automated vehicles in road safety and traffic laws. Alternatively, road safety and traffic laws could be amended to remove implicit requirements for a human driver where it is relevant to do so, or redefine 'driver' to capture automated vehicle systems.

A range of state and territory laws relate to human driver behaviour. These include provisions related to drink driving, alcohol interlocks and drug driving that are simply not relevant to highly or fully automated vehicles that don't have a human driver. Such provisions could continue in legislation without being a barrier to more automated vehicles.

The NTC discussion paper will undertake a full review of each state and territory's road safety and traffic legislation to identify any provisions that could be a barrier, risk or issue for more automated vehicles.

Issue 5: effective operation of traffic laws will need to identify responsibility for the vehicle at a given point in time

In a highly automated vehicle there could be times when the driver is driving and in control and times when the automated vehicle system is driving and in control and the human driver does not have to monitor the driving task. Enforcement agencies and the courts will have to be able to identify who was in control of the vehicle at any particular time.

There are existing owner onus provisions for camera-detected offences and parking offences that place the obligation on the owner to demonstrate that he or she was not responsible for the vehicle at the time of the alleged infringement.[6] This approach might provide a model for holding automated vehicle owners or operators responsible for any breach of traffic laws, with a mechanism that allows them to identify the human driver as responsible for the offence. This could be ascertained from the vehicle data.

Alternatively, the human driver could be prime facie in control at all times and have as a defence to an alleged offence that the automated vehicle system was in control of the vehicle at the time of the incident.

Identifying responsibility for the vehicle may not be an issue for partial or conditional vehicles if the human driver remains in control of the vehicle, even if the vehicle was in 'automated mode.' Likewise, this may not be an issue for some highly or fully automated vehicles if the vehicle is never controlled by a human driver. However, enforcement agencies would continue to need to identify a responsible party for the vehicle.

Issues with regulating the driver – consultation questions

Question 3 – Have we identified the key issues relating to the Australian Road Rules and state and territory road safety and traffic laws? Are there other issues that should be assessed as part of the NTC review?

[6] For example, the *Road Traffic Act 1961* (SA) has owner onus provisions for camera-detected offences (section 79B) and parking offences (section 174A).

6

Issues with regulating light vehicles

KEY POINTS

- New vehicles in Australia must meet the ADRs, based largely on UN regulations.
- New ADRs may be needed for different types of automation.
- New ADRs for automated vehicle standards could capture more of the driving task and regulate compliance with road safety and traffic laws.

6.1 Australian Design Rules for new vehicles

The current ADRs capture the physical vehicle (such as the structure of the vehicle) and the performance of the physical vehicle (such as braking and headlight luminosity). The ADRs do not ensure road rules compliance given that road rules today – and how the vehicle behaves on the road – are the responsibility of the human driver. Therefore, there are two distinct regulatory frameworks that distinguish between vehicle design rules (regulated by the Commonwealth) and road safety traffic laws (regulated by states and territories).

The *Motor Vehicle Standards Act 1989* (Cwlth) requires all road vehicles, whether they are newly manufactured in Australia or imported as new or second-hand vehicles to comply with the relevant ADRs at the time of supply to the Australian market.

The ADRs are national standards for vehicle safety, anti-theft and emission controls. The ADRs are generally performance-based and cover issues such as occupant protection, structures, lighting, noise, engine exhaust emissions and braking.

It is Australian Government policy to harmonise the national vehicle safety standards with UN regulations where possible.[7] These standards are largely performance based and this approach is preferred by industry as it allows for innovations in design, so long as the underlying performance needs are met.

[7] Department of Infrastructure and Regional Development website (2016).

Australia is also a signatory to the 1958 and 1998 UN agreements which cover mutual recognition of approvals and harmonisation of technical requirements for self-certification and type approval. There are, however, some instances where the ADRs depart from UN standards because of a local technical or regulatory variation. For example, ADRs 63 and 64 relate to road trains and/ or B-doubles, which are not covered by UN regulation.

The large majority of vehicles entering the Australian market are new vehicles that meet the latest ADRs. However, the *Motor Vehicles Standards Act 1989* also provides a number of concessional arrangements for the importation and supply of vehicles, such as enthusiast vehicles or personal imports. These provide concessions as long as other specific requirements are met.

Government has adopted a risk-based approach to ADR compliance and safety assurance

In line with type approval systems around the world, the Commonwealth Government requires vehicle manufacturers to ensure compliance with the ADRs through the provision of evidence as part of an approvals process. This is then followed up by a risk based audit program. This is considered a reasonably light touch approach which places a measure of responsibility and trust with manufacturers.

The Commonwealth does not test ADR-compliance on new vehicles. Entities involved in the manufacture, importation and supply of road vehicles to the market are responsible for ensuring compliance with the requirements of the *Motor Vehicle Standards Act 1989 and the Competition and Consumer Act 2010.*

The Australian Competition and Consumer Commission (ACCC) provides a second layer of regulation by administrating vehicle recalls. These will occur when there is a vehicle safety defect that will or may cause injury or when a vehicle does not comply with an ADR within the terms of the *Competition and Consumer Act 2010.*

Issues with the current regulatory framework

Issue 6: new design rules may be needed for different types of automated vehicles

The current ADRs do not preclude automated vehicles, but it is possible that some highly or fully automated vehicles that do not have certain features, such as a steering wheel, brake pedal or rear view mirror, may not be imported into Australia today without an ADR exemption. The ADRs could therefore be a regulatory barrier to wide-scale commercial introduction of some automated vehicles.

Table 4 provides examples of current design rules that highly or fully automated vehicles may impact. It highlights that some design rules will always be required regardless of automation, while other design rules could change and others added.

However, all current design rules could continue to be relevant to those highly automated vehicles that are not automated all the time and enable a human driver to take back control of the vehicle.

Additional vehicle design rules may need to be developed to introduce new standards related to technology performance. For example, security standards for automated vehicle systems could be included in the design rules to ensure trusted systems can cooperate, can protect personal information and can prevent hacking. On the other hand, responsibility could remain with industry to agree and maintain technology performance standards.

Table 4: Examples of design rules impacted by highly or fully automated vehicles: what could stay, what could change and what could be new

What could stay?	What could change?	What could be new?
ADR 2—Side Door Latches and Hinges Side door hatches and hinges do not relate to the human driver function and would remain relevant.	**ADR 10 Steering column** Without a human driver in some highly or fully automated vehicles, the requirement for a steering column would not be necessary.	**Operating systems** Software systems and the broader operating environment of the automated vehicle system.
ADR 69 Full frontal impact occupant protection Car impact standards would remain relevant.	**ADR 14 Rear view mirrors** Without a human driver in some highly or fully automated vehicles, the requirement for a rear view mirror would not be necessary.	**Mapping location updates** It is possible that mapping location standards will need a minimum level.
ADR 4 Seatbelts Seatbelts do not relate to the human driver function and would remain relevant.	**ADR 31 Brake systems** Without a human driver in some highly or fully automated vehicles, the requirement for the driver to 'brake from his driving seat without removing his hands from the steering control' would not be necessary.	**Data exchange** It is possible that systems will need to exchange data messages with infrastructure and other vehicles.

Policy makers and stakeholders should consider whether parallel ADRs for automated vehicles are the best solution, or if alternative approaches should be considered. One approach could be to maintain a set of ADRs that are sufficiently performance based so they cover all vehicles, including automated vehicles.

Amending current standards to keep pace with automated vehicles is likely to be addressed through the development of new international standards. For example, ADR 10 in relation to the steering column is fully harmonised with the relevant UN regulation and is applied regulation. This means that any changes made to steering column design by the UN to accommodate automated vehicles would be accepted in Australia.

Unique design rules may be needed for Australia

If UN standards adapt with the development of automated vehicles, governments and industry should consider what – if anything – is unique about Australia that would warrant vehicle design rules that depart from, or are in addition to, UN standards.

We have seen that Australia already has different design rules to match local conditions and regulations. There are some aspects of the Australian road environment that will require special consideration. For example, an automated vehicle will need to understand and respond safely to a kangaroo crossing the path of a vehicle as kangaroos move differently to other animals. However, the extent to which the safety performance of an automated vehicle should be regulated to this level through the ADRs is open to discussion and will depend on the regulatory approach adopted.

Many manufacturers and automated vehicle developers, such as Google, are already building a profile of driving scenarios and situations, which includes encounters with different road behaviours and animals. This is occurring without government oversight. The current regulatory framework of consumer laws and product liability could be sufficient to ensure that anything unique about the Australian road environment will be adequately dealt with by manufacturers.

Local trials are important because they can evaluate what is unique about driving in Australia

Future automated vehicle trials and testing in Australia are important because they can evaluate what is unique about driving in our country and can identify what needs to be captured in the design of imported automated vehicles. As our understanding of the Australian road environment develops, we will be in a better position to understand what impact automated vehicles could have on the ADRs.

Issue 7: design rules could capture more of the driving task

In the event that automated vehicles take on greater responsibility for the safe driving of the vehicle, the ADRs may have a role ensuring new and imported vehicles are safe and comply with the Australian Road Rules.

One approach may be to develop an ADR that sets out a performance-based requirement for vehicles to be compliant with state and territory road rules. Such a design rule could reference the relevant state and territory legislation, or provide manufacturers with the tools to identify the rules for including in any Australia driving profile.

Unless road rules are fully standardised, such an Australian profile would require subsets for each jurisdiction and it could be the manufacturers' responsibility to ensure that each subset remains current.

For example U-turn legislation in New South Wales (NSW) states that at traffic lights a driver must not make a U-turn unless a sign permits it. However, in Victoria a driver can make a U-turn at any traffic lights unless a sign does **not** permit it. For an automated vehicle to comply with the Australian Road Rules and local traffic laws, the vehicle would need to know which state or territory it is operating in.

Further consideration needs to be given as to whether automated vehicle compliance with road rules should be assured through the ADRs or whether this can be achieved without government oversight. Subject to further analysis and discussion, it may be that the current regulatory framework of consumer laws and product liability laws could be sufficient to ensure that manufacturers comply with the road rules, without amending the ADRs or through another regulatory mechanism.

Chapter 5 discusses potential regulatory barriers related to the Australian Road Rules.

In September 2015, it was discovered that on some vehicles, Volkswagen had intentionally installed software in diesel engines that could detect when the vehicle was being tested and then alter the vehicle's emissions performance to demonstrate compliance with environmental standards.

Vehicle emissions compliance approaches do not relate to automated vehicles, but the example illustrates the traditional trust that governments have placed in global manufacturers to meet design standards.

If new design rules and standards are to include the performance of vehicles in relation to road rules, there may be a case for governments to have a greater role in safety assurance. Alternatives to the type approval approach include:

- government testing
- third party certification
- self-certification with additional third party audits.

How safety assurance of automation is dealt with in each manufacture's country of origin, and the development of international standards in this area, will be a key factor in resolving this issue. For example, in 2015 the State of California released draft automated vehicle deployment regulations which will establish manufacturer requirements to allow the provisional public operation of automated vehicles. The standards include a requirement for safety certifications from the manufacturer as well as an independent testing organisation to validate the readiness of the automated vehicle for deployment.

Australian policy-makers should watch closely to see what standards and certification approach is adopted in countries with an automotive export market to Australia.

6.2 In-service vehicles and modification

Current regulatory framework

States and territories are responsible for regulation of in-service use and the operation of light vehicles after they have been supplied to the market. In-service standards for heavy vehicles are regulated by the HVNL.

The Australian Light Vehicles Standards Rules (ALVSRs) require vehicles that are subject to ADRs when they are manufactured or imported to continue to comply with those rules while they are in service. The ALVSRs also have combination requirements, such as some dimensional limits, which are not specified in the ADRs.

The ALVSRs are model law developed by the NTC. Amendments are typically proposed by local road authorities or by law enforcement agencies. Once ministers have agreed any changes to the ALSVRs, it becomes a matter for the states and territories to legislate to update their own rules. The ALVSRs may be incorporated into local laws in their entirety or introduced with some changes.

Issues with the current regulatory framework

Issue 8: some in-service vehicle standards assume a human driver

As with ADRs, most vehicle standards will continue to be relevant for automated vehicles, while others may create potential regulatory barriers that may need to be addressed.

For example, in the ALVSRs there will clearly be a continued requirement for braking standards and the current rule in relation to braking performance would continue to apply to an automated vehicle.[8] However, elsewhere in the ALVSRs it provides that:

> A motor vehicle must be built: (a) to allow the driver a view of the road and of traffic to the front and sides of the vehicle so the driver can drive the vehicle safely.[9]

This standard appears to have been drafted in the context of human drivers, given that automated vehicle systems do not 'view' the road in the same way that human drivers do. To ensure there are no barriers to highly or fully automated heavy vehicles, the ALVSRs could be amended to ensure the principles are retained but without the assumption of a human driver. Alternatively, the definition of 'the driver' in the ALVSRs could be redefined to capture either a human driver or the automated vehicle system.

Issue 9: vehicle modification may require increased regulatory oversight

State and territory governments actively oversee light vehicle modifications in limited circumstances (such as modification of a petrol engine to operate on liquefied petroleum gas). They generally rely on a mix of self-regulation and roadside enforcement to ensure compliance with vehicle standards.

The Motor Vehicle Insurance and Repair Industry has a voluntary code of conduct for vehicle repairers. The Federal Chamber of Automotive Industries (FCAI) has also developed the *Voluntary Code of Practice for Access to Service and Repair Information for Motor Vehicles*, which is based on the following principles:

- that consumers should be able to choose who maintains and/or repairs their motor vehicle
- independent repairers should be able to access all information required for the diagnosis, body repair, servicing, inspection, periodic monitoring and reinitialising of the vehicle in line with the service and repair information that manufacturers provide to their authorised dealerships.

As vehicles become increasingly automated, there is a risk that modifications to the physical vehicle (including vehicle sensors) and modifications to vehicle software (including software that ensures compliance with the Australian Road Rules) could impact the safe operation of the automated vehicle system. For example, replacing a vehicle's tyres can impact its automatic braking system performance.

Manufacturers and technology providers manage modification issues today through the development of accredited repairer networks and the codes of practices noted above. Vehicle modification could continue to be self-regulated within the context of consumer laws and product liability, and there may not be any regulatory barriers to address. However, because highly and fully automated vehicles may undertake the driving task without human intervention, governments may seek increased regulatory oversight, particularly in relation to a vehicle modification that is privately undertaken and outside the scope of consumer law.

Vehicles retrofitted with automated functionality are another consideration. Aftermarket fitment could be self-regulated by industry, or there could be a role for governments to oversee aftermarket automation because of the high risk to road safety if the aftermarket device was incorrectly fitted.

As noted in **chapter 3**, a high risk problem is a sufficient reason for explicit government regulation in accordance with the *Best Practice Regulation Handbook.*

[8] ALVSR, Part 8 Div 1.

[9] ALVSR, Part 4 Div 1, 30.

Governments have closely regulated aftermarket modifications in the past.

After the introduction of the Ozone Protection and Synthetic Greenhouse Gas Management Regulations Act 1989, many vehicles using CFCs in air conditioning systems needed to be upgraded. Governments agreed the competence of mechanics to upgrade air conditioning systems was a significant safety issue that warranted regulatory oversight, and the Australian Refrigeration Council was appointed to administer the Ozone Protection and Synthetic Greenhouse Gas Act 1995.

As a result, a licensing regime to handle refrigerants and air conditioning equipment was introduced.

Governments already have legislative instruments to undertake vehicle inspections if they wish. For example the Central Inspection Authority of South Australia, established under the *Road Traffic Act 1961*, can require vehicles for inspection. In the event that automated vehicles are used for passenger services, an alternative vehicle inspection regime could apply. For example, in Victoria regulation and inspection of passenger vehicles is supervised by Transport Safety Victoria.

The NTC is seeking feedback from industry and consumers as to whether the safety risks associated with vehicle repairs and aftermarket fitments would be so increased with automated vehicles that additional regulatory oversight by manufacturers or governments is warranted. And if so, if this issue is within the scope of our assessment of regulatory barriers, or should be considered as a separate policy issue.

Issues with regulating the road vehicle – consultation question

Question 4 – Have we identified the key issues relating to the Australian Design Rules and other vehicle standards? Are there other issues that should be assessed as part of the NTC review?

7

Issues with regulating heavy vehicles

KEY POINTS

- Heavy vehicles over 4.5 tonnes are regulated by the Heavy Vehicle National Law, or HVNL, in all jurisdictions except for Western Australia and the Northern Territory.
- Some HVNL provisions and heavy vehicle standards assume a human driver. This may present regulatory barriers to automated heavy vehicles.
- Heavy vehicle operations must also comply with the Australian Road Rules, and safe distance rules could limit the uptake of heavy vehicle platooning.

Current regulatory framework

The HVNL and associated regulations commenced in the Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania and Victoria in 2014. The HVNL establishes uniform laws for heavy vehicles over 4.5 tonnes (gross vehicle mass). It covers regulatory areas including registration,[10] vehicle standards, mass dimension and loading, fatigue, exemptions by permit and accreditation. The National Heavy Vehicle Regulator (NHVR) administers the HVNL. State and territory police and authorised officers are appointed to enforce heavy vehicle offences under the HVNL.

The HVNL does not cover heavy vehicle inspections, driver licensing and all matters related to the carriage of dangerous goods. These regulatory areas are the responsibility of the relevant state and territory authorities.

Heavy vehicle in-service standards are administered by the NHVR. The Heavy Vehicle (Vehicle Standard) National Regulation (HV-VSNR) provides that heavy vehicles must comply with the heavy vehicle standards applying to the vehicle, unless a vehicle standards exemption has been granted by the NHVR.

The HVNL defines driver to mean the person driving the vehicle or combination.

In Western Australia and the Northern Territory, heavy vehicles are regulated by state and territory road safety laws and Occupational Safety and Health laws.

Issues with the current regulatory framework

Issue 10: some HVNL provisions and heavy vehicle standards assume a human driver

Some provisions in the HVNL assume a human driver and may be barriers to introducing more automated heavy vehicles. **Table 5** provides examples. This includes provisions relating to the driver's responsibility to keep certain documents in his or her possession while driving, or to follow requests made by an Authorised Officer. As with state and territory road safety and traffic laws, the human driver assumption may be an operational barrier to the effective regulation of heavy vehicles that are fully or highly automated.

In addition to these examples, there are other HVNL provisions relating to directions of an Authorised Officer that relate to both drivers and other parties, such as operators or responsible parties.[11] It is possible that if there is no human driver, the directions of an Authorised Officer could be addressed to these other parties. However, while these provisions may not be a barrier to more automated vehicles, new roadside enforcement procedures may need to be developed to ensure that an operator or responsible party is made aware of a direction of an Authorised Officer and can comply with that direction.

[10] Not yet commenced.

[11] See sections 516 and 517 of the HVNL for examples.

Table 5: Examples of HVNL provisions that could be barriers to automated heavy vehicles

HVNL examples	Potential barrier to automated heavy vehicles
Section 83(1) **Keeping copy of permit while driving under vehicle standards exemption** – The driver of a heavy vehicle who is driving the vehicle under a vehicle standards exemption (permit) must keep a copy of the permit for the exemption in the driver's possession	A highly or fully automated vehicle that does not have a human driver would be unable to comply with this legal requirement
Section 191(1) **Duty of operator** – An operator of a heavy vehicle must not permit the vehicle's driver to transport the freight container by road using the vehicle unless the driver has been provided with a complying container weight declaration for the freight container	A highly or fully automated vehicle that does not have a human driver would be unable to comply with this legal requirement
Section 513 **Direction to stop heavy vehicle to enable exercise of other powers** – An authorised officer may direct the driver of a heavy vehicle to stop the vehicle so that the authorised officer can enter and inspect it under section 520 or enter and search it under section 521	The authorised officer would have no power to stop a vehicle if there was no driver
Section 526 I**ssue of vehicle defect notice** – The authorised officer may issue the vehicle defect notice by— (a) if the driver of the heavy vehicle is present—giving the notice to the driver; or (b) if the driver of the heavy vehicle is not present—attaching the notice to the vehicle	Under either scenario (a) or (b), there must be a human driver for an authorised officer to immediately ground the vehicle. An agreed process will need to ensure that the operator of an automated vehicle is made aware of the defect notice

The NTC discussion paper will include a full review of the HVNL and identify any provisions that could be a barrier, risk or issue for more automated heavy vehicles. The HVNL could be amended to ensure each provision can operate effectively without the assumption of a human driver.

Vehicle automation also provides an opportunity for enforcement agencies and heavy vehicle operators to adopt back-office electronic record keeping capabilities, in a similar way to the development of the electronic work diary (EWD) to record heavy vehicle drivers' work and rest hours. For example, permits, accreditation, container mass and dangerous goods records could be accessed via cloud technology rather than rely on drivers providing the information on paper. This would significantly reduce in-vehicle paper records and generate operational efficiencies.

Issue 11: some in-service standards for heavy vehicles assume a human driver

In a similar way to light vehicles, some in-service standards for heavy vehicles in the HV-VSNR assume a human driver. For example, there is a requirement in the HV-VSNR that the heavy vehicle allows a safe view of the road and traffic:

> A heavy motor vehicle must be built — (a) to allow the driver in the normal driving position a view of the road and of traffic to the front and sides of the vehicle so the driver can drive the vehicle safely.[12]

Standards such as this would remain relevant to automated heavy vehicles with a human driver in control of the vehicle, but not to a highly or fully automated vehicle that did not have a human driver. An automated vehicle does not have a 'normal driving position' but the principle underpinning the standard – driving safely with no visual interference – remains an important design principle that could still apply to all heavy vehicles. To ensure there are no barriers to highly or fully automated heavy vehicles, the HV-VSNR in-vehicle standards could be amended to ensure the safe design principles are retained but without the assumption of a human driver.

The HV-VSNR in-service standards already have many principle- or performance-based standards. For example, the HV-VSNR provides that 'a thing fitted to a heavy vehicle must be designed, built and fitted to the vehicle in a way that minimises the likelihood of injury to a person making contact with the vehicle.[13] A similar approach could be taken for those standards that currently assume a human driver.

The NTC discussion paper will include a full review of the HV-VSNR and identify any standards that could be a barrier, risk or issue for more automated heavy vehicles.

Issue 12: safe distance rules could limit the uptake of heavy vehicle platooning

Platooning allows vehicles to travel close together by accelerating or braking simultaneously and enables a closer headway between vehicles by eliminating human driver reaction times. Heavy vehicle platooning could provide fuel efficiency and safety benefits and is a potential early application of automated technology.

Road Rule 127 relates to safe distances of long vehicles and provides that the driver of a long vehicle must drive at least the required minimum distance behind another long vehicle travelling in front of the driver, unless the driver is:

(a) driving on a multi-lane road or any length of road in a built-up area; or
(b) overtaking.

The required minimum distance is 200 metres for a road train or 60 metres for any other long vehicle that is not a road train. These distances are considerably longer than safe distances in a platoon.

In regional Australia there is a significant freight network of roads that are single lane and may otherwise be safe and appropriate for heavyvehicle platooning. Road Rule 127 is therefore a potential regulatory barrier because it limits the range of heavy vehicle platooning to multi-lane roads or built-up areas.

Road Rule 126 applies to all other road vehicles and provides an alternative approach. It states that a driver 'must drive a sufficient distance behind a vehicle travelling in front of the driver so the driver can, if necessary, stop safely to avoid a collision with the vehicle.' Although Road Rule 126 still requires the human driver to engage the brakes and stop safely, this is less prescriptive than Road Rule 127. Another solution could be to use the current exemption framework to allow platooning on specific roads that are not multi-lane or in an urban area.

Issues with regulating heavy vehicles – consultation questions

Question 5 – Have we identified the key issues relating to heavy vehicles? Are there other issues that should be assessed as part of the NTC review?

[12] HVNL Schedule 2, Part 2, 8(1).

[13] HVNL Schedule 2, Part 2, 7.(1).

8 Liability

KEY POINTS

- Legislation and common law principles of liability are well established, but assigning fault in automated vehicle crashes could become more complex.
- Manufacturers are already subject to product liability obligations – these obligations will have a growing role ensuring the safe operation of automated vehicles.

Automated vehicles have significant potential to increase road safety and the number of crashes is expected to reduce significantly with the introduction of automated vehicles. However, crashes will still occur and the rules of liability relating to automated vehicles need to be clearly defined.

Today, vehicle crashes can be caused by a number of parties. For example:

- **the driver** causes a crash because he or she was distracted and is responsible for the driving task
- **a third party** causes a crash because he or she walked into the traffic and is responsible for taking care when crossing the road
- **the manufacturer** causes a crash because of a defect with the brakes and it is responsible for the safe manufacture of the vehicle
- **the service provider** causes a crash because the tyres were not properly fitted and it is responsible for the proper fitment of the tyres
- **the network manager** causes a crash because traffic lights at an intersection were simultaneously green and it is responsible for the road infrastructure.

These types of parties could continue to be liable for a vehicle crash involving an automated vehicle. New additional parties could include service providers who offer technology services integral to the safe performance of the automated vehicle, such as maintenance (currently the owner/driver), location mapping, communications signals or C-ITS functionality.

Automated vehicles could potentially save many lives but through system failure they could cause the loss of a small number of others; a net gain for society but an extremely difficult problem from a community perspective. Liability risks could prevent the roll-out of automated vehicles or severely reduce their functionality or scope of operations if manufacturers become excessively cautious (Glancy et al, p.37). At the same time the threat of future litigation also acts as an incentive, ensuring rigorous testing and research before any public release.

There could be specific automation-related reasons for an automated vehicle crash. These could include:

- sensor failure
- software failure
- the vehicle travelling at speeds that are legal but unsafe for the road conditions
- data communication failure or interference
- a driver failing to respond to a request to intervene
- driver over-reliance on the automated vehicle system.

The key difference for automated vehicles is that as automation increases *control of the vehicle* increasingly shifts from the human driver to the manufacturer (or other third party). By definition, when a vehicle is highly or fully automated, the automated vehicle system is responsible for driving the vehicle, monitoring the driving environment and monitoring the dynamic driving task. The legal entity responsible for the automated vehicle system will therefore be responsible – and liable – for the vehicle's actions.

While an overall reduction in crashes is likely, the issue of who is liable in the event of a crash will likely become more complex as automated vehicle technology and the human machine interface develops. The question of how liability would be resolved in the event of an automated vehicle system failure will be important in providing certainty to consumers, manufacturers, insurers and road managers.

This chapter is in two section: **section 8.1** considers the liability of drivers, manufactures and services providers; while **section 8.2** considers the liability of road managers.

8.1 Liability of drivers, manufacturers and service providers

Current regulatory framework

The regulatory framework for liability is well established. The liability regime in Australia is primarily based on common law approaches, supplemented by specific regulation in certain areas, including no fault legislation covering personal injuries. It should be noted that the Australian legal system allows for concepts of joint, several and contributory liability, where a manufacturer or service provider could contribute in part to a collision (and be held liable for this contribution) even if it is not wholly responsible.

Liability encompasses three broad areas of law: tort, contract and product liability.

1. Tort

A party in a collision could take action against another party or parties under the common law action of tort. Such cases require the key elements of:

- duty of care
- breach of duty (that is, standard of care)
- causation
- damages.

While the duty of care on a public road (and any breach) could be straightforward, automated vehicles may raise particular challenges in relation to proving causation of the damage.

The common law is supplemented and amended by state legislation, in particular civil liability acts such as the *Civil Lability Act 2003* (Qld). These provide largely consistent definitions of causation (with minor variations), classifying causation into two elements – factual causation and scope of liability.

2. Contracts

Parties involved in the delivery and service of automated vehicles may be linked through a network of contracts (for example, a third party may be responsible for the maintenance of vehicle sensors or the update of over-the-air mapping data).

Questions about the allocation of risks and liabilities under a contract are largely left to the parties to the contract to determine under the principle of freedom of contract, provided the contract is not illegal. Contracts in this area should cover details relating to the use and ownership of data, allocation of risks and costs and any caps on liability. Two areas of contract law may have particular relevance to automated vehicles:

- disclaimers under consumer contracts – especially relevant to requirement's for the driver to monitor the automated driving system and/or take back control of the driving task
- insurance contracts will be relevant for the allocation of risks and are governed by the *Insurance Contracts Act 1984* (Cwlth).

3. Product Liability

Product liability is governed by the *Competition and Consumer Act 2010*, supplemented by state consumer protection laws. The *Competition and Consumer Act 2010* includes general obligations that goods are of merchantable quality and that services supplied are fit for purpose and it sets out obligations to comply with prescribed safety standards. These obligations will be crucial as the performance aspect of automated vehicles extends. It is also important to note that product liability covers manufacturing defects (usually one off) as well as design defects (which affect all products in the line).

The ACCC advises that suppliers may reduce exposure to product liability action by using responsible and sensible business practices, including:

- conducting regular reviews of product designs and production
- implementing and reviewing quality assurance procedures
- testing products regularly to relevant standards, including batch testing
- conducting appropriate marketing
- providing clear and thorough user instructions
- where necessary, conducting a quick voluntary recall of any products found to be defective or unsafe.

Compulsory third-party personal injury schemes

A number of states and territories have compulsory third-party personal injury schemes which are funded through vehicle registration payments. They provide compensation for personal injuries sustained in crashes on public roads. Some schemes are run on a no-fault basis, others are fault-based. The schemes typically play a role in improving road safety and so they offer a direct economic benefit.

All these areas of law, along with the various personal injury schemes, have evolved over decades and in some cases centuries. As such, any potential changes should proceed with extreme care.

Issues with the current regulatory framework

Issue 13: liability is well established but assigning fault could be more complex

The current liability framework is based on the driver being in control of the vehicle and driving safely for the road conditions. As we discussed in **chapter 5**, this is derived from the Vienna Convention on Road Traffic and the principle is replicated in the Australian Road Rules, which states that: 'a driver must not drive a vehicle unless the driver has proper control of the vehicle' (ARR Rule 297).

This principle of control could extend to another party responsible for the automated vehicle system in a highly or fully automated vehicle. This could be the vehicle owner, manufacturer or contracted service provider.

Conditional automation is more complex. Human drivers may still be in control because of the responsibility to monitor the automated vehicle system. However, their failure to respond to a request to intervene could partly be the fault of the manufacturer if the manufacturer did not include sufficient driver vigilance controls or the human-machine interface was poorly designed.

Broadening the meaning of driver in the Australian Road Rules to cover monitoring and intervention functions (discussed in section 5.1) could significantly clarify responsibility from a liability perspective

Because assigning fault may become more complex, liability concerns may mean automated vehicles need to log actions in significant detail to enable the tracing of causation, and to make clear whether the driver or system is in control at any given time.

Tort laws can apply to automated vehicles, possibly with new requirements

The law of tort enables a party to take action against another party for a civil wrong even when no contract exists. A crucial issue of fact is ascertaining which entity is in control at what point and whether that is well defined. For example some conditional systems could operate multiple dynamic driving tasks for long periods without engaging the driver. This sends a message to the driver that nothing is required of them. Despite being clearly described as a driver's aid, many customers have treated these systems as fully automated.

Manufacturers are likely to have a clear role in managing this risk and clear expectations of the driver will be crucial. For example, in-seat weight monitors could indicate whether the driver is in the driving seat, or cameras could detect whether the driver is watching the road to ensure a safe hand-over. Driver training and marketing will also be vital.

Because the regulatory framework for liability allows for concepts of joint, several and contributory liability, assigning fault will be undertaken on a case-by-case basis and there is sufficient scope and flexibility to factor in such elements as vigilance controls and the human-machine interface.

The regulatory framework for liability may not need to change

We do not anticipate that significant changes would be required to contract or product liability principles to accommodate automated vehicles. Multiple contracts could be in place in a single system and it will be up to the parties to the contract to determine the details under the common law principle of freedom of contract. New aspects of contracts will need to be considered to cover extended performance, ownership of data, allocation of risks and costs and any caps on liability.

The current regulatory framework for liability is not likely to be a barrier to more automated vehicles. However, the complexity of assigning fault in a more complicated operating environment means that governments may have a role in helping to increase market confidence that sufficient liability principles and regulations exist to cover automated vehicles. Consumers may also seek certainty that if a crash is caused by an automated vehicle system, compensation can be recovered from the responsible party even if they are international corporations based in overseas jurisdictions.

The current regulatory framework for liability is not likely to be a barrier to more automated vehicles

8.2 Liability for road managers

Current regulatory framework

The civil liability of road authorities varies across each state and territory. The variation ranges from liability with certain limitations to no liability at all. This variation in itself could be a barrier. **Table 6** summarises the differences, and a summary of legislation relating to road manager liability is provided at **Appendix C.**

In Victoria, the *Road Management Act 2004* (Vic) provides that a road authority has a statutory duty to inspect, maintain and repair a public road to the standard specified in the *road management plan.* If the standards of road upkeep in the road management plan meets the minimum standard needed for automated vehicles, then the road agency in Victoria has met its liability responsibilities. This could be an operational barrier if the standards for some road types are not at a level required by some automated vehicles. Under this approach, the standards set by the road management plan are clearly critical to the road agency's exposure to liability.

In Queensland and NSW, the road agency only has liability if it had actual knowledge of the particular risk that resulted in the harm. In Queensland this is achieved through a restriction on liability of public or other authorities with the functions of road authorities.[14] In NSW there is a special non-feasance protection for roads authorities.[15] The road agency in South Australia has no liability to maintain, repair or renew a road.[16]

Table 6: Examples of how states legislate road management liability

Victoria	Queensland	NSW	South Australia
Road Management Act 2004	***Civil Liability Act 2003***	***Civil Liability Act 2002***	***Civil Liability Act 1936***
Liability with certain limitations	**No liability except where the authority had actual knowledge**	**No liability except where the authority had actual knowledge**	**No liability**
A road authority has a statutory duty to inspect, maintain and repair a public road to the standard specified in the road management plan for that public road or a specified class of public roads which includes that public road	A public or other authority is not liable in any legal proceeding for any failure to repair a road or to keep a road in repair unless at the time of the alleged failure the authority had actual knowledge of the particular risk	A public or other authority is not liable in any legal proceeding for any failure by the authority in relation to any function it has as a road authority to repair a road or to keep a road in repair unless at the time of the alleged failure the authority had actual knowledge of the particular risk the materialisation of which resulted in the harm	A road authority is not liable in tort for a failure to maintain, repair or renew a road or to take other action to avoid or reduce the risk of harm that results from a failure to maintain, repair or renew a road

The NTC discussion paper will include a full review of road manager liability, including the liability of local authorities and commercial toll roads.

Issues with the current regulatory framework

Issue 14: limitations on road manager liability may be a barrier

The standard of roads could substantially impact the safe operation of automated vehicles. Substandard physical or digital infrastructure could be a practical barrier to entry into the Australian market for automated vehicles, but it is questionable whether a road manager's exposure to liability is necessarily the only or principal incentive to ensure the infrastructure is fit for purpose.

It is also noted that fully automated vehicles may have to deal with a wide variety of road standards, regardless of the physical or digital infrastructure maintained by road managers.

Liability – consultation question

Question 6 – Have we identified the key issues relating to the liability of drivers, manufacturers, service providers and road managers? Are there other issues that should be assessed as part of the NTC review?

[14] Section 37 of the *Civil Liability Act 2003* – Restriction on liability of public or other authorities with functions of road authorities.

[15] Section 45 of the *Civil Liability Act 2002* – Special non-feasance protection for roads authorities.

[16] Section 42 of the *Civil Liability Act 1936* – Liability of road authorities.

9 Privacy and access to data

KEY POINTS

- privacy principles may be sufficiently robust to regulate private sector access to personal information
- government access to automated vehicle data may warrant additional legislative privacy protections.

Automated road vehicles are expected to generate significant volumes of data, some of which will be very precise location information based on GNSS technology. Some automated vehicles could also use C-ITS technology or generate open data that could be freely and easily accessed by third parties.

At this stage we do not know whether this data will be personal information – that is, the extent to which the location and behaviour of an individual will be identifiable from these data sources. It is feasible the ability to identify an individual will vary across different types of automated vehicles and will depend on the mix of technologies used and operational models. For example, the likelihood of being able to identify the user of a non-ticketed people carrier is probably lower than a privately owned automated vehicle relying on vehicle-to-infrastructure C-ITS technology.

A potential operational barrier is consumer uncertainty of how personal information will be protected and who can access the data under what circumstances. This chapter is therefore presented in two sections: **section 9.1** considers privacy protections in the private sector, and **section 9.2** considers privacy protections by the government agencies.

9.1 Privacy and the private sector

Current regulatory framework

The private sector is already harnessing personal information for commercial intelligent transport system (ITS) purposes. For example, navigational systems are available on the market that provide consumers with live traffic updates based on the consolidation of the location and speed of other users of the commercial application. In these situations, consumers voluntarily opt-in to a commercial application and thereby agree to share their personal information for these purposes. Providers must handle their personal information in compliance with the *Privacy Act 1988* (Cwlth).

The *Privacy Act 1988* regulates the collection, use, disclosure, security and access of personal information. A private sector organisation must collect personal information only by lawful and fair means and not in an unreasonably intrusive way. Section 6 of the Act defines personal information as:

> Information or an opinion (including information or an opinion forming part of a database), whether true or not, and whether recorded in a material form or not, about an individual whose identity is apparent, or can reasonably be ascertained, from the information or opinion.

The definition of personal information is sufficiently broad to include location information if that information is about an individual whose identity is apparent or can be reasonably ascertained from that information. The *Privacy Act 1988* will not apply, however, if the information does not identify an individual.

In 2012, the *Privacy Act 1988* was amended to create the Australian Privacy Principles (APPs), a single set of 13 privacy principles applying to private sector organisations as well as Commonwealth agencies. Largely replicating the pre-existing privacy principles, the amendments:

- **require that the individual must be 'reasonably identifiable' for information to be considered personal** – whether an individual is reasonably identifiable from certain information requires a consideration of the cost, difficulty, practicality and likelihood the information will be linked in such a way as to identify him or her
- **relax cross-border disclosure of personal information** – there is no general prohibition on cross-border transmission of personal information, although the entity must take such steps as are reasonable in the circumstances to ensure the overseas recipient does not breach the APPs
- make it mandatory for relevant entities to have a privacy policy.

Privacy principles may be sufficiently robust to regulate private sector access to personal information

At issue is how easily it is that data generated by automated vehicle technology could identify an individual. For example, if a service provider collects a vehicle's unique number but has no method to match that number to a vehicle registration or individual, then it is unlikely that data would meet the *reasonably identifiable* test and would not be personal information.

In the event that automated vehicles generate personal information, the APPs will apply and the relevant entity handling the personal information, such as the manufacturer or vehicle operator, will need to ensure compliance with the APPs. This would include the requirement to have a privacy policy and to inform an individual what the data will be used for. Consent from an individual will only be required if the relevant entity seeks to use the personal information for a secondary purpose.

In 2013, the NTC assessed privacy issues related to C-ITS technology (NTC, 2013). C-ITS is another example of an emerging technology where it is uncertain whether the data generated from the technology can be anonymous or pseudo-anonymous. After a careful assessment of the *Privacy Act 1988* and APPs, we found the current privacy framework could regulate private sector handling of personal information generated by C-ITS. The then Standing Council on Transport and Infrastructure subsequently approved the following policy finding:

> **Policy finding**: No changes are recommended to current privacy laws governing the private sector development of C-ITS systems and data. Companies will need to closely follow the National Privacy Principles as required, as they do for C-ITS systems that have already been developed (NTC, 2013, p. 20).

The development of automated vehicles does not appear to depart from an opt-out commercial arrangement and they are likely to operate within the same privacy framework, as consumers today opt-in to navigation systems that generate location information. Therefore, at this stage in the development of automated vehicles, the *Privacy Act 1988* and APPs appear to be sufficiently robust to provide industry with the tools to protect personal information and provide consumers with confidence their personal information is being handled, stored, shared and destroyed appropriately. However, consumers need to continue to ensure they scrutinise privacy policies and make informed choices about how their personal information is used for commercial purposes.

9.2 Government access to personal information

Current regulatory framework

The operational role of governments in relation to automated vehicles is evolving. It is unclear at this early stage whether government agencies or road managers would require access to automated vehicle data, or if automated vehicle data (beyond what is already collected today) constitutes personal information.

There may also be circumstances where government agencies require access to automated vehicle information for lawful purposes. This could include information required for:

- safety data to assess the performance of automated vehicles
- crash investigation purposes
- criminal investigations that seek to identify the location of a victim, suspect or witness
- counter-terrorism purposes.

Some jurisdictions, such as California and South Australia, are seeking to regulate that on-road automated vehicle trials include a requirement that data is captured and made accessible to the government.

The privacy laws of the Commonwealth, states and territories are clear: if there is a lawful purpose for which personal information can be accessed, a government agency may access that information, and enforcement purposes are largely exempt from privacy laws. However, the collection of personal information must be directly related to a function or activity of the agency, and the collection of the information must be reasonably necessary for that purpose.

As noted above, Commonwealth agencies are regulated by the *Privacy Act 1988* and APPs. States and territories regulate the collection, use, disclosure, security and access of personal information by public sector entities through their own Information Privacy Principles (IPPs). While terminology and form may vary, the general approach across jurisdictions is consistent.

The IPPs are principle-based. In addition to privacy principles, governments can also legislate the handling of personal information in a particular regime. They may do this to increase consumer confidence or because of the sensitive nature of the personal information.

The Intelligent Access Program in the HVNL, for example, uses GNSS information, and the HVNL places legislative limits on what Intelligent Access service providers do with that data. Namely, an Intelligent Access service provider can disclose information to police for law enforcement purposes, but only if there is a warrant. Likewise, the EWD, which will also use GNSS location information linked to an individual heavy vehicle driver, has adopted a similar legislative approach.

The *Road Safety Act 1986* (Vic) legislates for what purposes registration and licencing information can be used or shared with third parties, whereas other states and territories rely on the their IPPs to regulate the handling of registration and licensing information.

Issues with the current regulatory framework

Issue 14: government access to automated vehicle data may warrant additional legislative privacy protections

The benefits of automated vehicles may not be realised if consumers are uneasy about government access to their location information, which may relate to a person's political views, medical issues and social matters (Victorian Law Reform Commission, 2010, p. 64). Location information can therefore be sensitive information and uncertainty about government access to identifiable location information – if any – could be a regulatory barrier.

Personal information generated by automated vehicles could also be much broader than location information. It could include data attributes such as time, seat occupancy, vehicle speed, and phone call and social media use.

In 2013, the NTC assessed privacy issues related to C-ITS technology (NTC, 2013). C-ITS is another example of an emerging technology where it remains to be seen whether the data generated from the technology can be anonymous or pseudo-anonymous.

As a point of comparison, it is noted that stronger privacy restrictions for government access to C-ITS data was recommended by the NTC in 2013. In relation to government access to C-ITS location information, the then Standing Council on Transport and Infrastructure approved the following policy finding and recommendations:

> **Policy finding:** Privacy concerns represent a potential barrier to the take-up of technology that could significantly improve road safety. Australia should aim for the highest level of privacy protection in the standards set for C-ITS safety systems. This is in keeping with emerging international standards.
>
> **Recommendation 1:** That Austroads adopt privacy by design principles, including the undertaking of a privacy impact assessment, in the development of the C-ITS operational framework.
>
> **Recommendation 2:** That in the development and implementation of a C-ITS operational framework, in particular regarding standards for data messages broadcast by C-ITS stations, Australian governments seek the highest possible level of anonymity for drivers and that this be a key focus for Austroads in developing the framework.
>
> **Recommendation 3:** That Australian Ministers explicitly consider privacy impacts on drivers in any decision relating to institutional arrangements for C-ITS. In particular, any entity that manages and stores unique identifiers is separate from agencies which hold licensing and registration information.
>
> **Recommendation 4:** In the event that individuals can be reasonably identified from the safety data message broadcast by C-ITS devices, that specific legislative protections are developed to define in what circumstances organisations that are exempt from compliance with privacy principles, including enforcement agencies, may access C-ITS personal information (NTC, 2013, p. 26). [Emphasis added.]

A similar approach could be taken in relation to government agency access to data generated by automated vehicles.

Consumers will seek clarity regarding the circumstances in which personal information generated by an automated vehicle might be accessed for enforcement or investigatory purposes. Equally, government agencies need certainty in regard to accessing information when it is reasonable and beneficial to the community to do so.

Privacy and access to data – consultation question

Question 7 – Have we identified the key issues relating to privacy and access to data by government agencies? Are there other issues that should be assessed as part of the NTC review?

10 Supporting on-road trials

KEY POINTS

- Broad exemption powers to support trials already exist at Commonwealth, state and territory levels. Existing legislation may not be a barrier to on-road trials.
- Codes of practice, guidelines and legislation can help manage risks and provide additional guidance, certainty and national consistency for on-road trial participants.

On-road trials are integral to ensuring automated vehicles can operate safely on Australian roads. It will be crucial to test automated systems can accurately detect and respond to the Australian environment. Unique features such as fauna (such as kangaroos), road markings and signage, weather (such as dust storms), satellite positioning services and communications coverage will need to be onsidered.

Existing legislation has not been a barrier to on-road trials in other countries. In 2015, the UK Department for Transport (DfT) reviewed existing legislation and established there are no impediments to trialling automated vehicles:

> Real-world testing of automated technologies is possible in the UK today, providing a test driver is present and takes responsibility for the safe operation of the vehicle; and that the vehicle can be used compatibly with road traffic law (DfT, *Pathway to Driverless Cars*, 2015).

There are three mechanisms that could support Australian on-road trials:

1. Using existing powers to exempt testing vehicles from legislative restrictions.
2. Introducing specific legislation permitting on road testing.
3. Publishing guidelines or a code of practice for on-road testing – possibly in conjunction with either of the above.

These are discussed in more detail in the following sections.

10.1 Exemption powers

In Australia, we have seen that the Australian Government has responsibility for the ADRs and states and territories have responsibility for road safety and traffic laws. Consequently, there are two exemptions to consider: Commonwealth exemptions for non-standard vehicles and state and territory exemptions to operate a vehicle on a public road.

This exemption framework could support on-road trials and initial deployment of automated vehicles.

Commonwealth legislation can exempt non-standard vehicles

As noted in **Chapter 6**, all new vehicles need to comply with the ADRs set out under the *Motor Vehicles Standards Act 1989*. The Act provides that nonstandard vehicles can be granted an exemption in defined circumstances.[17]

The intention of the exemption power is to permit importation of evaluation vehicles, or bona fide personal imports by individuals. The exemption is granted and managed by the Commonwealth and there do not appear to be any barriers preventing this exemption power from applying to automated vehicle trials.

States and territories have broad exemption powers

Each state and territory has a mechanism to exempt vehicles from traffic laws. These exemption powers are broad in scope and there do not appear to be any barriers preventing these exemption powers from applying to automated vehicle trials.

[17] Part 4 Division 3, 20(1)(b) of the *Motor Vehicles Standards Act 1989*.

For example, in Tasmania the *Tasmanian Road Rules 2009* provide for local exemptions under Regulation 376. This regulation provides that the Transport Commission may issue a person with an exemption from having to comply with a provision of the Road Rules where appropriate. The exemption may be in the form of a permit or certificate and:

> may, in the Commission's discretion, be issued for an unlimited or limited period and have general or limited application; and
>
> may be issued subject to such conditions as the Commission reasonably determines and specifies in the permit or certificate (Tasmanian Road Rules, Regulation 376).

Regulation 376 also gives the Commission the power to impose permit conditions. In the context of automated vehicle on-road trials, such conditions may be required and could include such matters as vehicle pre-testing, insurance and driver skills.

Issues with the current regulatory framework

The NTC discussion paper will undertake a full review of exemption powers in each state and territory. Because of their broad scope, there is the risk that a patchwork of on-road trial standards and processes will develop across states and territories. Reliance on exemption powers without transparent and consistent guidelines for automated vehicles could result in a lack of national consistency in relation to trial terms and conditions, insurance and driver skill requirements. Reliance on exemption powers could also be a hig cost option for industry.

This lack of clarity and consistency could be a barrier to on-road automated trials.

10.2 Legislation to facilitate on-road trials

South Australia was the first Australian jurisdiction to introduce specific legislation to facilitate on-road automated vehicle trials and demonstrations. A legislative approach is being adopted to increase market certainty that trials of automated vehicle can be conducted legally in South Australia and to ensure trials are undertaken consistently and with appropriate conditions that ensure public safety.

The *Motor Vehicles (Trials of Automotive Technologies) Amendment Bill 2015* was introduced into the South Australian Legislative Council in December 2015. The bill will amend the *Motor Vehicles Act 1959.* The bill provides that for a purpose related to an authorised trial of 'automotive technology', the Minister will have the power to exempt a person or class of persons, or a vehicle or class of vehicles, from the operation of a provision or provisions of the *Motor Vehicles Act* or any other Act, law or standard (section 134E).

The aim of the Bill is to balance protecting the interests of trial participants with road safety. This is achieved in part by requiring all proposals to have risk management plans and third party and public liability insurance. There is also an indemnity provision protecting those exercising official powers or functions in good faith and measures to protect commercially sensitive information. The bill also contains measures to ensure the general public are kept aware of any trial taking place, including the location and period of the trial.

The South Australian legislative approach to facilitate on-road trials is an alternative to relying on generic exemption powers. But if more widely adopted, it could result in variations in trial conditions and standards between states and territories.

10.3 Guidelines and codes of practice

An non-regulatory approach has been used in the UK and United States. With the aim of encouraging automated vehicle trials, the DfT published a code of practice in 2015, while the National Highway Traffic Safety Administration (NHTSA) in the United States released a preliminary statement of policy in 2013 that provided recommendations on how to safely conduct testing on public roads.

UK supports trials with a Code of Practice

In 2015, the UK DfT published a code of practice to promote automated vehicle testing in a safe on-road environment. The code does this by providing clear requirements for on-road trial approvals. These include:

- safety requirements, including risk analysis and management, compliance with road traffic laws and driver licensing and training
- appropriate insurance
- engagement with the relevant transport and highway authorities
- engagement with media.

This code is a voluntary, non-statutory instrument, but failure to adhere to the code could terminate the on-road trial and could impact insurance and operator liability.

Safety is the primary focus for trial guidelines issued by NHTSA

The US NHTSA statement of policy (NHTSA, 2013) outlined roles for the US Federal Government and the states. The statement provides that establishing uniform, national standards is needed for vehicle safety, and the agency recognises that premature regulation can obstruct the development and uptake of new technology.

The NHTSA statement of policy makes recommendations to the US states for governing the trials of automated vehicles, with a primary focus on safety. It draws out issues related to human factors and consistency with existing safety standards:

a) Ensure that the process for transitioning from self-driving mode to driver control is safe, simple, and timely

b) Self-Driving test vehicles should have the capability of detecting, recording, and informing the driver that the system of automated technologies has malfunctioned

c) Ensure that installation and operation of any self-driving vehicle technologies does not disable any Federally Required Safety Features or Systems

d) Ensure that self-driving test vehicles record information about the status of the automated control technologies in the event of a crash or loss of vehicle control (NHTSA, 2013).

The NHTSA statement of policy also recommended that states hosting trials establish reporting requirements to monitor the performance of self-driving technology during testing.

Within an existing legislative framework with sufficient legal protections for on-road vehicle behaviour, guidelines can provide a reasonable and non-restrictive approach to encouraging on-road automated vehicle trials.

Finally, it is noted that where a mechanism to trial automated vehicles is not available or is impractical, road operators may close a road and permit off-road trials and testing. This approach limits the opportunity to test on-road vehicle interaction with other vehicles, but may be appropriate depending on the specific research objectives.

Guidelines or codes of practice could be considered to support trials in Australia. They could be published at a national or state level.

Supporting on-road trials – consultation question

Question 8 – Have we identified the key issues relating to on-road trials of automated vehicles? Are there other issues that should be assessed as part of the NTC review?

11

Supporting more automated rail

KEY POINTS

- The rail sector has adopted a safety management system approach to manage risks – the regulatory framework does not necessitate prescriptive rules and there are unlikely to be any significant regulatory barriers to introducing more automated trains in Australia.
- The challenge may be establishing a safety case for automated trains that operate on shared systems and which interact with other types of trains, other modes or vulnerable road users.

11.1 Automated trains are already operating

Automated trains are already operating in a number of countries. In the next 10 years, the growth rate for kilometres of fully automated lines is expected to triple, reaching over 1,800 km by 2025.'[18] A review of existing automated train networks indicates they operate on closed systems and do not generally interact with other modes:

- Automated trains have been in use since 1961, when the first completely automated subway train went into service in New York. Semi-automation was introduced to the London Underground in 1964, with a driver in control of opening and closing doors and initiating the start of the train from the station.
- The Docklands Light Rail started servicing the redeveloped docklands area of London in 1987. This is a fully automated system, using minimal staffing on trains and at major interchange stations. Fully automated trains have also operated in Lille, France, since 1983, and in Vancouver, Canada, since 1986.
- An automated heavy-haul rail system is planned in Western Australia's mining sector.
- In October 2014, the NSW government announced the North West Rail Link (now branded Sydney Metro Northwest) for Sydney's north-western suburbs, which is planned to start operating in 2019 and include automated trains.

Classification of automated rail operations

Fully automated trains are trains controlled remotely by systems capable of supervising, operating and managing their entire operations with no driver or attendant on board.[19]

The UITP, or International Association of Public Transport, is an advocacy group that promotes public transport. It has developed a classification system for train automation. There are four grades of automation based on the following functions:

- setting train in motion
- stopping train
- door closure
- operation in event of disruption.

A non-automated train means all these functions are controlled by the driver. A fully automated train means all these functions are automatic and controlled by the automated vehicle system.

Alternatively, an automated train could be **partially automated**, with systems that assist the driver to brake or speed; **semi-automatic**, with the driver only starting the train; or **driverless**, where the train is controlled externally and (optionally) an attendant, who is able to intervene in emergencies, travels on board.

[18] Observatory of Automated Metros World Atlas Report, 2013 UITP.

[19] UITP International Association of Public Transport Observatory of Automated Metros website (2016).

Automated trains can be used in Australia under the current legislation

Section 1.3 provides an overview of the regulatory framework for automated trains.

Automated trains can be used in Australia under the current legislation, which is non-prescriptive and requires:

- operators to ensure, so far as is reasonably practicable, the safety of their operations
- persons who design, commission, manufacture, supply, install or erect rail infrastructure or rolling stock to ensure, so far as is reasonably practicable, it is safe and has been tested and examined to ensure it is safe.

Operators are required to undertake rigorous risk assessment and to implement measures to eliminate or mitigate the risks so they comply with the legislation and can become accredited to operate. This obligation remains, whatever the nature of the operations and whether the trains are totally driver controlled or fully automated.

Accreditation cannot be granted unless the ONRSR is satisfied the applicant has the competence and capacity to manage risks to safety associated with the railway operations; the competence and capacity to implement the proposed safety management system; and the financial capacity, or public risk insurance arrangements, to meet reasonable potential accident liabilities arising from the railway operations.

A rail transport operator must show it has assessed all the risks to its operations and put in place controls to eliminate or reduce them so far as is reasonably practical.

On this basis, the NTC concludes there are unlikely to be any legislative barriers to automated rail operations in Australia.

11.2 Applying the regulatory framework to automated trains

Operators will have to demonstrate the effectiveness of the technical and operational measures proposed to ensure safety, so far as reasonably practicable, for automated operations. This is likely to require more effort, at least initially, than for conventional operations. However, experience elsewhere in the world indicates that technology and operational procedures exist.

The difficulty of ensuring safety so far as reasonably practical at level crossings may lead to the decision to eliminate the risk by creating a tunnel or elevated road. The difficulties may diminish in the future as progress in technology enables other solutions to manage the risks.

> *'The relevance of so far as reasonably practical to the driverless train case study is that it increases the onus on evidence of fitness for purpose. For example, when considering safety at railway level crossings, in the absence of total grade separation, there must be a convincing argument that whatever controls are in place (boom barriers, flashing lights, road markings, or whatever) are sufficient to ensure that the risk really has been reduced so far as reasonably practical'*
>
> - Kevin Anderson and Peter Hughes, 'A Due Diligence Approach to Safety Validation by Means of SFAIRP', Conference on Railway Engineering, Brisbane 10-12 September, 2012.

Apart from the *National Standard for Health Assessment of Rail Safety Workers*, the RSNL does not mandate the use of particular rail safety standards, leaving it to each operator to show how it ensures the safety of its operations. An operator could apply a relevant standard to its operations to do this.

International standards for automated trains

International standards have been developed for automated train operations and associated systems. These include:

- The International Electro-technical Commission (IEC) is an international standards and conformity assessment body for all electrical, electronic and related technologies. It has produced IEC 62267:2009 Railway applications – Automated urban guided transport (AUGT) – Safety Requirements), which covers high-level safety requirements applicable to automated urban guided transport systems. It includes standards in relation to the safety requirements needed to compensate for the absence of a driver or attendant staff, depending on the level of automation of the system.

- The standards association of the Institute of Electrical and Electronics Engineers (IEEE), IEEE-SA, has produced an international standard similar to IEC 62290-1, providing for general requirements for Communications-Based Train Control (CBTC) systems - IEEE 1474.1-2004. A CBTC system is a continuous, automatic train control system utilising high-resolution train location determination. This standard is applicable to the full range of transit applications including automated passenger trains.
- IEEE Standard 1901-2010 (Broadband over Power Line Networks: Medium Access Control and Physical Layer Specifications) is also relevant to CBTC. It is a standard for high-speed communication devices via electric power lines.

Sydney Metro is working towards compliance with IEC 62267:2009, using the British Standard.

Australian standards for automated rail

The Rail Industry Safety and Standards Board (RISSB) is funded jointly by industry and Australian governments and is responsible for the development and management of rail industry standards, rules, codes of practice and guidelines with the aim of assisting the rail industry manage rail safety and improve efficiency through standardisation, interoperability and harmonisation. RISSB is an accredited Australian Standards Development Organisation. All its standards are Australian Standards.

To date, RISSB has not developed any guidance materials or standards for automated train operations and Australian rail operators would therefore have to look overseas for guidance or relevant standards.

Issues with the current regulatory framework

Issue 15: the safety case for automated trains may be more challenging on shared systems

Automated trains face different safety challenges to automated road vehicles. Because of their length, metal wheels and mass, some trains may require 1.6 km or more of track to slow to a standstill and trains cannot generally stop within the maximum sight distance of the train driver or detection systems currently used in trains.[20]

Automated trains are currently operating on closed systems where access to railway tracks is restricted and there is no interaction with other types of trains, other modes or vulnerable road users. To avoid interaction, automated trains today are generally operated on tracks that are in tunnels, elevated or securely fenced.

The ability to exclude the public from open railway lines to ensure safety may limit the extension of fully automated trains to freight and general passenger operations on shared systems, and would need to be addressed.

More automated rail vehicles - conclusions

There are unlikely to be regulatory barriers to the introduction of more automated trains in Australia. Under the existing legislative framework of the RSNL, those who design, commission, manufacture, supply, install or erect rail infrastructure or rolling stock must ensure, so far as reasonably practicable, that it is safe. Rolling stock and rail infrastructure operators must ensure the safety of their operations, so far as reasonably practicable.

The experience of existing automated operations demonstrates that control systems and standards provide a high level of safety.

Provided an operator can ensure the safety, so far as reasonably practicable, of its automated rail operations and gain accreditation (or a variation of existing accreditation) by satisfying the ONRSR that it has the competence and capacity to manage the risks to safety associated with the operations, it would be able to operate those services.

The key operational challenge for rail operators may be establishing a safety case for automated trains that are operating on shared systems and interact with other types of trains, other modes or vulnerable road users.

Supporting more automated rail – consultation question

Question 9 – Have we identified the key issues relating to more automated rail operations? Are there other issues that should be assessed as part of the NTC review?

[20] Damon Lavrinc, 26 April 2013, 'It's not a lack of technology that's keeping trains from going driverless', *Wired* website.

12

Other issues

KEY POINTS

- Automated road vehicles are likely to generate significant societal changes that will challenge a number of current policy settings, including driver training, licensing, vehicle registration and the regulation of on-demand transport services. There are also policy challenges related to human factors and vulnerable road users.
- Some of these challenges will be addressed by Austroads projects or progressed in the international arena – while others require further implementation certainty or market maturity before regulatory options are considered.

A range of other policy issues may have regulatory implications in future. These are identified in this chapter and include human factors, vulnerable road users, validation of the safety case, driver training and licensing, communications and issues related to the changing nature of vehicle ownership.

Some policy issues, such as licensing, are being considered as part of an Austroads automated vehicle project. Others, such as human factors and vulnerable road users, are complex safety and policy challenges that require further research and understanding before regulatory options are considered.

Human factors

Human factors is the inter-disciplinary study of humans as components of complex systems made up of people and technology. It is concerned with the human-machine interface and understanding the performance capabilities and limitations of the individual human operator. The primary focus of human factors is to improve safety and operational efficiency through the reduction and management of human error at both the personal and organisational level.[21]

Human factors is a key operational issue for automated vehicles:

> The transition when humans must take back control of the vehicle is emerging as one of the greatest challenges in [automated vehicles]. If the driver cannot provide assistance when its most needed, it could make the situation worse with potentially catastrophic consequences (Main Roads Western Australia, pg. 12).

Humans can often behave in complex and unpredictable ways, whereas technology behaves as programmed, so the interaction of the two can lead to unforeseen results. An example is the complexity and challenge of conditional automation that is reliant on the human driver to take back the driving task and ensuring the driver is sufficiently alert and ready to do so. Other factors include:

- over-reliance on the technology, behavioural adaptation and skill loss
- awareness of capabilities and limitations
- remaining alert while monitoring the automated vehicle system
- taking greater risks because the vehicle is safer (risk compensation)
- in-vehicle driver distraction.

Human factors issues are a potential regulatory challenge in the context of managing liability, but at this stage in the development of automated vehicles, manufactures and designers rather than governments are focused on addressing these issues. It remains to be seen what role – if any – governments should have to address human factors, however on-road trials can further improve our understanding of any limitations associated with humans undertaking the monitoring function.

[21] SafetyWise website (2016).

Vulnerable road users

Vulnerable road users include motorcyclists, cyclists and pedestrians which have the least protection in traffic and those who have limited task capability such as the young and elderly. Vulnerable road users are a priority concern in the development of sophisticated automated vehicle sensors that can detect and respond safely to different road users.

In some respects, the sophisticated sensors of automated vehicle systems will improve 'line of sight' and minimise the risk of blind spots, while C-ITS technology enables vehicles to detect other road users around corners and bends. But there are challenges associated with vulnerable road users. For example, human drivers are often able to read pedestrian body language and safely gauge whether or not a person is about to step out onto the road. Some pedestrians also rely on making eye contact with drivers before crossing the road. Ideally, automated vehicle sensors would have a similar level of intelligence, while avoiding over-cautious systems. It is also important that vulnerable road users know how to engage with automated vehicles. Pedestrians stepping out onto the road, for example, could become over-reliant on automated vehicles stopping.

Protecting vulnerable road users is not just the responsibility of manufacturers and designers. There are a number of national and international best practice approaches to protecting vulnerable road users, including through regulation, infrastructure, design and education.

Assessing the safety and security of automated vehicles

As discussed in **chapter 6,** we have the regulatory tools to approve automated vehicles through the ADRs and other vehicle standards. However, manufacturers have yet to establish with a robust evidence base that automated vehicles will operate safely enough.

There are three key issues:

1. How safe is 'safe enough'? The safety case threshold could be 'no less safe than current vehicles', or it could be 'significantly safer than human drivers.' The safe operation of the vehicle may relate to the driving performance of the automated vehicle and the security and the operating system.
2. How is the safety case tested? What role should governments have in Australia to test the safe operation of automated vehicles, and should international test results be further validated through on-road trials in Australia?
3. Who decides when a vehicle is safe enough? The approach of the rail sector involves operators identifying the risks and demonstrating how these risks are eliminated or managed and presents one solution. There could also be a role for governments to set the safety target against which a safety case may be submitted.

In the event the safety case can be validated in the international domain, Australia will be in a good position to recognise this safety case through existing ADR/UN regulation processes.

Driver training and licensing

The nature of learning to drive may change significantly. Elements of the current driving test such as parallel parking may become less important than preparing for a monitoring task and knowing how to respond to a request to intervene. Many of the human factor issues raised above could be addressed through driver training and re-training.

The driver licensing function may also change over time. It is likely that some highly and fully automated vehicles will not require a licensed driver to operate.

The Austroads registration and licensing project will consider these issues.

Communications

There are regulations relating to wireless communications that could affect the introduction and use of automated vehicles. This includes cellular communications, GNSS signals, radar sensors and lidar performance. ACMA is the Commonwealth agency responsible for these regulations. The regulatory framework is in place, and for the most part is consistent with key international jurisdictions.

As the automated vehicle technology evolves, there may be some modification of regulatory instruments (such as device licensing) over time. These issues would be dealt with by ACMA.

The changing nature of vehicle ownership

In 2015, the International Transport Forum report examined the convergence of three mega trends of the last decade. These were:

- mass urbanisation
- sharing economy from under-utilisation of assets, such as vehicles and housing
- technology, particularly in relation to automated vehicles (International Transport Forum, 2015).

The report concluded that development of automated vehicles could significantly impact personal mobility and vehicle ownership. In particular, on-demand short-term automated vehicle hire could emerge as a viable alternative to traditional vehicle ownership.

Wide-scale disruption of vehicle ownership patterns could have critical impacts on society and economic opportunity. The taxi industry, public transport regulation, insurance, vehicle registration and roadworthiness assurance could all be impacted by a shift from vehicle ownership to on-demand short-term vehicle hire. This creates a number of challenges for policy-makers:

- Regulations should keep pace with on-demand transport services using automated vehicles to ensure that consumers are offered safe and secure mobility.
- Insurance markets may change.
- Vehicle registration may be managed at a wholesale level by manufacturers or third party service providers: this may impact how compulsory third party insurance is administered.
- In Australia, vehicle roadworthiness checks are largely linked to changes in vehicle registration – this may not always be the most appropriate mechanism to assure vehicle roadworthiness with different patterns of vehicle ownership and risk profiles.

These challenges reflect potentially very significant societal and economic changes. Yet highly or fully automated vehicles are not available on the market, and a full regulatory review of these issues may be more useful when there is greater technology and implementation certainty.

The Austroads registration and licensing project will consider specific issues related to registration and compulsory third-party insurance.

Other issues – consultation question

Question 10 – Are there additional issues or risks that should be considered in the NTC's assessment of regulatory barriers to more automated vehicles?

Appendix A: Glossary

Term or title	Acronym	Description
Adaptive cruise control	ACC	Advanced capabilities in a cruise control system such as braking and accelerating in a range set by the driver
Australian Light Vehicle Standards Rules	ALVSRs	Vehicles standards legislation covering ongoing maintenance requirements of in-service vehicles
Australian Design Rules	ADRs	National standards for safety, anti-theft and emissions in vehicle design
Australian Privacy Principles	APPs	Standards for how Commonwealth agencies, private sector and not-for-profit organisations must handle, use and manage personal information
Australian Road Rules	ARRs	Model road rules developed by the NTC and applied in state and territory legislation
Australian Standards Development Organisation		Peak non-government standards organisation in Australia
Austroads		The association of Australasian road transport and traffic agencies
Auto parking assist		The vehicle self-parks, but the driver must monitor the environment during the automation mode and be ready to intervene if required
Automated highway driving		A system that takes control of driving and monitoring road environment on specific roads, but the driver monitors the automated driving system
Automated urban guided transport	AUGT	A public transportation system in an urban environment with self-propelled vehicles operated on a guideway
Cooperative Intelligent Transport Systems	C-ITS	An intelligent transport system that enables vehicles, roads and infrastructure to share information by broadcasting signals, including information on conditions, incidents and vehicle movements
Communications-Based Train Control	CBTC	A signalling system that utilises telecommunications between the train's on-board computer and wayside equipment to determine traffic management and control of infrastructure
Department for Transport	DfT	UK government department for transportation
Electronic work diaries	EWD	An electronic device or system to monitor and record the work and rest times of a driver
Global Navigation Satellite System	GNSS	A satellite navigation system that provides geospatial positioning with global coverage, based on longitudinal, latitudinal and altitudinal data
Gross vehicle mass	GVM	Maximum operating weight/mass of a vehicle as specified by the manufacturer or standards
Highway driving assist		The vehicle can maintain an appropriate speed, safe distance to other vehicles and lane position, but the driver monitors the environment during the automation mode and be ready to intervene if required
International Organization for Standardization	ISO	Independent, non-governmental international standard-setting body composed of representatives from national standards organisations
Information Privacy Principles	IPPs	State privacy principles regulating public sector accesses and handling of personal information
Institute of Electrical and Electronics Engineers	IEEE	Professional association for engineering, computing and technology information around the globe. IEEE and its members produce publications, conferences, technology standards, and professional and educational activities
International Association of Public Transport	UIPT	International organisation for public transport authorities and operators, policy decision-makers, scientific institutes and the public transport supply and service industry
International Electrotechnical Commission	IEC	Organisation that prepares and publishes International Standards for all electrical, electronic and related technologies

Light Detection and Ranging	Lidar	Optical technology that uses light to detect the proximity of objects
National Highway Traffic Safety Administration	NHTSA	USA agency that directs motor vehicle and highway safety and consumer programs
Office of the National Rail Safety Regulator	ONRSR	Independent body corporate established under the Rail Safety National Law (South Australia) Act 2012. The primary objectives of the ONRSR are to encourage and enforce safe railway operations and to promote and improve national rail safety
National Transport Commission	NTC	Independent statutory body that contributes to the achievement of national transport policy objectives by developing regulatory and operational reform of road, rail and intermodal transport
Network manager		A state, local authority or commercial road manager
International Organization of Motor Vehicle Manufacturers	OICA	International membership body for automotive manufacturers
Radar		Radio wave detection system
So far as it reasonably practicable	SFAIRP	Legal concept used for reducing risk, enshrined in rail safety law in Australia
Society of Automotive Engineers	SAE	International association for automotive engineers
The Australian Competition and Consumer Commission	ACCC	Competition regulator and national consumer law champion for Australia. Promotes competition, fair trading and regulation of nation infrastructure
The Federal Chamber of Automotive Industries	FCAI	Peak industry organisation representing the manufacturers and importers of passenger vehicles, light commercial vehicles and motorcycles in Australia
The United Nations Economic Commission for Europe	UNECE	Group for promoting pan-European economic integration. Brings together 56 countries from Europe, Central Asia and North America to work together on economic and sectoral issues
Transport and Infrastructure Council	TIC	Group comprising of Commonwealth, State, Territory and New Zealand Ministers with responsibility for transport and infrastructure issues, as well as the Australian Local Government Association
Platooning		Platooning allows vehicles to travel close together by accelerating or braking simultaneously and enables a closer headway between vehicles by eliminating human driver reaction times
Victorian Law Reform Commission	VLRC	The central agency for developing law reform in Victoria
Vienna Convention		International treaty on road traffic signed in 1968 designed to facilitate international road traffic standards
World Forum for Harmonization of Vehicle Regulations	WP29	International regulatory forum within the institutional framework of the UNECE Inland Transport Committee

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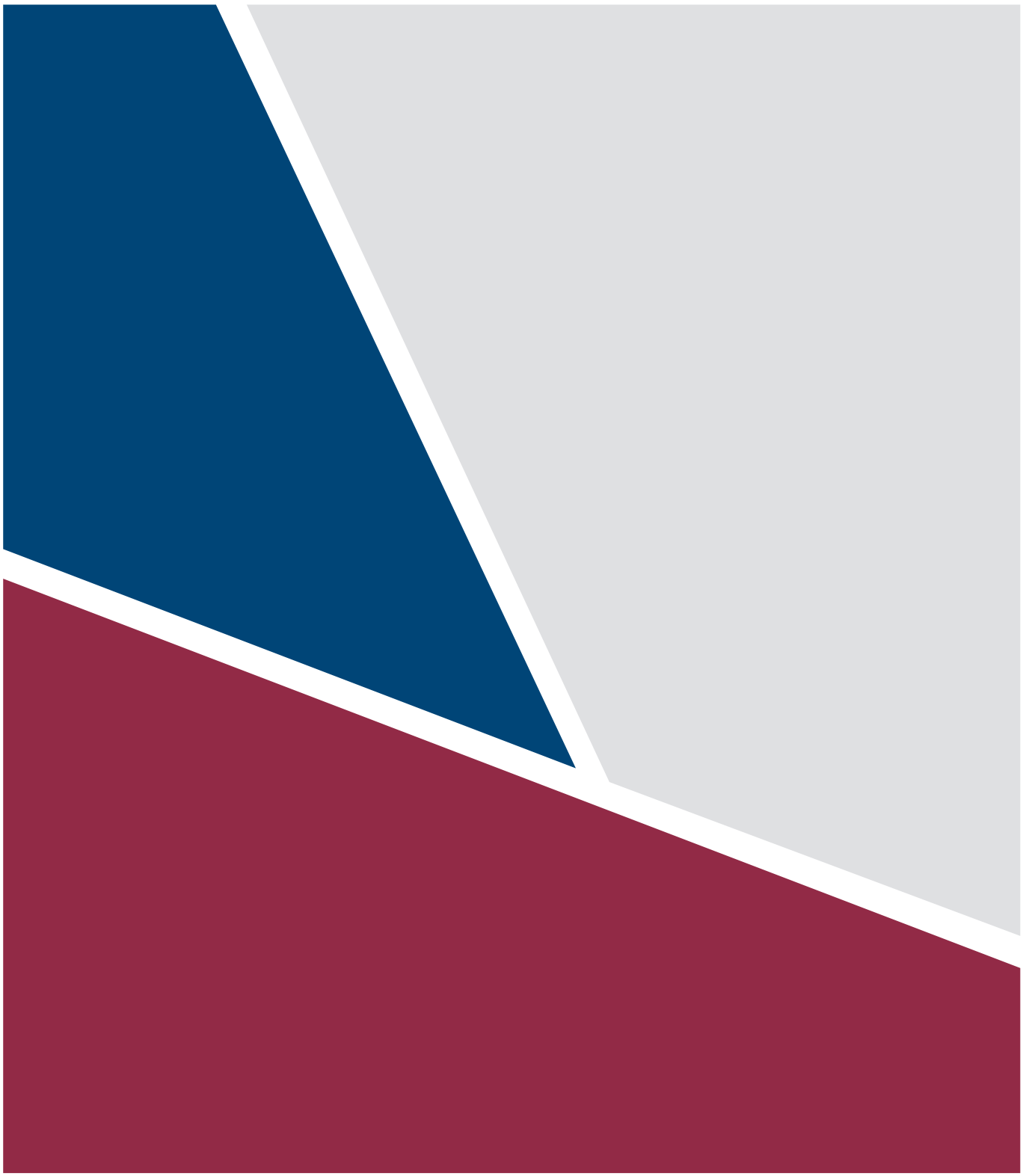
Appendix C: Road manager liability legislation

State	Legislation
NSW	**Section 158 of the Road Transport Act 2013, New South Wales** (1) The Authority may, in accordance with the statutory rules, exempt any person or vehicle or any class of persons or vehicles from the operation of all or any of the provisions of this Part. (2) An exemption: (a) may be absolute or subject to conditions, and (b) if subject to conditions, has effect only while the conditions are observed.
Victoria	**Section 95 of the Road Safety Act 1986** (1) Subject to subsections (8) and (9), the Governor in Council may make regulations for or with respect to any matter or thing required or permitted by this Act to be prescribed or necessary to be prescribed to give effect to this Act including, but not limited to, the matters and things specified in Schedule 2. (2) A power conferred by this Act to make regulations may be exercised— (a) either in relation to all cases to which the power extends, or in relation to all those cases subject to specified exceptions, or in relation to any specified case or class of case; and (b) so as to make, as respects the cases in relation to which it is exercised
Queensland	**Section 14 of the Transport Operations (Road Use Management —Vehicle Standards and Safety) Regulation 2010** (1) The chief executive may issue— (a) a guideline for the safe movement on a road of a type of light vehicle; or (b) a permit for the safe movement on a road of a particular light vehicle or type of light vehicle. (2) The commissioner may issue a permit for the safe movement on a road of a particular light vehicle or type of light vehicle.
Western Australia	**Section 111AB of the Road Traffic Act 1974** Exemption from specified regulations, regulations may allow grant of (1) The regulations may provide for the Minister to declare, in writing in accordance with the regulations, that a specified requirement of the regulations does not apply to a specified person or vehicle. (2) The regulations may provide for the CEO to grant exemptions from regulations made under section 111(2) (aa) or (c).
South Australia	**Section 163AA of the Road Traffic Act 1961**, (1) The Minister may, by instrument in writing or by notice in the Gazette— (a) exempt— (i) any specified vehicle; or (ii) any vehicles of a specified class; or (iii) vehicles carrying loads of a specified kind, from specified provisions of this Part; or (b) vary or revoke an exemption under paragraph (a). (2) An exemption under subsection (1) is subject to such conditions and limitations (if any) as the Minister thinks fit and specifies in the instrument or notice of exemption.
Tasmania	**Section 376 of the Road Rules 2009** PART 23 - Local Exemptions Division 1 - Exemption permits and certificates 376. Exemption permits and certificates (1) The Transport Commission, having regard to such considerations as it thinks fit, may issue a person with – (b) an exemption certificate otherwise exempting the person from having to comply with a provision of the Road Rules.

Australian Capital Territory	**Section 35 of the Road Transport (Safety and Traffic Management) Act 1999** (1) A regulation may— (a) exempt a vehicle, person or animal prescribed by regulation from this Act (or a stated provision of this Act); or (b) authorise the road transport authority to exempt a vehicle, person or animal prescribed by regulation from this Act (or a stated provision of this Act). (2) An exemption given under a regulation mentioned in subsection (1) may be conditional. (3) A regulation may provide for the road transport authority to— (a) suspend the operation of a regulation mentioned in subsection (1) (a) in the way and circumstances prescribed by regulation; or (b) suspend the operation of an exemption given by the authority to a vehicle, person or animal in the way and circumstances prescribed by regulation.
Northern Territory	**Section 59 of the Motor Vehicles Act** (1) A person, on payment of the prescribed fee, may apply to the Registrar for an exemption under this section and the Registrar, on receipt of such an application, in his discretion and subject to such conditions and for such period as he thinks fit, may, by instrument in writing, exempt a particular vehicle or vehicles included in a particular class of vehicles from the operation of one or more of the provisions of Part VA, the Standards or Schedule 4. (2) The Registrar may, by notice in the Gazette, exempt a class of vehicles from Part VA, the Standards or Schedule 4 on such conditions as the Registrar thinks fit and specifies in the notice, including the condition that the exemption only applies to vehicles in relation to which an application in the approved form, accompanied by the prescribed fee, has been made by the vehicle's owner and accepted by the Registrar.



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