

In-service safety for
automated vehicles
July 2019

Consultation regulation
impact statement

Report outline

Title	In-service safety for automated vehicles
Type of report	Council of Australian Governments Consultation Regulation Impact Statement
Purpose	For public consultation
Abstract	This consultation Regulation Impact Statement (RIS) seeks feedback on the role and regulation of different parties involved in the safe operation of automated vehicles on Australian roads ('in-service'). It considers safety duties that should apply to these parties and the institutional and regulatory arrangements to support them.
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Glossary

Term	Definition
Australian Design Rules (ADRs)	National standards for safety, anti-theft and emissions in vehicle design.
Australian Road Rules	National model law intended to provide the basis for nationally consistent road rules in each jurisdiction. These rules do not, by themselves, have any legal effect.
Austrroads	The peak organisation of Australasian road transport and traffic agencies.
Automated Driving System (ADS)	The hardware and software collectively capable of performing the entire dynamic driving task on a sustained basis. It is a type of driving automation system used in vehicles with SAE levels 3, 4 or 5 of automation as established in standard SAE J3016 by the Society of Automotive Engineers International (SAE).
Automated Driving System Entity (ADSE)	The legal entity that certifies that the Automated Driving System (ADS) can safely perform the driving task in place of a human driver. The ADSE will self-nominate by seeking type approval for the ADS under the <i>Road Vehicle Standards Act 2018</i> (Cth).
Automated vehicles	A vehicle with conditional to full automation (SAE levels 3–5). It is a vehicle that has an automated driving system, which means that it is capable of performing the entire dynamic driving task on a sustained basis without human input. It is distinct from vehicles with automated features to assist a driver (SAE levels 1–2), which still require a human driver to perform part of the dynamic driving task.
Council of Australian Governments (COAG)	The peak Australian intergovernmental forum comprising of the heads of Commonwealth, state and territory governments and the Australian Local Government Association.
Conditional automation (SAE level 3)	The ADS undertakes the entire dynamic driving task in situations within its 'operational design domain' (see below). The human driver does not have to monitor the driving environment or the ADS, but must be receptive to ADS requests to intervene and any system failures. Conditional automation is also referred to as level 3 automation.

Department of Infrastructure, Transport, Cities and Regional Development	Department of the Commonwealth government responsible for administering the <i>Road Vehicle Standards Act 2018</i> (Cth) and housing the Office of Future Transport Technology.
Dynamic driving task	All the operational and tactical functions required to operate a vehicle in on-road traffic. This includes steering, acceleration and deceleration, object and event detection and response, manoeuvre planning and enhancing conspicuity through lighting signalling etc. The dynamic driving task excludes strategic functions like trip planning, such as where and when to travel and route selections.
Driving automation features	Automation features which assist the driver, such as lane changing features. A vehicle with driver assistance features is not capable of performing the entire dynamic driving task and requires a human driver. It can cover SAE level 1 (either longitudinal or lateral vehicle control) and SAE level 2 (longitudinal and lateral and control).
Fallback-ready user	A human in a vehicle with conditional automation who is able to operate the vehicle, who is receptive to requests from the ADS to intervene and is receptive to evident dynamic driving task performance-relevant system failures. The fallback-ready user is expected to respond by taking control of the vehicle.
First supply	The market entry of motor vehicles to Australia.
Full automation (SAE level 5)	All aspects of the dynamic driving task and monitoring of the driving environment are undertaken by the ADS. The ADS can operate on all roads at all times. No human driver is required. Full automation is also referred to as level 5 automation.
Geneva Convention on Road Traffic 1949	A convention on road traffic created before the Vienna Convention. Australia is a contracting party to this convention.
Global Forum on Road Traffic Safety (WP.1)	A permanent working party of the UNECE (see below) which administers the Geneva and Vienna Conventions.
Heavy Vehicle (Vehicle	Heavy vehicle regulation made by the Queensland Governor with approval from state and territory transport ministers. It commenced at the same time as the Heavy Vehicle National Law (see below) in 2014.

Standards) National Regulation	
Heavy Vehicle National Law	National laws related to the regulation of heavy vehicles over 4.5 tonnes. Operational in all Australian states and territories except Western Australia and the Northern Territory.
High automation (SAE level 4)	The ADS undertakes the entire dynamic driving task for sustained periods in situations within its 'operational design domain' (see below. When the system is driving the vehicle, a human driver is not required to monitor the driving environment or the driving task. Nor are they required to intervene, because the ADS can bring the vehicle to a safe stop unassisted. High automation is also referred to as level 4 automation.
Human– machine interface	Interface between a human operator and a machine. Includes functional and ergonomic design of the interface (human factors).
In-service	Vehicles supplied to the Australian market and are now in use.
In-service safety	The safety of automated vehicles once the vehicles are on the roads or 'in-service'.
<i>Motor Vehicle Standards Act 1989 (Cth)</i>	Commonwealth legislation to control the safety, environmental and anti-theft performance of all new and used vehicles entering the Australian market for the first time. The <i>Road Vehicle Standards Act 2018 (Cth)</i> will replace this Act.
National Heavy Vehicle Regulator	The National Heavy Vehicle Regulator is Australia's independent regulator for all vehicles over 4.5 tonnes gross vehicle mass (heavy vehicles). It administers one set of laws for heavy vehicles under the Heavy Vehicle National Law, delivering a comprehensive range of services under a consistent regulatory framework.
National Highway Traffic Safety Administration	An agency of the Executive Branch of the United States Government and part of the Department of Transportation. Functions of the National Highway Traffic Safety Administration include writing and enforcing Federal Motor Vehicle Safety Standards and licensing vehicle manufacturers and importers.
Operational design domain (ODD)	The specific conditions under which a driving automation system or feature is designed to function (for example, locations, weather conditions, driving modes).

Parliamentary Counsel's Committee	A committee representing the legislative drafting offices in Australia and New Zealand.
<i>Road Vehicle Standards Act 2018 (Cth)</i>	Commonwealth legislation to control the safety, environmental and anti-theft performance of all new and used vehicles entering the Australian market for the first time, and to set national road vehicle standards. It will replace the <i>Motor Vehicle Standards Act 1989 (Cth)</i> from 2019. The main provisions of the Act will come into effect on 10 December 2019. There will be a 12 month transitional period allowing some type approval holders to continue operating under existing approvals until 10 December 2020.
Remote driver	The remote driver (sometimes described as a remote operator or teleoperator) is a human who can operate the automated vehicle, but who is not seated in a position to manually operate vehicle controls such as brakes and steering (SAE International, 2018, p. 16). A remote driver may operate the vehicle from outside it or inside it.
SAE level 3	See 'Conditional automation'.
SAE level 4	See 'High automation'.
SAE level 5	See 'Full automation'.
Society of Automotive Engineers (SAE)	A global professional association and standards-developing organisation for engineering professionals. It established the levels of vehicle automation in its technical document J3016.
System failure	A malfunction in a driving automation system and/or other vehicle system that prevents the driving automation system from reliably sustaining dynamic driving task performance (partial or complete).
Transport and Infrastructure Council	Group comprising Commonwealth, state, territory and New Zealand ministers with responsibility for transport and infrastructure issues, as well as the Australian Local Government Association.
United Nations Economic Commission for Europe Working Party 1 (WP.1)	United Nations permanent body that focuses on improving road safety. Its primary function is to serve as guardian of the United Nations legal instruments aimed at harmonising traffic rules.

<p>United Nations Economic Commission for Europe Working Party 29 (WP.29)</p>	<p>United Nations forum within the institutional framework of the UNECE Inland Transport Committee. It works as a global forum allowing open discussion on motor vehicle regulations.</p>
<p>Vienna Convention on Road Traffic 1968</p>	<p>A convention which covers road traffic safety entered into at Vienna in 1968. Australia is not a contracting party.</p>

Executive summary

This consultation Regulation Impact Statement (RIS) seeks feedback on the role and regulation of different parties involved in the safe operation of automated vehicles on Australian roads ('in-service'). It considers safety duties that should apply to these parties, and the institutional and regulatory arrangements to support them.

The RIS forms part of the National Transport Commission's roadmap of reform to develop a nationally consistent regulatory framework to support the safe commercial deployment of automated vehicles into Australia.

Existing regulation and legal frameworks leave gaps where the safe operation of automated vehicles is not adequately covered. We propose that automated vehicle in-service safety risks could be adequately addressed through a mix of regulatory approaches. The regulatory framework could incorporate a general safety duty, together with some prescriptive rules or performance-based regulation. This RIS considers parties to which these duties and regulations should apply.

Context

The NTC's recent work focused on regulation required for automated driving systems (ADSs) to enter the Australian market. This RIS looks at regulation for the next step—regulating the safety of the ADS once it is on the roads.

In November 2018 transport ministers agreed that the entity seeking to bring ADSs to market in Australia, which we describe as the Automated Driving System Entity (ADSE), must self-certify against safety criteria. The ADSE must demonstrate how it will manage safety risks before its ADS can be supplied in the Australian market. The ministers also asked that the NTC does further work to propose an appropriate regulatory framework for the in-service safety of automated vehicles.

In the NTC's May 2018 *Safety Assurance for Automated Driving Systems: Consultation Regulation Impact Statement*, we consulted on an overarching and positive general safety duty on the ADSE. The proposed safety duty was modelled on the duty of care found in work health and safety law and would require an ADSE 'to ensure the safety of the ADS so far as reasonably practicable'. A general safety duty aims to ensure that in-service safety risks not identified at first supply are managed, and unsafe behaviours not otherwise captured by prescribed offences are prevented.

We proposed that this safety duty should only apply to ADSEs. We received feedback that parties other than the ADSE have a significant influence in ensuring the safe operation of automated vehicles, and that we should consider if any new duties should apply to these other parties. In response, this consultation RIS further explores the influence of parties other than the ADSE in ensuring in-service safety, including repairers, modifiers and ADSE executive officers.

Problem statement and analysis

This consultation RIS outlines and seeks feedback on the problem to be addressed. Our problem statement is that when automated vehicles become ready for deployment:

- they may introduce new in-service safety risks that the market will not eliminate or mitigate, and

- nationally inconsistent approaches to in-service safety and multiple regulators without clearly-defined roles could be a regulatory barrier to market entry.

These risks need to be addressed to support the uptake and safe operation of automated vehicles on Australian roads and unlock their broader benefits.

To regulate in-service safety risks, we must first identify the parties who can influence these risks. The parties we think will have a major influence on in-service safety are ADSEs, ADSE executive officers, ADS manufacturers, vehicle manufacturers, remote drivers, fallback-ready users, repairers and modifiers. We define some of these terms in our glossary. Parties that will have a moderate and minor influence on in-service safety are also considered in chapter 4.

Chapter 5 considers the existing regulatory frameworks that may already regulate in-service safety of automated vehicles. Each of the parties that may have an influence on in-service safety is considered, along with an explanation of the extent to which these parties are already regulated. Some existing mechanisms include work health and safety laws, the Australian Consumer Law and negligence laws. We conclude that these mechanisms do not provide adequate in-service safety of automated vehicles.

We outline some proposed regulatory frameworks to appropriately cover new and existing parties to ensure the safe in-service operation of ADSs. We analyse three main regulatory options in chapter 6: prescriptive rules, performance-based regulation, and a general safety duty. We consider a general safety duty should apply to both ADSEs and their executive officers, and potentially repairers. Any general safety duty may need to be supported by some more prescriptive rules to best achieve the regulatory objective. A general safety duty would greatly reduce the need for many prescriptive rules.

The main rules regulating safe behaviour on roads are the Australian Road Rules. However, each state and territory has slightly different road rules, so there is no uniform national consistency. In chapter 7 we ask whether ADSs should be required to comply with the road rules, or whether it would be sufficient for them to just 'drive safely'. We consider some of the existing national inconsistencies and how these could be resolved for automated vehicles.

There will be a need for a regulator to monitor and enforce in-service safety. We consider what functions and powers a regulator would need, the scope of the regulatory task and potential institutional arrangements (chapter 8), and the implementation of in-service safety regulation into Australian law (chapter 9).

Proposed options

We present four options to address the problem statement (chapter 10):

- Option 1 is the baseline option. It does not introduce any new safety duties or obligations for the in-service safety of automated vehicles. Instead, in-service safety is managed separately by each state and territory through existing regulatory frameworks.
- Option 2 introduces new in-service duties enforced by state and territory regulators under state and territory laws, based on a national model law. There are two versions of this option which differ in terms of the form of obligations, one with prescriptive safety duties (option 2a) and the other with general safety duties (option 2b).
- Option 3 introduces new in-service general safety duties enforced by a single national regulator through Commonwealth law.
- Option 4 introduces new in-service general safety duties enforced by a single national regulator through state or territory applied law.

A cost–benefit analysis of the options has been conducted by the independent consultants PwC.

Preliminary conclusions and next steps

The NTC concludes that a general safety duty should apply to both ADSEs and their executive officers, and potentially repairers (chapter 11) to ensure the safe operation of the ADS. Any general safety duty may need to be supported by some prescriptive rules to best achieve the regulatory objective.

PwC’s cost–benefit analysis suggests that all the reform options (options 2–4) have a higher net benefit than the base case (option 1). The options with the highest net benefit are options 3 and 4. Feedback from stakeholders will assist in distinguishing between these options.

The relative benefits and costs of the options may change in light of any new information from the consultation process as existing uncertainties are resolved. Depending on the feedback received on this consultation RIS, it may be necessary to amend the options or combine desirable elements from multiple options.

Following this consultation RIS we will analyse the information we receive and formulate recommendations for a decision RIS. The decision RIS will include recommendations to transport ministers at the Transport and Infrastructure Council about how to regulate in-service safety of automated vehicles.

List of questions

1. To what extent has the consultation RIS fully and accurately described the problem to be addressed, including the in-service safety risks? Please provide detailed reasoning for your answer.
2. Have we correctly identified the parties with an influence on the in-service safety of automated vehicles and accurately described their role? If you identify additional parties, please explain what their role is.
3. Have we accurately assessed each party’s influence on the in-service safety of automated vehicles? If not, please provide details.
4. Have we accurately described the regulation that already applies to relevant parties that would help ensure the in-service safety of automated vehicles?
5. Do you think there are any new risks posed by second-hand ADS components, after-market modifications or the transfer of ownership of automated vehicles, which may not be adequately addressed by existing regulation designed for conventional vehicles?
6. Do you think the parties with an influence on in-service safety are sufficiently covered by Australia’s current legal frameworks?
7. Do you think that a general safety duty to ensure the safe operation of the ADS ‘so far as reasonably practicable’ is appropriate to address the safety risks?
8. If a general safety duty were introduced, which parties should it apply to?
9. If a general safety duty were introduced, should it apply on public and private land (such as residential driveways)?
10. Should people injured by breaches of the general safety duty have a cause of action, or should the ability to enforce a general safety duty be limited to a regulator?

11. Do you think there should be specific driving rules for ADSs like the Australian Road Rules, or would it be sufficient to simply require them to 'drive safely'?
12. What approach to regulating the dynamic driving task for ADSs most efficiently achieves safe outcomes? Please provide reasons.
13. What functions and powers does the regulator need to effectively manage in-service safety? Would these differ depending on whether the regulator is enforcing a general safety duty, or only prescriptive duties?
14. Have we accurately described the scope of the regulatory task? Please provide data and evidence where possible to support your answer.
15. Have we accurately captured the benefits of the regulator being:
 - a. a government body or an independent body?
 - b. a national body or state and territory level bodies?
 - c. an existing body or a new body?
16. What are your initial views on how the regulator should be funded?
17. Have we adequately and accurately captured the key legislative implementation models for in-service safety of automated vehicles?
18. Do you think there are any transitional or constitutional issues that could arise when Australia establishes a national law for automated vehicles? If so, please explain what the issues are, and if they differ depending on the legislative implementation model used.
19. Have we accurately described how each option could work, as well as the advantages and disadvantages of each option?
20. Which option most effectively addresses the problem statement? Please consider your answer in conjunction with the PwC cost–benefit analysis.
21. Is there another option, or combination of options, which could more effectively address the problem statement? In particular, please consider whether there is a preferable combination of the elements of each option (governance arrangements, duties, legislative implementation)

1 Context

Key points

- Automated vehicles have the potential to provide significant benefits to Australian society. Initial models are expected to be commercially deployed between 2019 and 2022.
- In November 2018, transport ministers agreed that the NTC should propose an appropriate regulatory framework for the in-service safety of automated vehicles.
- This consultation RIS seeks feedback on the role of different parties in the in-service safety of automated vehicles, any additional safety duties that should apply to these parties and the institutional and regulatory arrangements to support these duties.

1.1 Purpose of this chapter

The purpose of this chapter is to:

- outline the objectives of the in-service safety for automated vehicles reform
- outline some key terms and concepts that will feature in the document
- introduce policy work and key Ministerial decisions to date
- explain the scope of the reform.

1.2 About the NTC

The NTC is a statutory agency that proposes nationally consistent land transport reforms to the Transport and Infrastructure Council. The council comprises Commonwealth, state and territory ministers who are responsible for transport and infrastructure. Our reforms are objectively assessed against the following policy objectives:

- improve transport productivity
- improve environmental outcomes
- support a safe transport system
- improve regulatory efficiency.

1.3 The opportunity

Automated vehicles have the potential to provide a significant range of benefits to Australian society. Transport ministers asked the NTC to develop regulation for automated vehicles so that Australia can be an early beneficiary of the potential benefits, including:

- **improvements in road safety**—automated vehicles have the potential to save lives caused by human error by removing or reducing the role of a human driver. The United States (US) Department of Transportation attributes the cause of 94 per cent of all crashes to human error (Singh, 2018, p. 1). The most common causes are fatigue, speed, distraction (including mobile phones), and alcohol or drugs (QBE, 2017). In Australia during 2018, there were 1,148 road deaths (provisional) (Department of Infrastructure, Regional Development and Cities, 2019a).

- Traffic accidents have a range of other costs ‘including property damage; lost earnings; lost household production; medical costs; emergency services; vocational rehabilitation; workplace costs; administrative costs; legal costs; and pain, suffering, and lost quality of life’ (Anderson, et al., 2016, p. 10). The annual economic cost of road crashes in Australia is estimated at \$27 billion per annum (Department of Infrastructure, Regional Development and Cities, 2019b).
- **improved access and mobility options**—including for young people, elderly people and people with a disability. Benefits include ‘personal independence, reduction in social isolation, and access to essential services’ (Anderson, et al., 2016, p. 17).
- **more efficient traffic flow and potential reductions in congestion**—automated vehicles may lead to more total travel rather than less. However, they may result in a more efficient traffic flow because their ability to constantly monitor surrounding traffic and respond with finely tuned braking and acceleration adjustments means they should be able to travel safely at higher speeds, follow other vehicles more closely and respond more quickly to traffic lights (Anderson, et al., 2016). Additionally, they could lead to a reduction in crash-related traffic congestion (Anderson, et al., 2016).
- **reduction in the costs associated with congestion**—A 2016 RAND report suggests that automated vehicle technology ‘appears almost certain to offer major benefits in terms of reducing the costs associated with traffic congestion’ (Anderson, et al., 2016, p. 24). This is because even if automated vehicles do not have a major impact in reducing congestion, they could free a driver to undertake activities other than driving. Additional travel time is one of the key costs associated with traffic congestion (Anderson, et al., 2016).

Evidence provided to a 2017 House of Representatives Standing Committee inquiry recognised that automated vehicles are likely to bring a range of benefits. Evidence given to the Committee focused on the benefits of improved safety, increased access and mobility, passengers’ ability to use their time in a more productive way, reduction of congestion, and improved urban planning and use of space (Parliament of the Commonwealth of Australia, 2017).

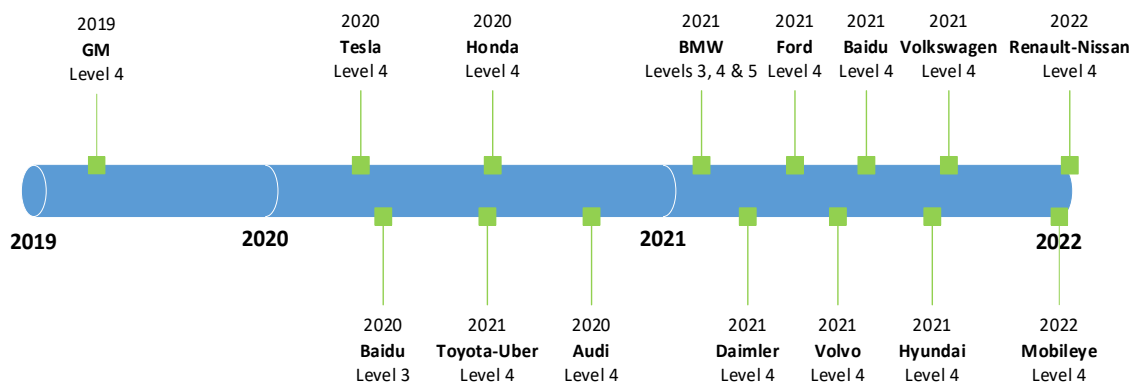
Commentators suggest that regulation is required to ensure the safe introduction and on-road use of automated vehicles (Lohmann & van der Zwaan, 2018, p. 3).

The automotive industry has suggested that ‘before the safety and environmental benefits of automated and connected vehicles can be realised a number of matters need to be considered – one of the most important of which is the regulatory environment’ (Federal Chamber of Automotive Industries, 2018, p. 5).

1.3.1 Timelines for deployment

Our understanding is that major vehicle manufacturers and technology companies expect initial ADS models (SAE level 3 or above) to be commercially available to overseas markets between 2019 and 2022. Figure 1 shows a timeline of predicted international release dates of ADS models as announced by the respective manufacturers.

Figure 1. Timeline of manufacturers' predicted release of automated vehicles



We recognise that these timelines could change significantly based on technology developments and outcomes of trials. We recognise there may be a delay between commercial deployment in international markets and in the Australian market. This is because some manufacturers may choose to initially focus their product offerings in the larger markets such as the US, Europe and China and will need to customise their vehicles for Australian conditions.

1.4 Objectives of this work

The objective of the reform is to develop a regulatory approach that ensures automated vehicles are able to operate legally on Australian roads and support their safe operation once they are on roads ('in-service').

In November 2018, transport ministers agreed to incorporate mandatory self-certification for automated driving systems (ADS) at their first supply to the Australian market into existing Commonwealth legislation (the *Road Vehicle Standards Act 2018* (Cth)).¹ The entity seeking to bring automated driving systems to market in Australia, which we describe as the Automated Driving System Entity (ADSE), must self-certify against safety criteria. It must demonstrate how it will manage safety risks before its ADS can be supplied in the Australian market. This is described in more detail at 1.8.3.

Transport ministers agreed in November 2018 that the NTC should undertake further work to propose an appropriate regulatory framework for the in-service safety of automated vehicles.

1.5 Previous consultation

In 2018 we consulted on an overarching and positive general duty on the ADSE (National Transport Commission, 2018e, p. 31).

The proposed safety duty was modelled on the duty of care found in work health and safety law (WHS), and would require an ADSE 'to ensure the safety of the ADS so far as reasonably practicable'. A general safety duty aims to ensure that in-service safety risks not

¹ Market entry (or first supply) of vehicles in Australia has been regulated under the *Motor Vehicle Standards Act 1989* (Cth); however, the *Road Vehicle Standards Act 2018* (Cth) will replace that Act from 2019. The main provisions of the Act will come into effect on 10 December 2019. There will be a 12 month transitional period allowing some type approval holders to continue operating under existing approvals until 10 December 2020. The Road Vehicle Standards Act also provides a framework for recalls of vehicles and vehicle components, which had previously been issued under the Australian Consumer Law. This paper focuses on the Road Vehicle Standards Act and its subordinate rules, and not the frameworks which the Road Vehicle Standards Act is replacing.

identified at first supply are managed, and unsafe behaviours not otherwise captured by prescribed offences are prevented.

We proposed that this safety duty should only apply to ADSEs—that is, the party seeking to bring the ADS technology to market in Australia. We considered the ADSE would have the best understanding of, and most control over, the safety risks and that, as a new party, it is not well covered by existing legislation. We also suggested that other parties with an influence on the in-service safety of ADSs were either likely to be covered by existing legislation or did not have significant ability to manage risks.

We received feedback through consultation² that:

- a number of parties, other than the ADSE, have a significant role in ensuring the safe operation of automated vehicles
- the role of these parties should be considered in determining what duties and obligations may be appropriate to ensure the safety of automated vehicles
- like the ADSE, parties with an influence on the safety of automated vehicles may not be appropriately covered by existing regulation
- some parties, such as repairers and modifiers, are covered by negligence in torts, but it may be desirable to extend a statutory safety duty to them. This would allow a government regulator to take action, in addition to those to whom the duty is owed.

Reasons given for extending safety duties to parties beyond the ADSE included: a need to consider who has the most control over a particular risk; a need to acknowledge and account for the idea that multiple parties may share responsibility in some cases; and the need to consider the enforceability of the duty. Existing duties may be difficult to enforce, as the parties to whom duties are owed may have limitations, financial or otherwise, to their ability to take enforcement action. The ability to enforce a safety duty may be assisted if a government regulator is also able to take action.

Potential parties suggested included pre-market actors, such as those involved in the manufacturing process, and post-market actors, such as repairers and modifiers.

In November 2018, transport ministers asked us to do further work on in-service safety. To appropriately respond to the feedback on previous consultations, including the 2018 consultation, this consultation Regulation Impact Statement (consultation RIS) further explores the influence of parties other than the ADSE in ensuring in-service safety.

The parties we identify all have the potential to influence in-service safety risks in some way. In identifying these parties, we seek to show where control for elements of in-service safety lies.

1.6 Purpose of this consultation Regulation Impact Statement

This consultation RIS outlines and seeks feedback on the:

- problem to be addressed (chapter 3)
- parties with an influence on the in-service safety of automated vehicles (chapter 4)
- existing regulatory frameworks that may provide for the in-service safety of automated vehicles (chapter 5)

² From ADVI, Motor Trades Association Queensland, PricewaterhouseCoopers, a number of road transport agencies and an industry association.

- regulatory approaches to providing for the in-service safety of automated vehicles (chapter 6)
- implementation of dynamic driving task obligations for ADSs into Australian law (chapter 7)
- required features of an in-service safety regulator, including the required functions and powers, the scope of the regulatory task and potential institutional arrangements (chapter 8)
- implementation of in-service safety regulation into Australian law (chapter 9)
- options to address the problem (chapter 10)
- independent cost–benefit analysis of the options prepared for the NTC by PwC.

Following the consultation RIS, we will analyse the information we receive and formulate recommendations for a decision RIS. The decision RIS will make recommendations to transport ministers at the Transport and Infrastructure Council about how to regulate in-service safety of automated vehicles.

1.7 Key concepts

Automated driving technology has created many new terms and concepts that are not always used consistently. We briefly describe some of the key concepts and how we use them below. Additional explanations are available in the glossary at page 1.



Levels of automation

The Society of Automotive Engineers (SAE) has developed a six-level classification to describe levels of driving automation in SAE J3016, *Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles*. (SAE International, 2018, pp. 19-23). These levels are widely used internationally to provide a common language for the development of policy and regulatory responses for automated vehicles. The levels range from ‘no automation’ (level 0), where the human driver carries out all the driving tasks, to ‘full automation’ (level 5), where the automated driving system carries out all the driving tasks.

A key distinction for the NTC which defines the scope of our work is between vehicles with an ADS and vehicles with ‘driving automation features’. Our national reform program focuses on ‘automated vehicles’, which we describe as vehicles that include an ADS (SAE levels 3–5). Only vehicles with an ADS are capable of driving on a sustained basis without human assistance.

Figure 2 provides a simplified explanation of the six levels of vehicle automation, describing the role of the vehicle (ADS or driver assistance features) and the role of a human driver at each level. The levels are derived from the SAE J3016.

Figure 2. Levels of vehicle automation

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

Two emerging markets

As for conventional vehicles, two major markets are likely to emerge for automated vehicles: a market for vehicles (vehicles privately owned by a household) and a market for rides (taxis, rideshare or public bus services) (Grush & Niles, 2018, p. 73).

It is often predicted that increased automation will lead to a decline in personal ownership of vehicles, and a greater proportion of fleet ownership and shared mobility (Deloitte, 2016).

Regulation will need to accommodate a changing market ‘for buying cars and [...] for buying rides. Both will be significant, mutually competitive, and demanding of space, infrastructure, regulation, and investment’. (Grush & Niles, 2018, p. 74)

Figure 3 below provides an explanation of some key terms used throughout this paper and the way the NTC uses these terms.

Figure 3. Key terms

Automated driving system (ADS) means the hardware and software collectively capable of performing the entire dynamic driving task on a sustained basis. It is a type of driving automation system used in vehicles with SAE levels 3, 4 or 5 of automation.

Automated driving system entity (ADSE) means the self-nominated party that will certify that the ADS can safely perform the driving task in place of a human driver. The ADSE will self-nominate at first supply when applying to the Commonwealth government for type approval of the ADS.

Automated vehicle means a vehicle with conditional to full automation (SAE levels 3–5). It is a vehicle that has an automated driving system which means that it is capable of performing the entire dynamic driving task on a sustained basis without human input. It is distinct from vehicles with automated features to assist a driver (SAE levels 1–2) which still require a human driver to perform part of the dynamic driving task.

Conditional automation (SAE level 3) means the ADS undertakes the entire dynamic driving task in situations within its ‘operational design domain’ (see below). The human driver does not have to monitor the driving environment or the ADS but must be receptive to ADS requests to intervene and any system failures. Conditional automation is also referred to as level 3 automation.

Dynamic driving task means all the operational and tactical functions required to operate a vehicle in on-road traffic. This includes steering, acceleration and deceleration, object and event detection and response, manoeuvre planning and enhancing conspicuity through lighting signalling etc. The dynamic driving task excludes strategic functions like trip planning (where and when to travel and route selections).

Driving automation features means automation features which assist the driver such as lane changing features. A vehicle with driver assistance features is not capable of performing the entire dynamic driving task and requires a human driver. It can cover SAE level 1 (either longitudinal or lateral vehicle control) and SAE level 2 (longitudinal and lateral control).

Fallback-ready user means a human in a vehicle with conditional automation who is able to operate the vehicle, and who is receptive to requests from the ADS to intervene and is receptive to evident dynamic driving task performance-relevant system failures. The fallback-ready user is expected to respond by taking control of the vehicle.

Full automation (SAE level 5) means the ADS undertakes all aspects of the dynamic driving task and monitoring of the driving environment. The ADS can operate on all roads at all times. No human driver is required. Full automation is also referred to as level 5 automation.

High automation (SAE level 4) means the ADS undertakes the entire dynamic driving task in situations within its 'operational design domain' (see below). When the system is driving the vehicle, a human driver is not required to monitor the driving environment or the driving task. Nor are they required to intervene, because the ADS can bring the vehicle to a safe stop unassisted. High automation is also referred to as level 4 automation.

In-service safety means the safety of automated vehicles once the vehicles are on the roads or 'in-service'.

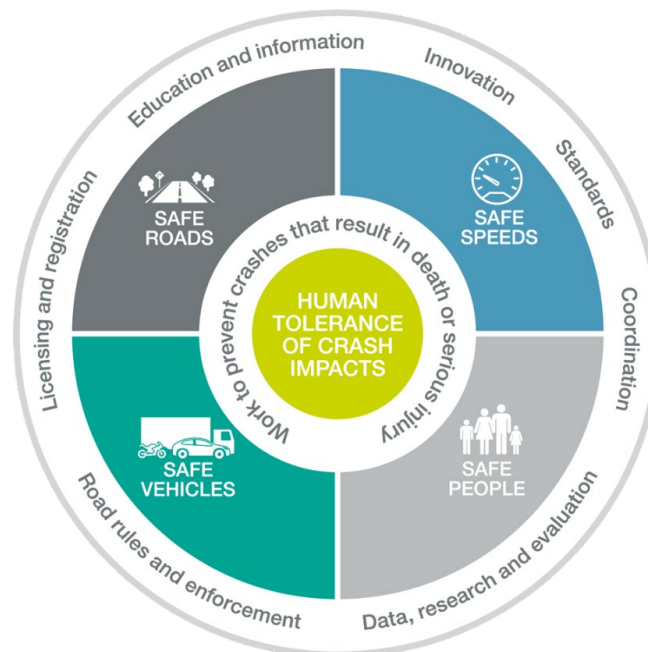
Operational design domain means the specific conditions under which a driving automation system or feature is designed to function (for example, locations, weather conditions, driving modes).

1.8 Background

1.8.1 The National Road Safety Strategy

The *National Road Safety Strategy 2011–2020* expresses the strong commitment of all Australian governments to road safety (Australian Transport Council, 2019). It is based on the Safe System approach to improving road safety, outlined in Figure 4.

Figure 4. The Safe System approach



Source: Australian Transport Council, National Road Safety Strategy 2011–2020

The Safe System approach includes the principle of shared responsibility, recognising that responsibility for road safety is shared by multiple parties, not just individual road users. The concept of shared responsibility is captured throughout this consultation RIS.

1.8.2 NTC’s broader automated vehicle national reform program

The in-service safety reform is part of a broader national reform program for the NTC that aims to develop end-to-end regulation to support the safe, commercial deployment and operation of automated vehicles at all levels of automation. The NTC is collaborating closely with the Commonwealth, Austroads and state and territory governments to ensure an integrated regulatory system.

Figure 5 illustrates the existing end-to-end regulatory process and initiatives by the NTC, Austroads, and the Department of Infrastructure, Transport, Cities and Regional Development to prepare Australia for automated vehicles.

Figure 5. End-to-end regulatory process

Stage	Initiative	Owner	Status
 Import and manufacture	UN harmonization of vehicle standards	Commonwealth	Ongoing
	Safety criteria for first supply of automated vehicles	Commonwealth	Ongoing
 Registration and licensing	Framework for registration and licensing of automated vehicles	Austroads	Ongoing
	Integrating advanced driver assistance systems in driver education	Austroads	Ongoing
 On the road	In-service safety for automated vehicles	NTC	Ongoing
	Operation of automated heavy vehicles in remote and regional areas	Austroads	Complete
	National enforcement guidelines for automated vehicles	NTC	Complete
	Regulating government access to C-ITS and automated vehicle data	NTC	Ongoing
	Review of motor accident injury insurance and automated vehicles	NTC	Ongoing
 Infrastructure	Infrastructure for automated vehicles: freeways and highways, traffic signs, line markings	Austroads	Ongoing
	Road authority data for connected and automated vehicles	Austroads	Ongoing

1.8.3 Key ministerial decisions

Australia's transport ministers have already agreed several key policy elements for regulating automated vehicles. The decisions most relevant to this consultation RIS are outlined below.

Purpose-built national law

Transport ministers have agreed that Australia will develop a new purpose-built national law to regulate the on-road operation of automated vehicles (May 2018). Among other matters, ministers agreed that the purpose-built national law should:

- allow an ADS to perform the dynamic driving task when it is engaged and provide the dynamic driving task obligations
- provide that the ADSE is responsible for dynamic driving task obligations when the ADS is engaged

- provide duties on a fallback-ready user.³

We are working through some of the detail of this new national law, such as dynamic driving task obligations, as part of this consultation RIS.

Mandatory self-certification against safety criteria at first supply

Transport ministers have agreed that the approach to assuring safety when an ADS is first supplied to the Australian market will be mandatory self-certification (National Transport Commission, 2018f). The entity bringing the ADS to market (the ADSE) needs to provide evidence against a set of safety criteria. The approach will be incorporated using existing regulatory frameworks for first supply of conventional vehicles to the Australian market (the Road Vehicle Standards Act).

The applicant must self-certify against the following criteria to demonstrate how it will manage safety risks, before their ADS can be supplied in the Australian market:

1. Safe system design and validation processes
2. Operational design domain
3. Human–machine interface
4. Compliance with relevant road traffic laws
5. Interaction with enforcement and other emergency services
6. Minimal risk condition
7. On-road behavioural competency
8. Installation of system upgrades
9. Verifying for the Australian road environment
10. Cybersecurity
11. Education and training

Ministers also agreed three other obligations on ADSEs to manage liability for events such as road traffic law breaches and crashes:

1. Data recording and sharing
2. Corporate presence in Australia
3. Minimum financial requirements

More detail on each of the safety criteria and other obligations is in Appendix A. The Commonwealth Department of Infrastructure, Transport, Cities and Regional Development, which has responsibility for the Road Vehicle Standards Act, will implement the safety criteria and other obligations.

1.9 Scope of the reform

1.9.1 Matters in scope

The scope of this consultation RIS is to assess regulatory reform options for the in-service safety of automated vehicles. In doing so, we are considering:

- the role of different parties in the in-service safety of automated vehicles

³ The 'fallback-ready user' is discussed in chapter 4.

- existing regulation of these parties and whether any additional safety duties should apply to these parties
- the institutional and regulatory arrangements to support these duties.

1.9.2 Matters out of scope

The following areas are out of scope for this consultation RIS:

- Detailed compliance and enforcement options, including specific powers of the in-service safety regulator to support any new obligations, and sanctions and penalties. The NTC will consider this in a subsequent phase of work which will be informed by the outcomes of this work and our work on regulating government access to C-ITS and automated vehicle data.
- Amendments to the Heavy Vehicle National Law. This RIS considers in-service safety duties for both light and heavy vehicles to ensure consistency. There may be a need for amendment to the Heavy Vehicle National Law, but we are not considering specific changes to that law in this RIS.
- Amendments to state and territory legislation, including passenger transport legislation, criminal law and road management legislation.

Issues that do not relate to the development of regulation such as urban planning and infrastructure requirements are outside our mandate. These issues are being considered by other agencies such as Austroads. Figure 5 at page 18 outlines the range of work being undertaken to prepare for national commercial deployment of automated vehicles and identifies the agency with responsibility.

1.9.3 Links to other NTC reforms

The following NTC reforms are not part of the automated vehicle reform program, however, there are links between these reform programs and regulating for automated vehicles.

Driver distraction

The NTC is reviewing the road rules for driver distraction. The review is considering vehicles operating at SAE levels 0–2. Distraction is also a factor in automated vehicles for someone who is required to, or permitted to, take over driving from an ADS. The NTC consulted on this in early 2019 and is currently developing a consultation RIS which will provide options for reform for release in June 2019. The NTC will ensure any new rules developed for driver distraction are technology-neutral and compatible with increased levels of automation.

Heavy Vehicle National Law review

The NTC is reviewing the Heavy Vehicle National Law. The review is considering the entirety of the law and its regulations, except the functions of the National Heavy Vehicle Regulator. The NTC will be consulting on reforms to the Heavy Vehicle National Law throughout 2019.

The Heavy Vehicle National Law review aims to develop performance and outcome-focused regulation. This will support the use of new technology in heavy vehicles, including increased levels of automation.

1.10 Deciding on the most effective option

In developing the consultation RIS we have been guided by Council of Australian Governments' advice contained in the *Best practice regulation a guide for ministerial councils and national standard setting bodies* (Council of Australian Governments, 2007).

1.10.1 Principles for best-practice regulation

The Council of Australian Governments has agreed on eight principles for best practice-regulation making, and that all governments will ensure that regulatory processes in their jurisdiction are consistent with these principles (Council of Australian Governments, 2007, pp. 4-6).

Transport ministers will assess the decision RIS recommendations for in-service safety of automated vehicles against these principles, which are set out below. The RIS process is designed to help ministers ensure the principles are implemented:

1. establishing a case for action before addressing a problem
2. a range of feasible policy options must be considered, including self-regulatory, co-regulatory and non-regulatory approaches, and their benefits and costs assessed
3. adopting the option that generates the greatest net benefit for the community
4. in accordance with the Competition Principles Agreement, legislation should not restrict competition unless it can be demonstrated that:
 - the benefits of the restrictions to the community as a whole outweigh the costs, and
 - the objectives of the regulation can only be achieved by restricting competition
5. providing effective guidance to relevant regulators and regulated parties in order to ensure that the policy intent and expected compliance requirements of the regulation are clear
6. ensuring that regulation remains relevant and effective over time
7. consulting effectively with affected key stakeholders at all stages of the regulatory cycle
8. government action should be effective and proportional to the issue being addressed.

1.10.2 Practical features of good regulation

The Council of Australian Governments has also identified practical features for regulation which the Transport and Infrastructure Council will consider in identifying the best option (Council of Australian Governments, 2007, pp. 16-17). These are:

1. **Accountability**—Ministers should obtain full government agreement on matters which may involve regulatory action before they are considered at Ministerial Council level.
2. **Compliance strategies and enforcement**—Regulatory measures should contain compliance strategies which ensure the greatest degree of compliance at the lowest cost to all parties.
3. **Inclusion of standards in appendices**
4. **Performance-based regulations**—Regulatory instruments should be performance-based, that is, they should focus on outcomes rather than inputs.
5. **Plain language drafting**—Where possible, regulatory instruments should be drafted in 'plain language' to improve clarity and simplicity, reduce uncertainty and enable the public to understand better the implications of regulatory measures.
6. **Date of effect**—The dates of commencement of proposed standards and regulatory measures should be carefully planned to avoid or mitigate unintended or unnecessary market consequences, such as the necessity to discard non-complying stock and to allow transition to compliance with new regulatory requirements.
7. **Advertising the introduction of standards and regulations**

8. **International standards and practices**—Wherever possible, regulatory measures or standards should be compatible with relevant international or internationally accepted standards or practices in order to minimise the impediments to trade. Compatibility in this context does not necessarily imply uniformity, however. National regulations or mandatory standards should be consistent with Australia’s international obligations.

Principle 4 is particularly relevant to this RIS. The general safety duty discussed in chapter 6 and analysed in the PwC cost–benefit analysis aligns with this guidance. In contrast, a prescriptive approach to regulation would not align well with the practical features of good regulation described by the Council of Australian Governments. There would need to be sound evidence to support departure from the starting point agreed by Australian Governments that good regulation is performance-based.

2 Consultation

Key points

- Any individual or organisation can make a submission to the NTC.
- We are seeking submissions on the paper by 26 August 2019.


2.1 How to submit

Any individual or organisation can make a submission to the NTC. The RIS includes 21 questions that we are seeking your feedback on. You do not need to answer all the questions. You may answer as many or as few questions as you like.

A cost–benefit analysis of the options presented in chapter 10 of this RIS has been conducted by the independent consultants PwC. It is published to our [website](#). We have listed the questions from the cost–benefit analysis here for information, but note that the cost–benefit analysis is published as a separate document.

Making a submission

 Visit www.ntc.gov.au and select ‘Submissions’ in the top navigation menu.

 Send a hard copy to:

National Transport Commission
Public submission – In-service safety for automated vehicles
Level 3, 600 Bourke Street
Melbourne VIC 3000.

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

Publishing your submission

Unless you clearly ask us not to, we publish all the submissions we receive online. We will not publish submissions that contain defamatory or offensive content.

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

2.2 Questions to consider – NTC consultation RIS

1. To what extent has the consultation RIS fully and accurately described the problem to be addressed, including the in-service safety risks? Please provide detailed reasoning for your answer.
2. Have we correctly identified the parties with an influence on the in-service safety of automated vehicles and accurately described their role? If you identify additional parties, please explain what their role is.
3. Have we accurately assessed each party’s influence on the in-service safety of automated vehicles? If not, please provide details.

4. Have we accurately described the regulation that already applies to relevant parties that would help ensure the in-service safety of automated vehicles?
5. Do you think there are any new risks posed by second-hand ADS components, after-market modifications or the transfer of ownership of automated vehicles, which may not be adequately addressed by existing regulation designed for conventional vehicles?
6. Do you think the parties with an influence on in-service safety are sufficiently covered by Australia's current legal frameworks?
7. Do you think that a general safety duty to ensure the safe operation of the ADS 'so far as reasonably practicable' is appropriate to address the safety risks?
8. If a general safety duty were introduced, which parties should it apply to?
9. If a general safety duty were introduced, should it apply on public and private land (such as residential driveways)?
10. Should people injured by breaches of the general safety duty have a cause of action, or should the ability to enforce a general safety duty be limited to a regulator?
11. Do you think there should be specific driving rules for ADSs like the Australian Road Rules, or would it be sufficient to simply require them to 'drive safely'?
12. What approach to regulating the dynamic driving task for ADSs most efficiently achieves safe outcomes? Please provide reasons.
13. What functions and powers does the regulator need to effectively manage in-service safety? Would these differ depending on whether the regulator is enforcing a general safety duty, or only prescriptive duties?
14. Have we accurately described the scope of the regulatory task? Please provide data and evidence where possible to support your answer.
15. Have we accurately captured the benefits of the regulator being:
 - a. a government body or an independent body?
 - b. a national body, or state and territory level bodies?
 - c. an existing body or a new body?
16. What are your initial views on how the regulator should be funded?
17. Have we adequately and accurately captured the key legislative implementation models for in-service safety of automated vehicles?
18. Do you think there are any transitional or constitutional issues that could arise when Australia establishes a national law for automated vehicles? If so, please explain what the issues are, and if they differ depending on the legislative implementation model used.
19. Have we accurately described how each option could work, as well as the advantages and disadvantages of each option?
20. Which option most effectively addresses the problem statement? Please consider your answer in conjunction with the PwC cost-benefit analysis.
21. Is there another option, or combination of options, which could more effectively address the problem statement? In particular, please consider whether there is a preferable combination of the elements of each option (governance arrangements, duties, legislative implementation)

2.3 Questions to consider – PwC cost–benefit analysis

1 Questions about the framework used for the analysis

- a Does the framework described in Chapter 2 [of the cost–benefit analysis (CBA)] identify all of the costs and benefits associated with the options for regulating automated vehicles?
- b Are there other costs and benefits that we should consider in the CBA?

2 Questions about key assumptions

- a *The impact of regulation on safety:* are the assumptions about the likely impact of regulation on safety outcomes for automated vehicles reasonable?
- b *Prescriptive versus general safety duties:* are the assumptions about the costs and benefits of the different regulatory approaches reasonable? Can you provide evidence to support any alternative assumptions?
- c *Business costs:* would introducing safety duties on ADSEs, ADSE executive officers or vehicle repairers increase their regulatory costs and if so, how? Would it result in increased safety benefits?
- d *Regulator costs:* are the assumptions about the costs of a national regulator versus state and territory regulators for in-service safety for automated vehicles reasonable? Can you provide evidence on likely operating costs? Would there be additional costs to government to regulate repairers under either a general duty or prescriptive duties?
- e *Take-up of automated vehicles:* are the assumptions about the take-up of automated vehicles reasonable? Can you provide evidence to support any alternative assumptions?
- f *Delay costs:* what is the likelihood that the regulatory approach will delay or bring forward the roll-out of automated vehicles in Australia? How would each of the options be likely to contribute to changes in the roll-out of automated vehicles?

3 Conclusions

- a Does the evidence presented in the analysis support the conclusions made in Chapter 5 [of the CBA]? If not, what alternative conclusions have you drawn?

For all of the questions identified above, we would welcome stakeholders providing additional evidence or data for us to incorporate into the analysis, and to help us to improve the quantification of costs and benefits.

3 Problem statement and need for government intervention

Key points

- Automated vehicles may introduce new in-service safety risks that the market will not eliminate or mitigate.
- Nationally inconsistent approaches to in-service safety of automated vehicles and multiple regulators without clearly-defined roles may be a regulatory barrier to market entry.
- Existing mechanisms to manage in-service safety of conventional vehicles are not fit for purpose for automated vehicles.
- The presence of these market and regulatory failures, and the expectations of Australian communities to address them, warrant government intervention.

3.1 Purpose of this chapter

The purpose of this chapter is to:

- outline the problem this consultation RIS seeks to address
- demonstrate the need for government intervention to address it.

3.2 The problem

In our current regulatory environment, when automated vehicles become ready for deployment:

- they may introduce new in-service safety risks that the market will not eliminate or mitigate
- nationally inconsistent approaches to in-service safety and multiple regulators without clearly-defined roles could be a regulatory barrier to market entry.

These risks need to be addressed to support the uptake and safe operation of automated vehicles on Australian roads and unlock their broader benefits.

3.3 Automated vehicles may introduce new in-service safety risks that the market will not eliminate or mitigate

3.3.1 Automated vehicles may introduce new in-service safety risks

Automated vehicles are widely expected to improve road safety in the future by reducing human error. However, there are also new risks associated with introducing automated vehicles.

In November 2018, transport ministers agreed an approach to assuring the safety of an ADS the first time it is supplied to the Australian market. As discussed in chapter 1, this approach will be incorporated into the Road Vehicle Standards Act. It will require the ADSE to provide evidence against a set of safety criteria to obtain type approval to supply its ADS to the Australian market. The implementation approach is being developed by the Department of Infrastructure, Transport, Cities and Regional Development. It is not yet certain how the

safety criteria will be implemented under the Road Vehicle Standards Act but it is likely that it will rely on a mix of requirements under the Australian Design Rules, conditions of type approval and rules. Amendments to the Act may be needed to allow all the safety criteria to be implemented. The choice of implementation approach may affect the extent to which the first supply requirements can be enforced while the automated vehicle is in-service.

The agreed first supply approach does not extend to safety risks arising over the lifetime of the vehicle when it is in-service, nor does it consider the role of parties beyond the ADSE in ensuring that an ADS is safe.

Table 1. Examples of in-service safety risks

Safety risks may arise when the vehicle is in-service because the ADSE, or another party, does or fails to do something. Risks include:

- technological failure (for example, a hardware fault that was not known at first supply)
- cybersecurity failure (for example, hack or attack due to poor security maintenance)⁴
- software updates introducing new safety issues (poor quality control, or the update is not supported by the vehicle's operating system)
- failure to monitor and issue security updates as required
- failure to issue software updates as required (or failure to install)
- after-market fitment and vehicle modifications adversely impacting the performance of the ADS
- vehicle repairs adversely impacting the performance of the ADS
- use of third-party components that do not meet safety requirements
- failure by the ADSE to address safety issues that emerge over time (software or hardware)—for example, through lack of appropriate support
- failure to monitor the performance of the system
- failure to adapt the system to changes in regulation over time
- failure to adapt the system to changes in the road environment over time.

The effectiveness of an ADS on Australian roads over the life cycle of the vehicle is relatively unknown and untested. The software and technology required for automated vehicles will be incredibly complex. Automated vehicles (those with an ADS) will require significantly more lines of code than vehicles currently on the market. In discussing automated vehicles, people often compare them to planes or trains, both of which may have high levels of automation. However, automated vehicles will require significantly more lines of code because of the frequency of their interactions with other objects.

Figure 6 compares the lines of software code required by a Boeing 787 Dreamliner (about 6.5 million lines) as compared to a modern luxury (non-automated) vehicle (as much as 100 million lines) (United States Government Accountability Office, 2016). The inherent

⁴ The risk of a hacker taking control of a vehicle already exists in vehicles which have digital systems without an ADS. For example, in 2015 hackers demonstrated their ability to control a Jeep Cherokee remotely via a weakness in the internet-enabled features of the car. This demonstration resulted in the recall of 1.4 million vehicles (Brewster, 2015).

complexity of this technology could result in unforeseen risks in-service once automated vehicles are commercially deployed. The code for automated vehicles will be more complex than vehicles currently on the market so the risks will continue to evolve over time as the technology develops.

Figure 6. Average lines of software code in modern luxury vehicles vs airplanes and jets

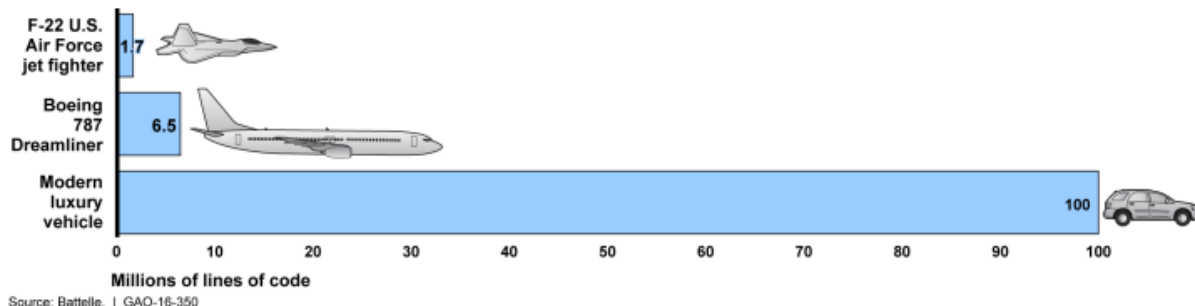


Figure 7 provides problem scenarios which illustrate a range of safety risks that could arise while automated vehicles are in-service.

Figure 7. In-service safety risks for automated vehicles

Organisational risk: Modification/roadworthiness

Scenario 1: Vehicle owner does not accept over-the-air software update

Deepa drives a vehicle that is capable of operating at high automation. She receives a notification that a safety critical software update to the ADS is available and should be installed. Deepa decides not to accept the update and the ADSE does not take any action to manage the risk.

Organisational risk: Modification/roadworthiness

Scenario 2: Vehicle repair affecting the ADS

Ben notices a scratch on the front bumper of his automated vehicle and takes the vehicle to a repairer. While repairing the scratch, the repairer damages the sensors on the front of the car.

Following the repair, Ben sets the vehicle to operate at high automation. The damaged sensors no longer accurately detect the distance between Ben's vehicle and the vehicle in front. The ADS does not diagnose a problem. As a result, Ben's vehicle runs into the back of another vehicle.

Operational/use risk: On-road operation

Scenario 3: Localised and systemic road traffic law breaches

Meg lives in Victoria. She owns an automated vehicle that fails to stop at a red light when operating at high automation. A number of other vehicles with this ADS in Victoria have failed to stop at a red light. Both the ADSE and Police are aware of these incidents.

Organisational risk: On-road operation

Scenario 4: Cybersecurity

Due to a security flaw in the ADS, malicious software is being installed into ADSs. This has resulted in a reduction of safety and performance of many ADSs on the road.

Organisational risk: Vehicle disposal/end of life

Scenario 5: Outdated ADS

A manufacturer has two ADSs—system A and system B. System A is a couple of years old and the manufacturer no longer wants to invest in updating it because it is keen to sell more of system B. The manufacturer stops maintaining system A. Vehicles with this ADS become progressively less safe as newly discovered problems are no longer fixed by the ADSE. Sarah owns a vehicle that incorporates system A and is unaware that the manufacturer has stopped supporting her vehicle's ADS.

Evidence of in-service safety risks

In automated vehicle trials and in early commercial deployments of vehicles with partial automation, there have been some crashes, including a small number of fatalities.

The case study below highlights the potential for overreliance on automated vehicle technology and the need for adequate safeguards while an automated vehicle is in-service.

Seeing Machines CAN Drive Trial – Driverless response time doubles

Seeing Machines is currently undertaking its automated vehicle trial, CAN Drive, supported by the ACT Government in Canberra. The trial uses automated vehicle technology to research driver behaviour to test how quickly a driver can be ready to resume control of an automated vehicle.

Initial results show reaction times more than double when the automated function is engaged. When drivers had complete control, typical reaction times were 1–1.5 seconds but increased to 3–3.5 seconds with autopilot engaged (The Australian, 2018). Drivers were also likely to glance away from the road for twice as long when the system was running (Car advice, 2018).

The trial will continue until the end of June 2019.

3.3.2 The market may not eliminate or mitigate the new in-service safety risks

ADSEs have a commercial incentive to maintain a good reputation with their customers by ensuring that ADSs operate safely in-service. However, there is a risk of a gap between what an ADSE believes is necessary to achieve this (in terms of ongoing service and delivery) and what is socially optimal (in terms of reducing crash risk). This could eventuate for the following reasons:

- ADSEs and other parties with a role in the in-service safety of automated vehicles are unlikely to bear the full economic cost of a crash caused by an unsafe automated vehicle. Broader unaccounted for social costs (or externalities) include the cost of traffic congestion, loss of productivity for those involved in a crash, other road users' pain and suffering, emergency responder and clean-up costs, medical treatment costs, lost workforce participation and road asset damage.
- ADSEs may identify some in-service safety risks that they do not consider significant enough to rectify. For example, an ADSE may be aware of an error that may occur in very limited circumstances, and deem that any potential legal liability or risks to reputation are not enough incentive to address the issues.
- ADSEs may identify an in-service safety risk and consider immediate action is not required or economically efficient. The delayed response may result in avoidable crashes or injuries. Such delay may not be easily attributable as a cause of an accident.

For these reasons, while automated vehicles are in-service, there is a risk of market failure to deliver a socially desirable level of safety risk management.

3.3.3 Existing mechanisms to manage in-service safety risks are not fit for purpose

In-service safety risks for conventional vehicles are currently managed via a range of regulatory tools including vehicle registration, driver licensing and road rules. The in-service safety of automated vehicles does not fit within the current regulatory framework, which assumes a human driver. For human drivers, driver licensing and the road rules are ways of ensuring that vehicles are driven safely by sufficiently skilled and capable individuals. There is no existing equivalent regulatory mechanism to ensure the ongoing safe performance of an ADS.

Existing regulation such as the Australian Consumer Law and WHS laws may cover some elements of in-service safety. However, as described in this consultation RIS, our analysis suggests that reliance on existing regulation would leave gaps. For example:

- WHS laws would only cover some journeys undertaken in certain circumstances, and these circumstances differ in different jurisdictions.
- vehicle recalls can occur through Australian Consumer Law or the Road Vehicle Standards Act for safety purposes;⁵ however, they could disproportionately impact on parties that are unable to control the risk.
- risks relating to software and hardware performance and cybersecurity failures, among others, may not be sufficiently regulated.

Due to the limitations of the existing regulatory tools, ADSEs and other relevant parties may not internalise all social costs associated with ADS crashes. The 'patchwork' nature of current after-market regulations, which may cover some but not all aspects of in-service safety, means that current regulations are unlikely to sufficiently cover remaining social costs. For these reasons, existing mechanisms to manage in-service safety risks are insufficient.

3.3.4 Market expectations

Australian consumers are likely to have high safety expectations for automated vehicles. A 2018 survey (EastLink, 2018) found that 37% of females and 28% of male respondents expect that self-driving vehicles should be 100% safe and will never be involved in a collision. Because automated vehicle technology is new, incredibly complex and its safety performance is uncertain, providing a high standard of safety may require government intervention.

Governments have an existing role regulating vehicle and road safety, and there is a public expectation that governments will take a proactive role in in-service safety assurance. Submissions to our 2017 paper on *Regulatory options to assure automated vehicle safety in Australia* clearly confirm that the community expects governments to have a role in ensuring automated vehicles are safe (National Transport Commission, 2017a, p. 12).⁶

3.4 Nationally inconsistent approaches and multiple regulators could be a regulatory barrier to market entry

ADSEs, governments and other parties with a role in the in-service safety of automated vehicles could face unnecessary costs arising from unclear, nationally inconsistent or

⁵ *Road Vehicle Standards Act 2018* (Cth) ss 37, 47, 77 and *Road Vehicle Standards Rules 2019* (Cth) pt 8.

⁶ Publicly available submissions are available on our website at: <https://www.ntc.gov.au/current-projects/safety-assurance-system-for-automated-vehicles/>.

fragmented in-service regulation. These parties could also face costs of interacting with, and understanding the roles of, multiple regulators who may not have clearly defined roles.

Specifically, there are risks that:

- regulation to manage in-service safety would be nationally inconsistent and not transferable across jurisdictions, leading to additional and unnecessary costs. ADSEs and other parties with a role in the in-service safety of automated vehicles may need to understand up to eight different regulatory schemes.
- overlapping, duplicated regulation between states and territories may result in unclear and uncertain in-service safety expectations.

These costs and risks would act as a disincentive for ADSEs to enter the Australian market, creating a regulatory barrier to market entry. If there are regulatory barriers to the introduction of ADSs, consumers may not be able to realise the full benefits of automated vehicles.

3.4.1 Nationally inconsistent approaches would result in additional and unnecessary costs

Ministers and industry want a single national market for automated vehicles. In the absence of a coordinated national approach, there is a risk that state- or territory-based approaches may not be transferable or harmonised across jurisdictions. In-service safety regulation may be nationally inconsistent.

This risk is highlighted by the experience for automated vehicle trials. The majority of states and territories in Australia are trialling connected and automated vehicles (Austroads, 2019). Three states have introduced new or amended laws to support these trials. While each piece of legislation generally touches on the key elements set out in the *Guidelines for trials of automated vehicles in Australia* (National Transport Commission, Austroads, 2017), the legislative requirements for testing automated vehicles differ. Trials in Australia have not crossed state or territory borders. Any regulation allowing for commercial deployment of automated vehicles will need to allow them to cross state and territory borders as conventional vehicles can now.

If nationally inconsistent regulation emerges, it will result in additional and unnecessary costs of compliance for ADSEs and other parties with a role in the in-service safety of automated vehicles. These costs could include costs of proving and maintaining compliance with different in-service safety requirements across eight different jurisdictions. Unnecessary regulatory costs pose an economic disincentive for the technology and automotive industries to invest in Australia.

Inconsistent regulation could also constrain cross-border activity, limiting the introduction and spread of the technology and potentially obstructing safety innovation.

Inconsistent regulation may also create unnecessary costs to government. Each state- or territory-based road manager may be required to create and apply individual in-service safety requirements. This would duplicate work across jurisdictions. Jurisdictions will need to update and change these standards leading to further cost and divergence.

3.4.2 Multiple regulators without clearly defined roles

Within each jurisdiction multiple regulators may have a role in regulating in-service safety. As noted in section 3.3.3, existing regulation may cover some elements of in-service safety. Existing regulators, such as WHS regulators, road transport regulators, consumer law regulators may each regulate certain aspects of in-service safety. It is not clear what the role and responsibilities of each regulator would be in relation to in-service safety of automated vehicles. This may result in overlapping and duplication of regulation and responsibilities

within a jurisdiction that could lead to unclear and uncertain in-service safety expectations, and increase costs for parties with a role in the in-service safety of automated vehicles.

A lack of clarity around roles and responsibilities may also mean that no regulator takes responsibility, increasing the safety risks. Regulators may be hesitant to investigate or prosecute if their legal standing to do so is unclear, or if they are not confident that they have appropriate expertise in the area. They will prioritise areas for which they have clear legal responsibility.

There is also the potential for some states and territories and not others to introduce a new regulator and regulations for in-service safety of automated vehicles. These new regulators may not have a clearly-defined understanding of their interaction with existing regulators within their own or other states and territories. This could lead to unnecessary costs to government, such as the need to establish memoranda of understanding between multiple regulators and administrative changes, such as roles and responsibilities moving between regulators.

3.4.3 Industry expectations

Submissions to previous NTC consultation have emphasised the need for a nationally consistent framework.⁷ The Federal Chamber of Automotive Industries (FCAI) has told the NTC that the main impediment to introducing ADSs is an inconsistent or uncertain regulatory environment in Australia. Toyota considered that a nationally consistent approach is preferable to two layers of potentially inconsistent regulation at the state/territory and federal levels.

In the United States, industry has commented on the need and importance of a single uniform set of laws and regulations across jurisdictions. This was highlighted by Google in its testimony to the Senate Committee on Commerce, Science, and Transportation (Urmson, 2016):

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.

This sentiment is shared by Lyft (Okpaku, 2016):

The worst possible scenario for the growth of autonomous vehicles is an inconsistent and conflicting patchwork of local, municipal and county laws that will hamper efforts to bring AV technology to market. Regulations are necessary, but regulatory restraint and consistency is equally as important if we are going to allow this industry to reach its full potential.

Volvo has also highlighted the need for a consistent set of uniform laws stating '[t]he absence of one set of rules means car makers cannot conduct credible tests to develop cars that meet all the guidelines of all 50 US states' (Volvo, 2015).

Varying state laws may impose burdens on software developers, who would have to tailor the already complex software in automated vehicles to adhere to specific laws and regions (Brodsky, 2016, p. 875). Manufacturers seeking to comply with multiple jurisdictions may have difficulty complying particularly in the most restrictive jurisdictions (Riehl, 2018, p. 7). The United States Department of Transportation recognises the need for national regulatory

⁷ Relevant submissions are available on our website at: <https://www.ntc.gov.au/submissions/history/?rid=162799&pid=9404>.

consistency and is looking to build regulatory consensus among states (U.S. Department of Transportation, 2018).

3.5 Need for government intervention

The problem statement outlines potential market and regulatory failures for in-service safety that are not adequately addressed by Australia's current regulatory framework. This suggests that government intervention is warranted.

As discussed in section 3.3, despite safety being a major benefit promised by automated vehicles, automated vehicles are also likely to introduce new safety risks. While automated vehicle safety will be regulated at first supply under the Road Vehicle Standards Act, there will be a gap in regulating the in-service safety of automated vehicles. Market forces are unlikely to be sufficient to eliminate or adequately mitigate all new in-service safety risks. Existing regulatory mechanisms, including the Australian Consumer Law and WHS laws, are a patchwork of measures unlikely to comprehensively or effectively ensure in-service safety. In addition, Australian communities have an expectation that automated vehicles will be safe and that governments have a key role in ensuring automated vehicle safety (both at first-supply and in-service).

As discussed in section 3.4, without a nationally coordinated approach, there is a risk that inconsistent regulatory approaches may emerge. This may involve multiple, overlapping regulators resulting in unnecessary and avoidable compliance costs to ADSEs and other parties with a role in the in-service safety of automated vehicles. Significant unnecessary and avoidable compliance costs may form a barrier to market entry meaning that Australian consumers do not receive the benefits of new automated vehicle technology.

Businesses operating in Australia have an expectation that regulations will be both efficient and effective, and not introduce unnecessary costs, barriers or burdens. Industry has noted the need for a nationally consistent framework.

For these reasons, governments are justified in taking a coordinated and proactive role to provide nationally consistent oversight of automated vehicle in-service safety.

3.6 Objectives of government action

The objective of government action is to create an environment for automated vehicles that:

- eliminates or mitigates in-service safety risks
- minimises regulatory costs, barriers and burdens to ADSEs and other parties with a role in the in-service safety of automated vehicles, such that Australian businesses and consumers can realise the benefits of automated vehicle technologies
- opens the Australian market to automated vehicle technology.

If these goals were achieved this would mean that:

- the Australian community is not exposed to unnecessary in-service safety risks from automated vehicles
- Australian businesses and consumers can fully realise the benefits of automated vehicle technology
- ADSEs and other parties with an influence on ADS in-service safety do not face unnecessary costs, barriers or burdens.

Question

1. To what extent has the consultation RIS fully and accurately described the problem to be addressed, including the in-service safety risks? Please provide detailed reasoning for your answer.

4 Parties with an influence on the in-service safety of automated vehicles

Key points

- There are several parties that may have an influence on the in-service safety of automated vehicles.
- Parties have varying levels of influence on in-service safety.
- Some parties may influence in-service safety in multiple capacities.

4.1 Purpose of this chapter

The purpose of this chapter is to:

- identify the various parties that may have an influence on the in-service safety of automated vehicles, and seek your feedback on whether we have correctly identified them and described their role
- provide our preliminary assessment of how significant their influence is on the in-service safety of automated vehicles and seek your feedback.

We include parties who directly affect the safety of the ADS, as well as those with a role that is not directly related to the ADS but which affects the safety of an automated vehicle once it is in-service.

This chapter does not discuss existing duties and obligations that apply to the parties described in this chapter. This is discussed in chapter 5. The chapter also does not discuss whether the parties should be subject to new duties or obligations. We consider this in chapter 6.

4.2 Parties with an influence on the in-service safety of automated vehicles

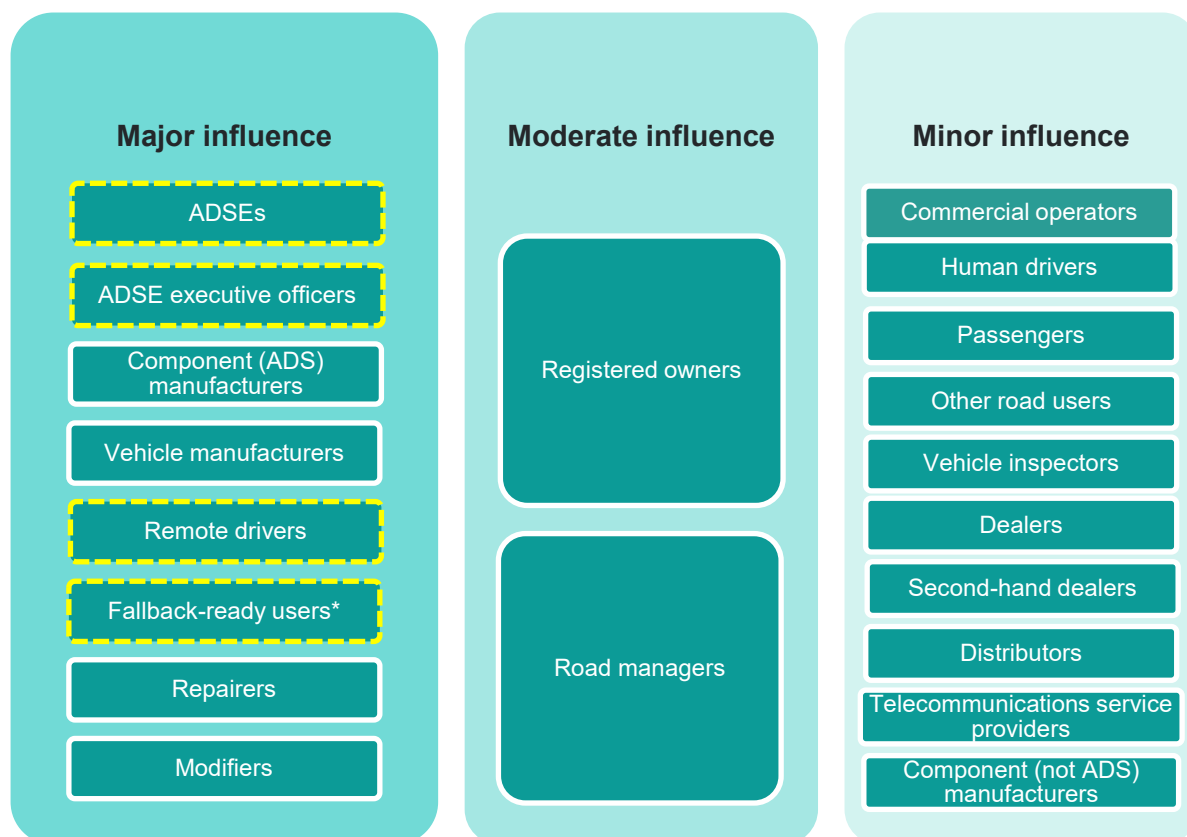
Figure 8 outlines the parties we identified with an influence, or a potential influence, on the in-service safety of automated vehicles. We do not consider parties who may have a role in regulating or administering safety duties, such as an in-service safety regulator, police or road transport agencies.

We have split the parties into three categories reflecting their level of influence on the in-service safety of automated vehicles:

- **Major influence:** Parties whose role directly affects the safe design or safe operation of an automated vehicle.
- **Moderate influence:** Parties whose role indirectly affects the safe design or safe operation of an automated vehicle.
- **Minor influence:** Parties who have the potential to indirectly affect the safe design or safe operation of an automated vehicle.

Yellow boxes denote new parties that only exist in relation to automated vehicles. As we describe in chapter 5, this means that there is no regulation specifically targeting their role in in-service safety.

Figure 8. Parties with an influence on in-service safety of automated vehicles



*The fallback-ready user is a party that only exists in SAE Level 3 vehicles.

The sections that follow describe the role of the parties we identified and the reasons for our preliminary assessment of their influence on in-service safety. This level of influence may change as technology evolves and new parties may emerge over time.

Some parties may have multiple roles. For example, an ADSE may also be the ADS manufacturer. Parties with multiple roles will have the responsibilities and influence on in-service safety described under each relevant party.

The heavy vehicle industry has a range of different parties with an influence on the operation and oversight of heavy vehicles. We have not described relevant parties specified in the Heavy Vehicle National Law as separate parties. These parties will influence the in-service safety of automated heavy vehicles in the same way as other parties described in this chapter, in particular, registered owners, commercial operators, drivers and executive officers.

The parties described include both parties specified in legislation (for example, registered owner) and more general groupings (for example, commercial operators), as appropriate.

4.3 Parties with a major influence on in-service safety

4.3.1 ADSEs

The ADSE will be a new party involved in in-service safety. It is the party that will be responsible for the safe performance of its ADS. It will certify that its ADS can safely perform the driving task in place of a human driver.

An ADSE may be:

- the manufacturer of the ADS

- the manufacturer of both the ADS and the vehicle which incorporates it
- the manufacturer of the vehicle only and not the ADS
- any other party or individual bringing the ADS to market in Australia.

The ADSE will 'self-nominate' by applying to the Commonwealth government for type approval⁸ of a component (the ADS) under the vehicle certification system at first supply to the Australian market. It will need to show how it meets a set of safety criteria outlined in a 'Statement of Compliance' (Appendix A provides the full criteria approved by Ministers). The ADSE will need to continue to comply with the safety criteria once the automated vehicle is in-service. These criteria include requirements to:

- ensure safety-critical ADS upgrades are installed
- ensure that the ADS continues to comply with road traffic laws
- ensure certain data (for example, crash data) is recorded and able to be shared with relevant parties
- minimise the risk of cyber-intrusion
- provide education and training about ADS operation to relevant parties.

There will be one ADSE for each ADS type approval.

The ADSE will have a major influence on in-service safety because it has direct control over the ADS in two main capacities:

- as the party with responsibility for assuring the ongoing safety of the ADS over its life, after the ADS is approved as safe at first supply. Failure to ensure ongoing compliance with the Statement of Compliance could create a number of design, operational and organisational risks that could lead to poor safety outcomes while an ADS is in operation.
- as the party with responsibility for the dynamic driving task when the ADS is engaged, during operation of an automated vehicle. In May 2018, transport ministers agreed that the ADSE will be responsible for the 'dynamic driving task' when an ADS is engaged. The dynamic driving task refers to all of the real-time operational and tactical functions required to operate a vehicle in on-road traffic.⁹

4.3.2 ADSE executive officers

We have included executive officers within an ADSE company as a separate party. They are the senior decision-makers within the ADSE.

ADSE executive officers are a new party involved in in-service safety. They may have a major influence on the in-service safety of automated vehicles as they can independently make decisions that directly affect the design or maintenance of an ADS.

⁸ 'Type approval' refers to a pre-market approval process under the *Road Vehicle Standards Act 2018* (Cth), by which the Department of Infrastructure, Transport, Cities and Regional Development approves a road vehicle (or road vehicle component) for entry on the Register of Approved Vehicles. Once a vehicle receives this certification, it may be provided for the first time in Australia and registered in a state or territory. When the safety assurance system for first supply is implemented, ADSEs will be able to receive type approval if their ADS meets a set of safety criteria and obligations as well as any other relevant Australian Design Rules (ADRs). Once international standards develop and are incorporated into ADRs to recognise the approval of ADSs, ADSEs will also be able to get type approval if they meet these standards (potentially combined with some of the safety criteria and obligations).

⁹ A detailed definition of the dynamic driving task is available in the glossary.

The Volkswagen 'emissions scandal' provides an example of the role of executive officers. Individual employees at Volkswagen misled regulators about the diesel emissions of Volkswagen vehicles. Officers with knowledge of these actions were convicted of criminal offences (Fowler, 2019).

4.3.3 Component (ADS) manufacturers (where they are not the ADSE)

The ADSE can be any party bringing an ADS into Australia; it does not need to be the manufacturer of the ADS. Therefore, ADS manufacturers also warrant consideration as a separate party with an influence on in-service safety.

An ADS manufacturer is an existing party involved in in-service safety.¹⁰ It will have a major influence on the in-service safety of automated vehicles because it has direct control over the design and building of the ADS which will perform the dynamic driving task in an automated vehicle. This means it will have the best understanding of the ADS components and the risks that could emerge. Design risks could emerge while a vehicle is in-service, and could result in technological failure, cybersecurity failure, failure to function appropriately and other safety issues. The ADS manufacturer will also be likely to have an influence in ensuring an ADS is safely integrated into a vehicle before it is supplied to the market, or ensuring an ADS fitted by an individual after-market is able to operate safely.

4.3.4 Vehicle manufacturers (where they are not the ADSE)

Vehicle manufacturers could be separate parties to the ADSE. They might manufacture the whole automated vehicle (including the integrated ADS) or only the vehicle into which they incorporate an ADS manufactured by another party.

The vehicle manufacturer is an existing party involved in in-service safety. It will have a major influence on the in-service safety of automated vehicles because it has direct control over the automated vehicle at the design stage.

The vehicle manufacturer will need to ensure the vehicle's design includes safe integration of the ADS. Inadequate design and ADS integration could lead to crashes when automated vehicles are in operation.

The vehicle manufacturer may also have an influence on in-service safety when repairs to the automated vehicles are required. The vehicle manufacturer could be the repairer or could influence safety by sharing appropriate information with third-party repairers to enable them to complete safe repairs.

¹⁰ The ADS manufacturer is an existing party because the ADS will be a 'road vehicle component' under section 7 of the *Road Vehicle Standards Act 2018* (Cth).

4.3.5 Remote drivers

Figure 9. Remote drivers



The remote driver (sometimes described as a remote operator or teleoperator) is a human who can operate the automated vehicle, but who is not seated in a position to manually operate vehicle controls such as brakes and steering (SAE International, 2018, p. 16). A remote driver may operate the vehicle from outside it or inside it.

A remote driver is a new party involved in in-service safety. It will have a major influence on the in-service safety of automated vehicles because it has direct control over an automated vehicle while it is operating.

The remote driver will undertake the driving task when the ADS is not engaged. A remote driver might be used in 'edge cases', where an ADS has been designed to request remote human intervention when it encounters a situation it cannot handle. An example is rerouting to avoid an obstacle. However, the remote driver may simply identify a path for the vehicle, rather than actively controlling the steering and braking/acceleration.

An example of a company using remote drivers in this way, as part of their system design for safety, is Nissan's 'Seamless Autonomous Mobility'.

Example: Nissan's Seamless Autonomous Mobility (SAM)

SAM will connect automated vehicles with remote operators ('mobility managers') through the wireless network (Nissan Motor Corporation, n.d.). When an automated vehicle comes across an unforeseen situation in the real world, it will be able to request help from a command centre. A remote operator in the command centre will assess the situation and take corrective action.

Nissan has stated its intention to use SAM to connect remote operators with fleets of automated vehicles, either operated by Nissan or commercial passenger operators (Ottley, 2019). The number of automated vehicles one remote operator could manage would be scaled up over time as the automated vehicles' artificial intelligence learns more about navigating obstacles in the real world.

4.3.6 Fallback-ready users

In SAE level 3 vehicles, the ADS is not designed to bring the vehicle to a safe stop if there is a system failure or it encounters conditions that it is not designed to function in; for example,

location or weather conditions (operational design domain). In these circumstances, a human, described as a ‘fallback-ready user’, must take over driving.

The fallback-ready user is a new party specific to SAE level 3 vehicles where an ADS is engaged. They must be responsive to requests from the ADS to intervene and be receptive to evident dynamic driving task performance-relevant system failures. In an SAE level 3 vehicle, when the ADS is not engaged the fallback-ready user will be the human driver. Human drivers are a separate party discussed in section 4.5.1.

The fallback-ready user will have a major influence on in-service safety because they must take over the driving task if the ADS cannot perform it. In May 2018, transport ministers recognised the critical role that a fallback-ready user will have in the safe operation of automated vehicles. Ministers decided that fallback-ready users should have legal duties to:

- remain sufficiently vigilant to respond to automated driving system requests, mechanical failure, or emergency vehicles and regain control of the vehicle without undue delay when required
- be appropriately licensed
- comply with drug, alcohol and fatigue driver obligations (National Transport Commission, 2018a, pp. 4, 50-52).

Failure to adhere to these obligations could lead to poor safety outcomes, for example, if the fallback-ready user is unable to take back control quickly enough.

The fallback-ready user might also be able to use the ADS inappropriately if the ADS’s design allows for this. For example, the fallback-ready user could use the ADS in weather conditions or locations that it is not designed to function in.

The safety criteria agreed by transport ministers recognise the role of the ADSE in ensuring a safe transition of the driving task between an ADS and a fallback-ready user.¹¹ They require that the human-machine interface (HMI) must facilitate interaction between the ADS and relevant parties that allows the vehicle to operate safely. The criteria specify that information communicated by the HMI should include:

requesting the human driver or fallback-ready user take back control of the vehicle with sufficient time for the human driver or fallback-ready user to respond, including in an emerging hazard situation. In addition, the applicant should outline the safeguards to ensure a fallback-ready user is actually ready to take back control. This could include monitoring by the ADS of human readiness to take back control and alert systems where such readiness is not apparent.

Example: Fallback-ready user’s influence on in-service safety

Darren is in the driver’s seat of an SAE level 3 automated vehicle that can operate in automated mode on highways. Darren knows that if the ADS requests it, he must take over driving. The ADS is currently engaged and has been driving the vehicle down a long stretch of highway for some time. Darren is not paying attention when the ADS warns it is nearing the highway exit and requires him to take back control of the vehicle.

¹¹ The concept of the ADS needing to give a fallback-ready user a ‘timely request to intervene’ is included in SAE International Standard J3016. UNECE Working Party 29 will develop guidance on transition demand for this transition of control between an ADS and a fallback-ready user.

4.3.7 Repairers

Repairers are an existing party involved in in-service safety. They could have a major influence on in-service safety because they will have direct access and control over the components of an automated vehicle while they are servicing it.

If repairs, either to ADS software or hardware or other components of the vehicle, are inadequate they could adversely impact the performance of the ADS. This could lead to increased crash risk. Inadequate repairs may be a result of a repairer's lack of understanding of the ADS's operation, or a failure to properly assess the impact of repairs.

It is likely that repairers will be vehicle manufacturers, dealers or independent repairers. An independent repairer is a business that repairs and services vehicles but is not officially endorsed by or affiliated with the manufacturer or dealer (Commonwealth of Australia, 2018, p. 5). Information sharing between ADS and vehicle manufacturers and repairers will be necessary if independent repairers are to remain a viable industry participant.¹²

Example: Repairer's influence on in-service safety

Marc is an independent mechanic. He is repairing a scratch on the bumper of an automated vehicle but damages a radar sensor on the front of the vehicle. The vehicle's owner subsequently drives the vehicle, which no longer accurately detects distances between itself and objects in front of it. The vehicle crashes into the back of another vehicle that has stopped in front of it at a red traffic light.

4.3.8 Modifiers

Modifiers are an existing party involved in in-service safety. They could have a major influence on in-service safety because they will have direct access and control over the components of an automated vehicle while they are modifying it.

Physical or software modifications to the ADS itself or other parts of the automated vehicle might interfere with the operation of the ADS, and aftermarket fitment of an ADS to a conventional vehicle could result in an unsafe vehicle. Modifications of an ADS by a person who did not design the system, or has insufficient understanding of it, could cause it to function in unintended ways, making it unsafe.

There are different parties that can modify the automated vehicle, for example:

- a repairer, custom modifier or the ADSE could undertake commercial modifications
- a registered vehicle owner (or another party at the owner's request) could undertake non-commercial modifications.

Modifications through aftermarket fitment of an ADS could change a conventional vehicle (SAE levels 0–2) to an automated vehicle. Modifications could also increase the level of automation of an already-approved automated vehicle (for example, making an SAE level 4 vehicle into a SAE level 5 vehicle). Modification could also add or change new automated or non-automated features to an already-approved automated vehicle.

We consider that modifiers will most likely be one of the parties above—a repairer, a registered owner or the ADSE. The roles and influence of each of these parties is set out in

¹² In 2018, the ACCC recommended regulatory intervention to mandate the sharing of technical information with independent repairers on commercially fair and reasonable terms, subject to appropriate safeguards, to enable the sharing of environmental, safety and security-related technical information. Following this, Treasury consulted in early 2019 on the establishment of a mandatory code of conduct to specify minimum standards of conduct for parties sharing and accessing vehicle service and repair information. Further information can be found in Appendix E.

this chapter. For this reason, we do not refer to modifiers as a separate party in the remaining chapters of the RIS.

4.4 Parties with a moderate influence on in-service safety

4.4.1 Registered owners (if different to ADSE)¹³

Vehicles in Australia must be registered to be legally driven on public roads. Two of the aims of vehicle registration are ensuring that vehicles are identifiable and that a person or company is responsible for each registered vehicle. This helps ensure a vehicle will operate safely on the roads.

The registered owner is an existing party involved in in-service safety. They will have a moderate influence on in-service safety because they have oversight of the safe operation of the automated vehicle while it is in-service. Their role includes:

- oversight of ADS system upgrades
- decisions about regular servicing, repairs and modifications to the ADS or other parts of the vehicle, which could affect the safe operation of the vehicle.

The registered owner may have a role in the installation of software upgrades. As part of the mandatory self-certification described in section 4.3.1, the ADSE will need to notify registered owners that a safety-critical software upgrade has been installed or is available and needs to be installed. The safety criterion also requires an ADSE to ensure the ADS is safely disengaged if the registered owner fails to install the update.

The registered owner may also be able to observe safety risks such as software failure, cyber-intrusion, or degradation of hardware. This means they will have a role in recognising when an ADS needs maintenance or repair and choosing an appropriate repairer, or in notifying relevant parties of faults.

Similarly, the registered owner could decide to modify their automated vehicle so would have a role in choosing an appropriately qualified modifier.

If a second-hand market for automated vehicles emerges, an automated vehicle might have multiple registered owners over its lifetime. A registered owner may potentially have an influence on the safety of an automated vehicle at the point a vehicle is sold to a new owner, for example, in providing accurate information and documentation about the vehicle to the new owner.

Example: Registered owner's influence on in-service safety

Aroha is the registered owner of a highly automated vehicle. She receives a notification that a safety critical software update to the ADS is available and must be activated manually in the vehicle. Aroha decides not to accept the update.

Aroha drives her vehicle to work. She hands control of the vehicle to the ADS on the highway. The ADS fails to detect road works blocking the lane ahead, because its software has not been updated. The vehicle crashes into parked machinery, injuring Aroha and the machinery operator.

¹³ The terminology used to describe the person in whose name the vehicle is registered varies between states and territories. The key terms used are 'registered owner', 'registered operator' and 'licence holder'. For simplicity, the consultation RIS uses the term 'registered owner' to refer to the person who has primary responsibility for the vehicle.

4.4.2 Road managers (public and private)

Road managers are responsible for the road network. Public road managers are typically state and territory governments and local governments. Private road managers are companies that have responsibility for maintaining particular roads such as a tollway.

Road managers are an existing party involved in in-service safety. They will not have direct access to or control of automated vehicles. However, road managers will have a moderate influence on in-service safety because they are responsible for infrastructure and networks that the vehicles rely on to operate safely.

Road managers have various functions that could influence the in-service safety of automated vehicles including:

- provision and maintenance of the infrastructure that ADSs will interact with—for example, ADSs will need to recognise road signs and traffic
- managing access to the road network—for example, limiting the access of an automated vehicle to a narrower part of the road network than it was approved for at first supply to the Australian market¹⁴
- traffic management, including the opening or closing of parts of the road network—for example, a temporary closure for works that an ADSE is not aware of could cause a safety hazard
- road managers may authorise traffic managers to control traffic on the roads in these circumstances.

4.5 Parties with a minor influence on in-service safety

4.5.1 Commercial operators (not ADSEs or registered owners)

Commercial operators control vehicle fleets and provide mobility services or hire vehicles to the public. For example, a commercial operator might own a ride share platform that links automated vehicles with passengers.

Where a commercial operator also owns their fleet of vehicles, they will also be a registered owner and have an influence on in-service safety as described in section 4.4.1. For the purposes of this section, we are describing the influence of commercial operators on in-service safety that is in addition to, or in place of, a registered owner's influence.

Commercial operators are an existing party involved in in-service safety. They will have a minor influence on in-service safety because they have oversight of the business that allows passengers to ride in automated vehicles provided by their platform.

Commercial operators will need to ensure the in-service safety of the people using their automated vehicles. They have duties to ensure the health and safety of their workers and other persons like visitors and volunteers, and to ensure the health and safety of others is not put at risk from work done as part of their business. Their influence lies in the elimination or mitigation of risks they could reasonably foresee.

¹⁴ Some stakeholders have suggested this as a role for road managers but we note that the safety assurance system is intended to override the need for secondary access decisions. Transport ministers agreed design principles for the safety assurance system in November 2017, one of which provided that 'approval of a road manager should not be required for the automated driving system to operate unless the automated driving system forms part of a part of a vehicle that would otherwise require an exemption or permit to access the road network' (National Transport Commission, 2017a, p. 3).

Commercial operators that are registered owners and provide their vehicles directly to customers, such as hire car companies, may have a role in consumer education on safe operation of the vehicle.

4.5.2 Human drivers

The human driver is an existing party involved in in-service safety. They may have a minor influence on the in-service safety of automated vehicles because they only have direct control over the operation of an automated vehicle when the ADS is not engaged.

When the ADS is not engaged in an automated vehicle, a human driver will be responsible for the driving task. They will be in a position to manually operate controls such as brakes. In an SAE level 3 vehicle, the human driver is a differently regulated party to the fallback-ready user, described in section 4.3.6, though it could be the same person.

4.5.3 Passengers

Passengers in an automated vehicle are an existing party involved in in-service safety. They may have a minor influence on in-service safety because they travel within an automated vehicle while it is operating, but do not have direct control over its operation.

In SAE level 3 automated vehicles, passengers may influence safety if their behaviour is a distraction to fallback-ready users.

In SAE level 4 or 5 automated vehicles, passengers could potentially play a role in ensuring appropriate behaviour, such as that minors are wearing seatbelts. It has also been suggested that passengers might have a role in case of an emergency, if their actions to intervene could help to avoid a safety incident. We do not consider this necessary as regulation does not currently place legal obligations on passengers to intervene to avoid safety incidents.

4.5.4 Other road users

Other road users such as, motorcyclists, cyclists, pedestrians and drivers of other vehicles are existing parties involved in in-service safety. They could have a minor influence on the in-service safety of automated vehicles because their behaviour could affect an automated vehicle while it is operating.

In some trials of automated vehicles, road users have altered their behaviour in an unsafe manner. For example, pedestrians have deliberately stepped into the path of an automated vehicle in the knowledge that the ADS will stop (Currano, et al., 2018, p. 216). Some drivers have overtaken in the wrong lane because they are impatient with automated vehicles travelling slowly.

4.5.5 Vehicle inspectors

Vehicle inspectors carry out vehicle roadworthiness inspections so vehicles can be registered or have their registration renewed. Vehicle inspectors could have a minor influence on the in-service safety of automated vehicles because they have direct access to the components of an automated vehicle while they are testing it. Inappropriately certifying vehicles as roadworthy could result in faulty automated vehicles being driven on the roads.

Vehicle inspectors are an existing party involved in in-service safety. A range of different bodies can be vehicle inspectors if approved by state and territory road transport regulators or the National Heavy Vehicle Regulator. These include independent repairers, vehicle dealerships and royal automobile clubs.

We consider vehicle inspectors' influence on in-service safety is minor because they are only responsible for testing for faults rather than fixing them. Vehicle inspectors also only have

access to the vehicle at set times in a vehicle's life—for example, at the point a vehicle is sold. The times a vehicle inspector has access to a vehicle differs depending on state or territory legislation.

4.5.6 Dealers

A dealer is any business that supplies vehicles to consumers. Dealers are an existing party involved in in-service safety. They could have a minor influence on in-service safety because they interact with individuals or companies that will operate automated vehicles before they have first used them.

Dealers could have an influence on in-service safety through the information they provide to customers purchasing or leasing automated vehicles. This is acknowledged in the safety criteria for ADSEs at first supply—ADSEs must meet an education and training criteria which includes a requirement to facilitate employee, dealer and distributor understanding of the technology and operation so that relevant information can be accurately conveyed to purchasers.

If dealers share appropriate advice on the operation of an ADS, such as use limitations, this could minimise the safety risks of operating the ADS. A dealer's role in providing sufficient information to customers may be more important if dealing in second-hand automated vehicles, as there may be fewer sources of information available to the consumer.

4.5.7 Distributors

Distributors buy vehicles then resell them to local entities who may be retailers, consumers or wholesalers. A distributor may be the Australian arm of an international vehicle manufacturer.

Distributors are an existing party involved in in-service safety. They could have a minor influence on in-service safety because they might interact with individuals or companies that operate or resell automated vehicles.

Distributors could have a similar influence on in-service safety to dealers, by providing information. The education and training safety criteria that ADSEs must meet references the provision of relevant information to distributors (as described above). The information they could provide would also be the same as dealers.

4.5.8 Second-hand dealers

Second-hand dealers buy and sell vehicles or vehicle components. In the future, they may sell ADSs. They may also sell automated vehicles that have been assembled.

Second-hand dealers are an existing party involved in in-service safety. They will have a minor influence on the in-service safety of automated vehicles. They have a role in providing safe ADSs, but it is not their responsibility to ensure the appropriateness of any aftermarket fitment of an ADS or ADS part to a vehicle.

4.5.9 Telecommunications service providers

Telecommunications service providers are existing parties involved in in-service safety. They may have a minor influence on in-service safety, because particular ADS functions may be reliant on the services they provide while the automated vehicle is operating. An ADS which is unable to manage the safety risks involved with a telecommunications failure should not receive type approval.

Telecommunications service providers will provide the connectivity between the ADS and its external surrounds, or between an ADS and the ADSE or automated vehicle fleet operator. The failure of the service could lead to the loss of communications resulting in unsafe

operation of the ADS. However, we still categorise telecommunications service providers' influence as minor because the ADSE can manage this risk. The ADSEs responsibility for this type of risk is reflected in the safety criteria at first supply. For example, the requirement for an ADSE to demonstrate how the ADS will detect that it cannot operate safely and the steps the ADS will take to bring the vehicle to a minimal risk condition.

Failures such as outages to telecommunications infrastructure are foreseeable, so the ADSE needs to ensure that the ADS can operate safely in the event of these types of failures.

Telecommunications service providers have not made any guarantees that their existing infrastructure is fit for automated vehicles to use. ADSEs must be prepared for ADSs to operate with this infrastructure as is.

4.5.10 Component (not ADS) manufacturers

Some automated vehicles may use components provided by manufacturers that are not the ADS manufacturer—for example, mapping components.

These component manufacturers are existing parties involved in in-service safety. They may have a minor influence on the in-service safety of automated vehicles because their components may be integrated with the ADS at the design stage.

Their failure may lead to loss of important functionality of the ADS. However, we still categorise their influence as minor because, as discussed in section 4.5.9, the ADSE has matching responsibilities to ensure ADSs can operate safely in the event of these types of failures. Additionally, manufacturers of these components are several steps removed from the manufacture of the automated vehicle.

4.6 Potential business models and the impact on regulated parties

A party may have multiple roles relating to in-service safety and therefore be regulated in a variety of capacities. For example, they may be the ADSE, a registered operator, a repairer and a modifier. Scenario 1, below, illustrates this. Any future regulation will need to be sufficiently flexible to cover safety risks in all potential scenarios. This means it will need to be able to cover scenarios where one party undertakes multiple roles, each of which has an influence on in-service safety. We provide an example of this in scenario 2. Regulation also needs to be able to accommodate scenarios where these roles are all undertaken by distinct parties; scenario 3 illustrates this.

Examples of parties with multiple roles¹⁵

Scenario 1 – Commercial passenger operator/ADSE

ABC Pty Ltd is the ADSE and operates a commercial fleet of SAE level 4 (with driver when the automated vehicle leaves its operational design domain) and SAE level 5 (no driver) rideshare vehicles. Uber has multiple roles and duties:

- Uber is the ADSE and must:
 - comply with safety criteria for the ADSs at first supply
 - continue to comply with safety criteria for the ADSs while they are in-service

¹⁵ The company names used in these examples are for illustrative purposes only.

- accept responsibility for dynamic driving task obligations
- ensure the health and safety of their employees, including drivers of their level 4 vehicles, passengers and others so far as reasonably practicable (WHS law for person conducting a business or undertaking).
- Uber is also the registered owner/operator and must maintain the roadworthiness of their vehicles and take them for appropriate repairs where necessary.

Scenario 2 – Registered owner/repairer

Ying owns her SAE level 4 automated vehicle. She has also made repairs to it herself. Ying has multiple roles:

- Ying is the registered owner of her ADS
- Ying has made repairs to her ADS and is therefore a repairer.

Scenario 3 – Multiple parties with ability to manage safety risk

Electra Autos is an ADSE that has manufactured both the vehicle and ADS. The ADS will only operate safely with the installation of a system upgrade. This risk could be managed by the following parties:

- Tesla could disable the ADS unless available safety-critical updates are installed
- the automated vehicle's registered owner, fallback-ready user and human driver (and potentially other parties) could be required to install safety-critical updates.

Questions

2. Have we correctly identified the parties with an influence on the in-service safety of automated vehicles and accurately described their role? If you identify additional parties, please explain what their role is.
3. Have we accurately assessed each party's influence on the in-service safety of automated vehicles? If not, please provide details.

5 Regulatory frameworks for in-service safety of automated vehicles

Key points

- International standards are a critical part of regulating automated vehicles, but international reform takes time and may not address some in-service safety issues. Australian reform needs to occur alongside international developments.
- Road safety is a priority for all Australian governments. Current regulation to ensure road safety comprises of road and traffic laws and more general laws including consumer protection, negligence, and WHS laws.
- There are gaps and inadequacies in current regulation to provide for the in-service safety of automated vehicles. The most significant gaps relate to regulation of new parties and road users, such as ADSEs, ADSE executive officers, remote drivers and fallback-ready users. There are also some gaps in regulating some existing parties.

5.1 Purpose of this chapter

The purpose of this chapter is to outline:

- regulation that ensures safe driving of motor vehicles in Australia. This includes both regulation specifically aimed at regulating vehicles or drivers, and more general regulation that can cover parties with an influence on the in-service safety of automated vehicles
- how regulation would apply to the parties identified in chapter 4 to cover the in-service safety of automated vehicles
- the inadequacies or 'gaps' in current regulation in providing for the in-service safety of automated vehicles.

The regulatory frameworks are complex and differ between states and territories. Their application to automated vehicles could also vary as technology, the division of the driving task, and proportion of the vehicle fleet changes over time.

The chapter provides a snapshot of the many laws currently in force in Australia and their role in ensuring in-service safety for automated vehicles. It is not intended to comprehensively detail all laws that may regulate the in-service safety of automated vehicles. To reduce repetition, a law will be explained in greatest detail the first time it appears.

5.2 International regulatory framework

Like Australia, other countries are considering how to regulate automated vehicles and manage the disruptive effects of a non-human driver on existing regulation. At the international level, this is occurring through United Nations Economic Commission for Europe (UNECE) forums.

Two international treaties have a significant impact on automated vehicle safety regulation, both at first supply and in-service. These treaties and the work of the relevant UNECE working parties are briefly outlined below.

In global terms, Australia is a secondary and relatively small market. This means Australia benefits from international regulatory decisions and from aligning its rules with international standards. We recognise that if Australia imposes standards for automated vehicles that are inconsistent with international regulation, manufacturers may not make their automated vehicles available in Australia. This would deprive Australians of the benefits of automated vehicles or delay these benefits.

5.2.1 Geneva and Vienna road traffic conventions

The aim of the Geneva Convention on Road Traffic 1949 (Geneva Convention)¹⁶ and the Vienna Convention on Road Traffic 1968 (Vienna Convention)¹⁷ is to improve international road safety by establishing standard traffic rules among contracting parties. Australia is a contracting party to the Geneva Convention. It is not a contracting party to the Vienna Convention, which supplements previous road traffic conventions; however, the Australian Road Rules are broadly consistent with it.

The Geneva and Vienna Conventions were concluded in 1949 and 1968 respectively, at a time when it was assumed that vehicles would always be operated by a human driver.

The Geneva and Vienna Conventions are administered by a permanent working party of the UNECE, the Global Forum on Road Traffic Safety (WP.1).

WP.1 delegates have differing views about whether amendment is required to the Conventions to allow for the use of SAE level 4 and 5 vehicles. It is likely that subsequent work will focus on this.

5.2.2 Developments on the Geneva and Vienna road traffic conventions

To facilitate the deployment of automated vehicles, WP.1's recent work has included amending and providing guidance on the conventions and the requirements relating to a driver. Recent developments include:

- Adoption by WP.1 on 20 September 2018 of the UNECE Resolution on the deployment of highly and fully automated vehicles. The resolution provides non-binding guidance to contracting parties to the Geneva and Vienna Conventions 'on the safe deployment of highly and fully automated vehicles in road traffic, in order to support the enhancement of road traffic safety, mobility and socio-economic progress'. It includes a recommendation that governments consider incorporating the recommendations of the resolution into their domestic legal and policy frameworks (Economic Commission for Europe, 2018).
- Discussing the possibility of a new convention to provide an international framework for automated vehicles (Economic Commission for Europe, 2019).
- Considering whether clarifying amendments should be made to the 1968 convention in order to better accommodate automated vehicles, along with the risks of divergence between the 1949 and 1968 conventions if only the latter were amended.
- Amendments to Article 8 of the Vienna Convention which came into force on 23 March 2016 (Economic Commission for Europe, 2014). The amendments deem certain automated features compliant with the Convention, while also maintaining the principle that a human driver must ultimately be able to control his or her vehicle. The

¹⁶ *Convention on Road Traffic*, opened for signature 19 September 1949, 125 UTS 3 (entered into force 26 March 1952) art 8.5 ('Geneva Convention').

¹⁷ *Convention on Road Traffic*, opened for signature 8 November 1968, 1042 UNTS 17 (entered into force 21 May 1977) art 8.5 ('Vienna Convention').

amendments provide for 'vehicle systems which influence the way vehicles are driven' to be used if the vehicle driving system either:

- complies with international legal instruments concerning wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles, or
- can be overridden or switched off by the driver.

5.2.3 International vehicle standards

International vehicle standards are developed through UNECE Working Party 29 (WP.29). WP.29 is the World Forum for Harmonization of Vehicle Regulations. It is dedicated to establishing international regulatory standards for motor vehicles and motor vehicle equipment, governing vehicle safety and environmental performance. It aims to ensure that the benefits of new technologies, such as automated driving, can be captured without compromising safety and other policy objectives. The Australian Government's policy is to harmonise its vehicle standards with international regulations wherever possible with specific consideration of the relevant UNECE agreements concerning vehicle standards. Harmonisation is also important to fulfil Australia's World Trade Organisation and Asia Pacific Economic Cooperation Commitments. Australia is a party to two treaties on vehicle standards.¹⁸

The Department of Infrastructure, Transport, Cities and Regional Development regularly attends and contributes to WP.29 meetings.

In June 2018, WP.29 established a new Working Party on Automated/Autonomous and Connected Vehicles (GRVA).

GRVA's priorities include developing standards for:

- Safety and security of vehicle automation and connectivity:
 - Framework
 - Functional requirements
 - New assessments and test methods
 - Cyber security (and software updates)
 - Data Storage System for Automated Driving
- ADAS:
 - Remote control manoeuvring
 - Automatically commanded steering systems
- Dynamics (steering, braking)
 - Advance Emergency Braking Systems
 - Anti-lock Braking System for motorcycles

¹⁸ Australia is a party to the following two treaties:

- *Agreement concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations*, opened for signature 20 March 1958, 335 UNTS 211 (entered into force 20 June 1959).
- *Agreement concerning the Establishing of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts which can be fitted and/or be used on Wheeled Vehicles*, opened for signature 25 June 1998, 2119 UNTS 129 (entered into force 25 August 2000).

- Electronic Stability Control

Under the 1958 Agreement, products meeting vehicle standards agreed to at the international level must be accepted by Australia. Australia implements this obligation through the Road Vehicle Standards Act, which primarily regulates the first supply of vehicles into the market.

For automated technology these frameworks may need to enable some changes to a vehicle or vehicle component in service, for example to enable the ongoing updates of critical ADS software.

5.2.4 Limitations on ability of international regulation to provide for in-service safety

International vehicle standards will be a critical and ongoing part of regulating automated vehicles. The approach to safety of automated vehicles at first supply is for an ADSE to obtain approval under the Road Vehicle Standards Act. The Act incorporates vehicle standards agreed at WP.29 and implemented by Australia. Regulating first supply through the Road Vehicle Standards Act recognises the need for consistency with international standards.

International agreements will not address some in-service safety issues, such as the allocation of responsibility for control of a vehicle, or clarifying the duty of care owed by ADSEs to road users under Australian law. International agreements are also unlikely to provide a comprehensive basis for recognising ADSEs as a legal entity in Australia's complex road safety legal and policy framework, which has evolved within Australia's unique federal structure. This reform work will need to occur alongside international developments.

To have legal effect, internationally agreed standards need to be implemented by legislation in Australia. Despite progress to changes on international law governing driving and vehicle standards, international regulatory reform takes time. If Australia waits for international developments to settle before beginning its regulatory reform process, achieving national consensus and changing laws could take years. Accordingly, the development of a national law to implement in-service standards in a nationally consistent manner needs to progress with urgency. The framework needs to be flexible to enable international regulatory decisions and technological advancements as they develop.

5.3 Summary of gaps in Australian regulatory framework for in-service safety of automated vehicles

Because of the risk to human life posed by unsafe or inadequately controlled vehicles, Australia thoroughly regulates conventional vehicles and drivers, particularly when they are on public roads.

In chapter 4 we identified the parties that may have an influence on ensuring in-service safety of automated vehicles, described their role, and provided our preliminary assessment of how significant their influence is.

In sections 5.4 to 5.6 we provide a detailed analysis of the regulation that applies to these parties, and our initial assessment of whether it is adequate to provide for in-service safety. Our assessment of whether parties are adequately regulated is based both on the significance of their influence on in-service safety of automated vehicles and the existing regulation that applies.

In this section we summarise the analysis of existing regulation of parties with an influence on the in-service safety of automated vehicles. We describe:

- the parties we consider have sufficient requirements and incentives under existing regulation to ensure the in-service safety of automated vehicles
- the parties we consider are not sufficiently covered by requirements and incentives in existing regulation to ensure the in-service safety of automated vehicles.

5.3.1 Parties who are sufficiently covered under existing regulation

We consider that existing regulation is likely to place sufficient requirements and incentives on the following parties to ensure in-service safety of automated vehicles:

- Component (ADS) manufacturers
- Vehicle manufacturers
- Registered owners
- Road managers
- Commercial operators
- Human drivers
- Passengers
- Vehicle inspectors
- Dealers
- Second-hand dealers
- Distributors
- Telecommunications service providers
- Component (not ADS) manufacturers.

Registered owners of vehicles, road managers, commercial operators, human drivers, passengers, vehicle inspectors and telecommunications service providers are broadly covered by existing purpose-built legislation. The legislation is fit for purpose or could be adapted to sufficiently incentivise parties to address new automated vehicle risks within their control. For example, registered owners of vehicles are subject to roadworthiness requirements and sanctions under vehicle registration frameworks.

Component (ADS) manufacturers, vehicle manufacturers, dealers, second-hand dealers, distributors and component (not ADS) manufacturers are sufficiently covered by more general law, including obligations in the Australian Consumer Law, contract law and negligence. For example, dealers' influence on the in-service of safety of automated vehicles relates to the provision of information about an ADS's capabilities. Australian Consumer Law prohibitions on making false or misleading representations in trade or commerce are likely to sufficiently regulate this role.

We do not consider it necessary for some parties, particularly telecommunications service providers and vehicle inspectors, to be covered by automated vehicle regulation. We have assessed their influence on in-service safety for automated vehicles as minor and there is extensive regulation that currently applies to them. If any additional obligations are required for these parties, we consider it would best be managed through incorporation into existing regulation.

5.3.2 Parties who are not sufficiently covered under existing regulation

We consider that existing regulation does not place sufficient requirements and incentives on the following parties to ensure in-service safety:

- ADSEs
- ADSE executive officers
- Remote drivers
- Fallback-ready users
- Repairers.

The reasons these parties are not sufficiently covered differ depending on whether they are a new or existing party. We summarise the reasons for each category of party below.

5.3.3 New parties (ADSEs, ADSE executive officers, remote drivers and fallback-ready users)

ADSEs would be covered by a patchwork of existing legislation which could leave significant gaps in the in-service safety of automated vehicles.

- The agreed safety assurance approach at first supply only addresses safety risks known at the time of first supply to the market. It provides no mechanisms to address risks that emerge while an automated vehicle is in-service. The approach also requires ADSEs to meet first supply safety criteria, some of which have in-service elements, without corresponding regulatory tools to enforce compliance.
- It is likely that an ADSE will owe a duty of care to people and property under negligence; however, the exact standards an ADSE would need to meet to satisfy a judge or jury they had taken reasonable care have not been tested. In addition, negligence requires vulnerable or injured individuals to pursue relatively powerful corporations in court. Litigation is expensive, risky and often slow.
- It is unclear how far an ADSE's duty of care to employees and other parties under WHS laws would extend once an ADS has been in-service for several years.
- The Australian Consumer Law focuses on safety risks which exist at the time of transaction. It is not clear whether an ADSE has an obligation to provide guarantees against safety risks that emerge while an automated vehicle is in-service.
- The exact nature of what amounts to a defect under the Australian Consumer Law has not been tested for automated vehicles.
- There are limitations on the ability of vehicle recalls to cover in-service safety risks, including potentially long delays between a safety issue arising and being resolved. Vehicle recalls adversely affect the vehicle's owner or user, rather than the ADSE who is responsible for the ADS's quality.

ADSE executive officers would also be covered by a patchwork of existing legislation which could leave gaps in the safety assurance of automated vehicles while they are in-service.

- The challenges of using WHS laws to cover due diligence by ADSE executive officers include reliance on multiple regulators who are not specialists in ADS safety.
- ADSE executive officers may have insufficient incentives under Australian corporations law to ensure in-service safety risks are addressed due to competing priorities.
- Duties under commercial passenger transport legislation differ between jurisdictions.
- Due diligence requirements in the Heavy Vehicle National Law do not apply in Western Australia and the Northern Territory.

Remote drivers and fallback-ready users might owe a duty to other road users to take reasonable care, however, the existence of this duty has not been tested in a court.

Ministers have already decided that fallback-ready users should have legal duties that relate to the safe operation of an automated vehicle; however, this is a policy decision that has not yet been implemented.

5.3.4 Existing parties (repairers and other road users)

Our analysis suggests there may be gaps in current regulatory frameworks which cover repairers. Obligations on repairers under the Australian Consumer Law and more targeted legislation focuses on consumer protection rather than safety more broadly.

Repairers owe a duty of care under WHS laws to certain persons who could be injured due to poor vehicle repair work. However, this may be insufficient because WHS regulators have other enforcement priorities, approaches may differ between jurisdictions, and these regulators may not have the level of technical understanding needed to regulate automated vehicle repairers.

Vehicle repairers are regulated at the state and territory level and may require further regulation in order to address any new in-service safety risks created by poor repairs to automated vehicles.

There may also be some gaps in the regulatory frameworks which cover other road users. The Australian Road Rules were not developed with automated vehicles in mind. They may not address risky behaviours from road users which arise when interacting with automated vehicles.

5.4 Parties with a major influence on in-service safety

This section describes the regulation that applies to those parties we assessed in chapter 4 as having a major influence on in-service safety. These are parties whose role directly affects the safe design or safe operation of an automated vehicle.

5.4.1 ADSEs

As ADSEs are a new party, there is limited regulation that may apply to it as a separate party to cover its role in the in-service safety of automated vehicles. The existing regulation, outlined below, is a patchwork of obligations. It is unlikely to be sufficient to cover the major influence of ADSEs on the in-service safety of automated vehicles.

Agreed first supply requirements

The regulation of automated vehicles at first supply will not cover all new in-service risks of automated vehicles. The Road Vehicle Standards Act will regulate automated vehicles and automated vehicle components at first supply to the Australian market. Transport ministers have agreed the ADSE will need to show how it meets a set of safety criteria. They will also need to continue to comply with the safety criteria once the automated vehicle is in-service. The approach is primarily designed to deal with known risks at the time the ADS is supplied to the market. Unforeseen risks could arise in-service. Some of the first supply criteria also have ongoing elements that pose a risk to safety while the ADS is in-service.

Negligence

If a person suffers loss because of another person failing to take reasonable care, the injured person can sue in negligence for compensation. To sue in negligence the injured person must be owed a 'duty of care' by the other party. A breach of negligence law does not have any criminal consequences such as imprisonment. It also requires an individual, rather than a regulator, to pursue a legal remedy and may be very costly.

The relationship between a human driver and another road user, and the relationship between a manufacturer and an end user of a product give rise to a duty of care in negligence. Providing the ADS for an automated vehicle would place the ADSE into a relationship with road users analogous to both these relationships. This makes it likely that a duty of care is owed.

Type approval under the Road Vehicle Standards Act for an ADS against the safety-criteria will be required for an automated vehicle to enter the Australian market and be registered for use. As the party which self-certifies against the safety criteria, an ADSE will be in a unique position to identify and remedy any defects in the automated vehicle before it exposes road users to the risk of harm.

Generally, an ADSE's duty of care will require it to take reasonable care to ensure that the use (or foreseeable misuse) of their ADS does not result in a collision with another vehicle, road user or stationary object. However, beyond that it is difficult to know with greater precision the standards to which a judge or jury would expect an ADSE to adhere to in order to demonstrate it had taken reasonable care.

Work health and safety law

Most of Australia applies harmonised WHS legislation (based on model law), which requires employers to take reasonably practicable steps to eliminate or mitigate risks associated with their business or undertaking.¹⁹ These statutory duties are owed to a number of parties, not just employees. Each state and territory has its own regulator, and each regulator's functions are very general. This means that the extent to which WHS law applies to road safety—and specifically to automated vehicle in-service safety—is unclear.

Section 19(2) of the WHS model law provides the following duty:

A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that the health and safety of other persons is not put at risk from work carried out as part of the conduct of the business or undertaking.

An injury caused by a dangerous or faulty ADS soon after the automated vehicle is in-service might be covered by a duty under the WHS model law. However, it is less clear whether an ADS failure which occurs after the vehicle has been in service for several years would also be covered under the ADSE's WHS duties. A WHS regulator might consider the risks involved in the ADS's operation after several years to be too far removed for the person who supplied the vehicle to be held responsible.²⁰

A further limitation of relying on WHS law for ADSEs is that it relies on multiple state-based regulators who are not specialists in ADS technology. They are likely to have different enforcement approaches and priorities. They may have different interpretations of the WHS law's application to automated vehicle safety.

Australian Consumer Law

Consumer guarantees and safety defects

The consumer guarantee and safety defect provisions in the Australian Consumer Law appear to have limited application to the in-service safety of automated vehicles.

¹⁹ Model Work Health and Safety Law. The frameworks in Western Australia (*Occupational Safety and Health Act 1984 (WA)*) and Victoria (*Occupational Health and Safety Act 2004 (Vic)*) are not based on the model law but their application to automated vehicles is similar.

²⁰ WHS frameworks can operate effectively alongside industry-specific regulatory frameworks. See for example *Work Health Authority v Outback Ballooning Pty Ltd* [2019] HCA 2.

The Australian Consumer Law provides consumer guarantees, including that goods are of acceptable quality and fit for their purpose.²¹ Consumers can claim a remedy from suppliers if the product does not meet one or more of the consumer guarantees.²² Consumers also have more limited rights to claim a remedy from manufacturers or importers.²³

The Australian Consumer Law covers liability for goods with safety defects, making a manufacturer or importer liable for damages if it supplies goods with a safety defect that cause injury to someone.²⁴

The ADSE may have some obligations under the Australian Consumer Law,²⁵ but the law focuses on the relationship between consumers and suppliers, manufacturers or importers at the point in time the transaction occurred. It is a defence to a safety defect claim that the safety defect did not exist at the time the product was supplied.²⁶ This may not be suited to an automated vehicle where defects could be introduced through software updates, and risks may not manifest until an ADS has been used for an extended period of time.

The Australian Consumer Law is primarily concerned with consumer protection rather than the broader goal of public safety. Claims for injury caused by a safety defect are limited to personal injury, damage to certain classes of consumer goods and damage to private property.²⁷ It does not, for example, extend to damage to public infrastructure such as roads, which, if damaged, could also pose a risk to safety.

An additional limitation of consumer guarantees is that they do not apply to goods or services that are acquired for more than \$40,000 and are normally used for business purposes.²⁸ This means they are unlikely to apply to automated vehicles purchased for commercial purposes such as taxis.

Misleading and deceptive conduct

The Australian Consumer Law also prohibits persons, in trade or commerce, engaging in misleading or deceptive conduct and making false or misleading representations.²⁹ These prohibitions require parties competing on product quality such as safety to make truthful safety representations. Rules against misrepresenting the safety of a vehicle or vehicle component could assist in ensuring the market operates to reward ADSEs which provide a safer product or service than their competitors.

Vehicle recalls

As the supplier of an ADS to the Australian market, the ADSE can be subject to vehicle recalls while its automated vehicle is in-service.

²¹ *Competition and Consumer Act 2010* (Cth) sch 2 ('Australian Consumer Law') ss 54-55.

²² Australian Consumer Law s 259.

²³ Australian Consumer Law s 271.

²⁴ Australian Consumer Law s 138.

²⁵ Due to the agreed first supply requirements for automated vehicles, an ADSE will be the type approval holder under the *Road Vehicle Standards Act 2018* (Cth) and therefore the importer or manufacturer for the purposes of the Australian Consumer Law.

²⁶ Australian Consumer Law s 142.

²⁷ Australian Consumer Law ss 138-141.

²⁸ Australian Consumer Law s 3. A review completed by Consumer Affairs Australia and New Zealand in March 2017 recommended that the \$40,000 threshold be increased to \$100,000. Consumer Affairs Ministers supported this proposal for further analysis, requiring a regulatory impact assessment (Ministers for Consumer Affairs, 2017). Such amendments do not currently appear to be in progress.

²⁹ Australian Consumer Law ss 18, 29.

A vehicle or vehicle component may be subject to a recall if a 'safety or ADR [Australian Design Rules] non-compliance issue is identified' (Department of Infrastructure, Regional Development and Cities, 2018a).

In the past, recalls have been issued under the Australian Consumer Law. Under the Road Vehicle Standards Act, the minister responsible for the administration of that Act will have responsibility for recall notices involving automated vehicles and ADS components. The Act gives the minister the broad power to issue recalls for safety purposes or non-compliance with national road vehicle standards.³⁰ For example, a recall notice could require the ADSE to make vehicle owners aware of a fault and offer a free repair. The precise requirements of recalls under the Road Vehicle Standards Act will be finalised when rules under that Act are made.

Although the power is relatively broad, it has limitations in its ability to ensure the in-service safety of automated vehicles. These include:

- limited information—recalls are made by the first supply regulator (the Department of Infrastructure, Transport, Cities and Regional Development) once a vehicle is in-service. This will rely on the first supply regulator being adequately informed by others that a recall has become necessary.
- Timeliness—there may be a long delay between the safety issue arising and being resolved. This is because there are several steps involved in the vehicle recall process. These include regulators becoming aware of the safety issue and issuing the recall, ADSEs complying with the recall to address safety risks, and vehicle owners bringing their vehicle in for repairs. While these timeframes may be acceptable for safety risks posed by some vehicle components, when the vehicle component is performing the dynamic driving task, relying on recalls may mean a safety issue is not addressed with the necessary timeliness.

Vehicle recalls also disproportionately affect the registered owner of the vehicle, who will lose the use of the vehicle while its ADS component is repaired.

5.4.2 ADSE executive officers

While ADSE executive officers, like ADSEs themselves, are a new party, some existing legislation creates specific obligations on officers in corporations. These obligations may apply to ADSE executive officers, requiring that they exercise due diligence for the ADSE's safety obligations. However, they are a patchwork of obligations which may be insufficient to cover the major influence ADSE executive officers will have on the in-service safety of automated vehicles.

The obligations outlined below would apply to ADSE executive officers in their capacity as individuals, separate to any duties on the ADSE.

Corporations law

Australian corporations law defines an officer of a corporation to include the director or secretary of the corporation, or a person who makes decisions that could affect the corporation or its financial standing.³¹

ADSE executive officers are required to act in the best interests of the corporation—the ADSE.³² This is a duty towards the corporation and not the public at large.

³⁰ *Road Vehicle Standards Act 2018* (Cth) s 37 and *Road Vehicle Standards Rules 2019* (Cth) pt 8.

³¹ *Corporations Act 2001* (Cth) s 9.

³² *Corporations Act 2001* (Cth) ss 180-181.

The duty to act in the best interests of the corporation should encourage ADSE executive officers to take steps to protect the ADSE from reputational risk or exposure to litigation arising from an unsafe product. However, when considering if something is in the best interests of the corporation, an ADSE executive officer will have competing priorities; the safety risk of the ADSE's product would be just one.

WHS law, Heavy Vehicle National Law and passenger transport legislation

Due diligence duties have been created specifically for executive officers in some regulatory frameworks. These duties were created to ensure executive officers exercise due diligence to ensure that their organisation complies with its duties of care.

Three regulatory frameworks which include duties on executive officers and could potentially apply to ADSE executive officers are WHS law, the Heavy Vehicle National Law and passenger transport legislation.

In the model WHS law, an officer of the person conducting the business or undertaking 'must exercise due diligence to ensure that the person conducting the business or undertaking complies with that duty or obligation'.³³ Due diligence requirements include taking reasonable steps to:

- acquire and keep up-to-date knowledge of safety matters
- ensure there are appropriate resources to eliminate or minimise risks
- ensure there are appropriate processes for receiving incident and risk information and responding in a timely way.³⁴

The due diligence requirements were recently reviewed by Safe Work Australia, which commented that it was one of the key successes of the model WHS law. Importantly, the review also concluded that unease around including officers' duties in the model WHS law was unfounded (Boland, 2018, pp. 51-52).

The Heavy Vehicle National Law also places a due diligence duty on executive officers. Due diligence requirements include taking reasonable steps to:

- acquire, and keep up to date, knowledge about the safe conduct of transport activities
- gain an understanding of the corporation's transport activities and associated risks (including public risks)
- use resources, and implement processes, to eliminate or minimise these risks.³⁵

In some states and territories, passenger transport legislation creates due diligence requirements for executive officers. They are similar to the requirements under the Heavy Vehicle National Law.³⁶

The application of WHS requirements to ADSE executive officers would have similar limitations and uncertainties as the application of WHS law to an ADSE. A key limitation would be the reliance on multiple regulators who are not specialists in ADS safety for enforcement.

³³ Model Work Health and Safety Law s 27(1).

³⁴ Model Work Health and Safety Law s 27(5).

³⁵ *Heavy Vehicle National Law Act 2012* (Qld) sch ('Heavy Vehicle National Law') s 26D.

³⁶ See, for example: *Point to Point Transport (Taxis and Hire Vehicles) Act 2016* (NSW) s 14; *Transport (Road Passenger Services) Act 2018* (WA) s 20; *Commercial Passenger Vehicle Industry Act 2017* (Vic) s 25.

If the ADSE provides a commercial passenger transport service, or has duties under the Heavy Vehicle National Law, it is likely that executive officers will have due diligence requirements. These frameworks do not rely on WHS law. However:

- executive officer duties under commercial passenger transport legislation differ between jurisdictions, are enforced by different regulators and do not exist in all states and territories.
- the Heavy Vehicle National Law does not apply to light vehicles and does not apply in Western Australia or the Northern Territory.

5.4.3 Component (ADS) manufacturers and vehicle manufacturers

Vehicle and vehicle component manufacturers are well-established parties in Australian law. The manufacturer of an ADS would be a component manufacturer. Our analysis suggests that the decision of transport ministers that an ADSE must vouch for the safety of its ADS at first supply should sufficiently cover any in-service risks arising from the components within the ADS. Where a vehicle or vehicle component (ADS) manufacturer is not an ADSE, the NTC does not see a benefit in any additional regulation targeted at the party itself. If a component in an ADS is found to be faulty, the ADSE—as the type approval holder—would need to address the problem.

Negligence

Manufacturers of vehicles and vehicle components have a duty under negligence law to design their product in a way which minimises the risk of the product causing injury.

The manufacturer must take care to reduce the risk of injury as far as they reasonably can, and to eliminate it, if reasonably possible, when the product is being used to perform its usual or foreseeable function.

The standard of a vehicle manufacturer's duty to road users is to 'take such care as a reasonably prudent manufacturer would take in the circumstances'.³⁷

This requires the designer of the product to consider the suitability of the design and associated problems and risks. The parties must take all reasonable steps to eliminate risks, particularly where the alteration to the design is simple and inexpensive.

Australian Consumer Law

Consumer guarantee and safety defect provisions apply to manufacturers under the Australian Consumer Law. Regardless of whether they are an ADSE, an ADS manufacturer or vehicle manufacturer may be liable if it manufactures goods with a safety defect that cause injury to someone. Consumers can also claim a remedy from the manufacturer where goods are not of an acceptable quality.

Contract

Where it is not also the ADSE, it is likely that the ADS manufacturer or vehicle manufacturer would have a contractual relationship with the ADSE. The ADSE could use a contractual relationship to minimise its risk if any in-service safety issues arise because of the design of the ADS or automated vehicle. This would place strong incentives on ADS manufacturers and vehicle manufacturers to provide for the in-service safety of automated vehicles. We consider that if the ADSE is sufficiently covered in-service, ADS manufacturers and vehicle manufacturers would not require further in-service regulation.

³⁷ *Middleton v Erwin* [2009] NSWSC 108.

5.4.4 Remote drivers and fallback-ready users

Remote drivers and fallback-ready users are new parties. There is limited existing regulation that could apply to them.³⁸ While they are road users, the road rules which regulate other road users were not developed with remote drivers or fallback-ready users in mind.

The existing regulation is fragmented or, in the case of fallback-ready users, policy decisions that have not yet been implemented. It may be insufficient to cover the major influence of remote drivers and fallback-ready users on the in-service safety of automated vehicles.

Duties on fallback-ready users

In May 2018 transport ministers decided that fallback-ready users should have legal duties to remain sufficiently vigilant, be appropriately licensed, and comply with drug, alcohol and driver fatigue obligations.

State and territory criminal law

Separate to traffic offences such as breaches of road rules, states and territories have created specific offences for more serious crimes which can involve the use of a vehicle. Vehicle use which has severe consequences, such as causing serious injury or death, could result in charges under criminal law. In Victoria, for example, these include: culpable driving causing death (up to 20 years' imprisonment); dangerous driving causing death or serious injury (up to 10 years' imprisonment and up to 5 years' imprisonment respectively).³⁹ If a court considers a fallback-ready user or remote driver is not technically the driver, those parties could still be prosecuted under various criminal negligence offences in state and territory law.⁴⁰

A fallback-ready user or remote driver could risk serious criminal charges if their extreme negligence causes a person's death or serious injury.

Negligence

It is likely that fallback-ready users and remote drivers will owe a duty to other road users to take reasonable care and risk liability in negligence law, if their carelessness causes injury or property damage. This would make them liable to pay compensation to the injured party.

5.4.5 Repairers

Repairers are established regulated parties. However, rather than specifically capturing safety, existing regulation generally covers how repairers should deal with their customers. In particular, this exists to address the greater knowledge that repairers have than customers about the parts they use and quality of repairs ('information asymmetry'). Existing regulation may be insufficient to cover the major influence they have on in-service safety of automated vehicles.

Consumer protection laws specific to repairers

Some states and territories require vehicle repairers to hold a licence to perform repairs. The main objective of this regulation is consumer protection. Requiring minimum standards, accountability and transparency for repairers could indirectly improve the overall safety of

³⁸ Some state and territory driving legislation may inadvertently capture these parties in some way, for example if they are technically a 'driver', or 'person-in-control' of a vehicle. Where this does occur, it is a legal technicality and an example of legislation being disrupted by new technologies, rather than a case of governments making a considered decision on the regulation of these new parties.

³⁹ *Crimes Act 1958* (Vic) ss 318, 319.

⁴⁰ See, for example, *Criminal Code Act 1899* (Qld) s 289.

Australia's vehicle fleet. However, the focus of existing regulation is on addressing the information asymmetries between these industries and their customers.⁴¹

Australian Consumer Law

Consumer guarantees

Repairers are service providers. The Australian Consumer Law guarantees that the service will be provided with due care and skill.⁴²

The Australian Consumer Law is concerned with consumer protection rather than public safety more broadly.

Misleading and deceptive conduct

The Australian Consumer Law's prohibitions against misleading or deceptive conduct and making false or misleading representations in trade or commerce apply to vehicle repairers.⁴³ These provisions should incentivise repairers to ensure representations they make about their repair work, including any assurances concerning a vehicle's safety, are truthful.

Work health and safety law

Vehicle repairers owe a duty under WHS law to persons who could be injured due to poor vehicle repairs.⁴⁴ This duty is enforced by the relevant WHS regulator in each state and territory.

However, there are risks in relying on WHS regulators for the regulation of automated vehicle repairs. These include that enforcement priorities and approaches may differ between jurisdictions and the technical understanding needed to regulate automated vehicle repairers would be challenging for regulators with a general jurisdiction such as WHS.

Negligence

Vehicle repairers can be liable for loss or damage caused by a failure to take reasonable care in performing vehicle repairs and modifications. However, as for ADSEs, litigation against automated vehicle repairers will be complex and, in many cases, risky for plaintiffs to pursue.

5.5 Parties with a moderate influence on in-service safety

This section describes the regulation that applies to the parties we assessed in chapter 4 as having a moderate influence on in-service safety. These are parties whose role indirectly affects the safe design or safe operation of an automated vehicle.

5.5.1 Registered owners

The registered owner of the vehicle is an existing party and there is existing regulation that covers them. Our analysis suggests that the established regulatory framework for conventional vehicles should generally provide sufficient coverage for their role in the in-service safety of automated vehicles. However, there may be a need to make some

⁴¹ See, for example, *Motor Dealers and Repairers Act 2013* (NSW) s 3.

⁴² Australian Consumer Law s 60.

⁴³ Australian Consumer Law ss 18, 29.

⁴⁴ Model Work Health and Safety Law s 19(2); *Safe Work NSW v Wagga Motors Pty Ltd* [2018] NSWDC 242.

amendments to existing duties to ensure they can be enforced appropriately for automated vehicles.

Vehicle registration

Generally, a vehicle may only be driven on public roads if it is registered in one of the states or territories. It is an offence to drive an unregistered vehicle.⁴⁵ Usually, where a vehicle does not meet roadworthiness requirements, its registration would be cancelled, or a defect notice could be issued. Vehicle registration legislation can also be used to support vehicle recalls, by giving state authorities grounds to refuse or cancel registration for vehicles which are subject to a recall notice.⁴⁶

Roadworthiness requirements are aimed at ensuring that the key components of the vehicle are in a satisfactory condition for safe road use. All states and territories have minimum safety requirements which must be met in order for a vehicle to be considered roadworthy and be eligible for registration.⁴⁷ Technical standards for roadworthiness are based on the Australian Design Rules, which do not currently capture automated driving systems.⁴⁸ Roadworthiness requirements under vehicle registration frameworks could probably manage any new safety risks that are within the control of a vehicle's owner. For example, an owner's failure to install a safety-critical software update could mean the automated vehicle is no longer roadworthy.⁴⁹

Vehicle registration requirements generally require the registered owner to ensure their vehicle meets a minimum level of safety while it is in-service. Using a vehicle on public roads after refusal or cancellation of registration is a criminal offence. This means the vehicle is of diminished or no value to its owner until the safety issue is remedied.

The threat of cancellation of vehicle registration should incentivise automated vehicle owners to take necessary action the in-service safety of the vehicle. This would include software updates, servicing, repairs and modifications.

However, even where state and territory laws provide a broad power to defect a vehicle if it is "unsafe", in practice this may be difficult to prove when compared to a more prescriptive rule. For example, a requirement that a vehicle's owner install software updates may be easier to enforce than a broad roadworthiness standard requiring a regulator to prove the failure to install an update made the vehicle unsafe. It may be appropriate for states and territories to consider if more prescriptive requirements are appropriate for clarity and ease of enforcement.

5.5.2 Road managers

Road managers are existing parties and are regulated through state and territory road management legislation. Australia's road infrastructure will change over time and may be developed to better provide for increased automation in vehicles. However, the first

⁴⁵ See, for example, *Traffic Act 1987* (NT) s 33.

⁴⁶ See, for example, *Road Transport (Vehicle Registration) Regulation 2017* (NSW) reg 6(3).

⁴⁷ See, for example: *Transport Operations (Road Use Management – Vehicle Standards and Safety) Regulation 2010* (Qld) reg 5; *Motor Vehicles Act 1959* (SA) s 55A; *Vehicle and Traffic (Driver Licensing and Vehicle Registration) Regulations 2010* (Tas) reg 3 (definition of 'roadworthy'), reg 52.

⁴⁸ For a light vehicle (a vehicle which weighs less than 4.5t and includes the typical car), the relevant technical standards are based on the Australian Light Vehicle Standards Rules (ALVSRs), which in turn are based on the Australian Design Rules (the ADRs) that are developed and administered by the Commonwealth. The ALVSRs require vehicles to continue to comply with the ADRs and include additional requirements. ALVSRs are a model law and form the basis for each state and territory's own in-service vehicle standards for light vehicles.

⁴⁹ However, if the ADS is not engaged, the vehicle itself would arguably remain safe and roadworthy.

commercial deployments will require the ADS of automated vehicles to function safely with existing public roads. Although road managers have a crucial role in ensuring road safety, they are not in a position to directly control the behaviour of ADSs. This suggests the current road management frameworks can remain fit for purpose when automated vehicles enter the road network, and any amendments to regulation of road managers should continue to be managed at the state and territory level.⁵⁰

Road management legislation and negligence

Road management legislation creates obligations for state, territory and local government road managers⁵¹ and shapes a road manager's duty of care towards road users.⁵² For example, this might include a statutory duty to inspect, maintain and repair a road to a particular standard,⁵³ and to give notice prior to closing a road.⁵⁴

Road managers have a duty to take reasonable care to not create a foreseeable risk of harm to road users when exercising their powers.⁵⁵

Traffic management regulation

Traffic management is a function of road managers typically outsourced to private firms. It is largely regulated through contracts between road managers and traffic management companies, and relevant road management legislation. WHS law also applies to ensure traffic management occurs in a way that minimises risks to road users (NT WorkSafe, 2018).

5.6 Parties with a minor influence on in-service safety

This section describes the regulation that applies to those parties we assessed in chapter 4 as having a minor influence on in-service safety. These are parties who have the potential to indirectly affect the safe design or safe operation of an automated vehicle.

5.6.1 Commercial operators

Commercial operators are established parties and there is existing regulation that covers them. Where commercial operators are also the registered owner of the vehicle, the regulation discussed in section 5.5.1 would also apply to them.

Our analysis suggests that existing regulation would sufficiently cover the role of commercial operators in the in-service safety of automated vehicles.

Heavy Vehicle National Law

The Heavy Vehicle National Law is currently being reviewed by the National Transport Commission, in part to 'support the use of new technologies' (National Transport Commission, 2018b, p. 1).

⁵⁰ Road management legislation can impact the right of road users to access the road network. It may require review to ensure new road users such as automated vehicles (particularly unoccupied automated vehicles) and remote drivers are able to access public roads within their operational design domain.

⁵¹ Most Australian roads are managed by state, territory and local government agencies. However, some publicly accessible roads are managed by private entities.

⁵² The common law duty of care owed by road managers can be modified by state and territory road management legislation.

⁵³ *Road Management Act 2004* (Vic) s 40.

⁵⁴ *Roads Act 1993* (NSW) s 38B.

⁵⁵ *Brodie v Singleton Shire Council* (2001) 206 CLR 512.

The Heavy Vehicle National Law applies in all states and territories except Western Australia and the Northern Territory. It gives commercial operators using heavy vehicles duties relating to vehicle maintenance and safe operation.

The Heavy Vehicle National Law 'chain of responsibility' creates obligations on certain participants in the heavy vehicle industry, including 'operators',⁵⁶ to manage safety risks within their control.⁵⁷ The chain of responsibility creates a general duty on these parties to 'ensure, so far as is reasonably practicable, the safety of the transport activities relating to the vehicle'.⁵⁸

The Heavy Vehicle National Law also requires that a person 'must not use, or permit to be used, on a road a heavy vehicle that is unsafe'.⁵⁹ A heavy vehicle could be unsafe if any component makes the use of the vehicle unsafe.⁶⁰

For jurisdictions where the Heavy Vehicle National Law applies, it generally covers the role of the heavy vehicle industry in the in-service safety of automated vehicles.

Commercial passenger vehicle legislation

State and territory commercial passenger vehicle (or point-to-point) legislation can impose safety duties on taxi, private hire and rideshare services. The duties differ between states and territories, and each jurisdiction has its own regulator.

Most, but not all, use a general safety duties approach. For example, New South Wales imposes safety duties on passenger and booking service providers such as taxi networks and rideshare platforms. It requires them to ensure the health and safety of drivers, passengers and others involved in the provision or use of their service.⁶¹

If an ADSE provides a fleet of automated vehicles for hire, they would probably be treated as a service provider under state and territory commercial passenger vehicle legislation. This would mean the ADSE would be subject to any general safety duties for the time it is providing the passenger service.

Work health and safety law

Commercial operators of automated vehicles will likely be subject to general duties under WHS legislation as 'persons conducting a business or undertaking'. It is likely that these duties would be owed to passengers or others outside the vehicle in certain situations.

WHS law in each jurisdiction creates a general duty similar to the one in the Heavy Vehicle National Law. It requires persons conducting a business or undertaking to manage safety risks related to the conduct of their business.

Informal consultation by the NTC suggests that the Northern Territory and Western Australia, where the Heavy Vehicle National Law does not apply, place greater reliance on duties under WHS law to manage certain risks for heavy vehicle safety.

⁵⁶ A person is an operator of a vehicle if the person is responsible for controlling or directing the use of the vehicle (see Heavy Vehicle National Law s 5).

⁵⁷ The chain of responsibility parties are defined in the Heavy Vehicle National Law s 5 (definition of 'party in the chain of responsibility').

⁵⁸ Heavy Vehicle National Law s 26C.

⁵⁹ Heavy Vehicle National Law s 89(1).

⁶⁰ Heavy Vehicle National Law s 89(2).

⁶¹ *Point to Point Transport (Taxis and Hire Vehicles) Act 2016* (NSW) s 12.

Negligence

Commercial operators can be liable in negligence for risks within their control. This precise liability will depend on the business model and the degree of control a commercial operator has on the risk.

Potential liability in negligence law should incentivise commercial operators to take reasonable steps to ensure an automated vehicle that they make available for hire is safe and fit for purpose.

5.6.2 Human drivers, passengers and other road users

Human drivers, passengers and other road users are well-established parties, and the application of the law to these road users is relatively well understood. Our analysis suggests that existing regulation would generally cover the role these parties have in the in-service safety of automated vehicles. There may be some minor gaps relating to the interaction between automated vehicles and other road users. Greater regulation may be desirable to ensure these parties do not intentionally damage or interfere with the safe operation of an ADS.

Human driver licensing

To ensure vehicles are only driven by safe drivers, each Australian state and territory limits the right to drive on public roads to those persons who hold a driver's licence.

Driving without a licence is an offence.⁶² While precise requirements vary across jurisdictions, obtaining and retaining a licence generally requires that individuals:

- complete supervised driving experience⁶³
- take written and practical tests to demonstrate their theoretical understanding of the road rules and ability to apply them in practice
- are of a specified minimum age and physical ability
- comply with drug, alcohol and fatigue requirements
- continue to comply with all road and traffic laws.

A driver can have their licence suspended or cancelled. This can happen if the driver fails to comply with their licence conditions, contravenes traffic laws such as driving while intoxicated, or accrues a certain number of demerit points⁶⁴ linked to offences such as speeding or failing to stop at a red light.

Road rules

The Australian Road Rules are model law maintained by the NTC⁶⁵ and contain rules for road users including motorists, motorcyclists, cyclists, pedestrians and passengers.

The Australian Road Rules form the basis of the road rules for each state and territory, but there are some jurisdictional differences. Despite these differences, the fundamental driving

⁶² See, for example, *Road Safety Act 1986* (Vic) s 18.

⁶³ For example, in Victoria, a learner driver must complete 120 hours of supervised driving experience, including at least 20 hours of night time driving before they are able to sit the test to drive unsupervised.

⁶⁴ State and territory driving laws provide a framework of demerit points which are linked to certain traffic offences. Once enough demerit points are accumulated (through multiple traffic infringements) the driver can lose their driving licence.

⁶⁵ The Australian Road Rules can be accessed at: <https://www.ntc.gov.au/roads/rules-compliance/the-australian-road-rules/>.

task obligations are substantially the same nationally. For example, in every state and territory, drivers are required to drive on the left side of the road, stop at stop signs, and give way to the right at intersections.

In addition to drivers of motor vehicles, the Australian Road Rules provide a comprehensive framework for the regulation of passengers and other road users.

- Part 14 provides rules specifically for **pedestrians**, including the requirement that pedestrians obey pedestrian lights when crossing the road (ARR 232), and not cause a traffic hazard by moving into the path of a driver (ARR 236).
- Part 15 of the ARRs provides for the regulation of **cyclists**, including that they ride with at least one hand on the handlebars (ARR 245) and wear bicycle helmets (ARR 256).
- Part 16 creates rules for vehicle **passengers**, including that they wear seatbelts (ARR 265), and not interfere with the driver's control of the vehicle (ARR 272).

Although the Australian Road Rules provide a comprehensive framework for regulating human drivers and other human road users, they were not developed with automated vehicles in mind. They may not sufficiently cover new undesirable behaviour for other road users such as pedestrians deliberately stepping out into the path of an automated vehicle because they rely on the ADS to come to a stop.

Negligence

It is well established that road users owe a duty to take reasonable care not to cause harm to other road users. This duty extends to: vehicle passengers, drivers and pedestrians, the loved ones of those persons⁶⁶, good Samaritans who may seek to render assistance after a collision and thereby be exposed to the risk of injury,⁶⁷ and to at least some bystanders who may sustain psychiatric injury as a result of witnessing a collision.⁶⁸

The duty is owed not only to road users who are careful and considerate, but also to road users who disobey road rules and act erratically such as careless and drunk drivers.⁶⁹

5.6.3 Telecommunications service providers

Telecommunications service providers are a well-established party and there is extensive existing regulation that covers them. This regulation is likely to sufficiently cover the minor influence of telecommunications service providers on the in-service safety of automated vehicles.

Regulation of telecommunications

Telecommunications networks and providers are extensively regulated under Commonwealth legislation, including under the *Telecommunications Act 1997* (Cth), the *Telecommunications (Interception and Access) Act 1979* (Cth) and the *Telecommunications (Consumer Protection and Service Standards) Act 1999* (Cth).

The objects of the Telecommunications Act 1997 include promoting the long-term interests of end-users of telecommunications services, providing community safeguards in relation to telecommunications activities and adequately regulating the telecommunications industry.⁷⁰

⁶⁶ *Jaensch v Coffey* (1984) 155 CLR 549; *Gifford v Strang Patrick Stevedoring Pty Ltd* (2003) 214 CLR 269.

⁶⁷ *Chappel v Hart* (1998) 195 CLR 232.

⁶⁸ *FAI General Insurance Co Ltd v Lucre* (2000) 50 NSWLR 261.

⁶⁹ See *March v E & M H Stramare Pty Ltd* (1991) 171 CLR 506, 527 (McHugh J).

⁷⁰ *Telecommunications Act 1997* (Cth) s 3.

For example, some participants (carriers) need a licence to 'operate facilities if they are used to supply telecommunications services to the public'.⁷¹

If additional regulation is considered necessary to cover any new responsibilities, this would best be managed through amendments to existing telecommunications legislation, rather than new obligations in automated vehicle regulation.

Requirements on ADSEs under the agreed first supply approach

The 'minimal risk condition' safety criterion, which an ADSE must self-certify against at first supply, requires ADSEs to outline the steps they will take to bring the vehicle to a safe state if it cannot operate safely, reducing the risk of a crash.⁷²

While not directly regulating telecommunications service providers, these requirements on ADSEs recognise the potential for telecommunications networks to fail in some cases, and provide additional safeguards if this occurs.

5.6.4 Vehicle inspectors

Vehicle inspectors are an existing party and are likely sufficiently covered under existing regulation. The role of vehicle inspectors ties in closely with roadworthiness and vehicle registration, which also differ between jurisdictions. There is extensive regulation covering vehicle inspectors, and inspectors have been regulated at state and territory level in the past. We consider that if further regulation is required for the inspection of automated vehicles, it would be best addressed through established state and territory legislation.

State and territory motor vehicle registration legislation allows the private sector to have a role in certifying a vehicle's roadworthiness.⁷³ This certification is required at certain points in a vehicle's life, which differ between jurisdictions. Some examples of when an inspection may be required include: upon transfer of ownership, transfer of registration from one state to another, once a vehicle reaches a certain age, circumstances where a vehicle has been given a defect notice, and when registering a vehicle which has previously been written off.

Certain categories of vehicle may have further inspection requirements. For example, a personal vehicle may require a further inspection before it may be used as a rideshare vehicle. Heavy vehicles may have more regular inspection requirements than light vehicles.

When certifying a vehicle is safe for use, vehicle inspectors perform a regulatory function. There is currently extensive regulation of vehicle inspectors at the state and territory level, including:

- the ability for state and territory authorities to revoke a vehicle inspector's licence
- rules requiring an inspector's employer to exercise due diligence, and ensure the inspector complies with any conditions of their licence.⁷⁴

The regulation of vehicle inspectors varies between jurisdictions, allowing jurisdictional differences to be accommodated. For example, to prevent monopoly pricing in remote

⁷¹ *Telecommunications Act 1997* (Cth) ss 42-44.

⁷² See Appendix A for a full description of the 'minimal risk condition' criterion.

⁷³ The term used to describe these private sector parties varies between jurisdictions. For example:

- In the Northern Territory they are known as 'inspectors' appointed under the *Motor Vehicles Act 1949* (NT) s 7(2).
- In Victoria they are known as 'testers' under the *Road Safety (Vehicles) Regulations 2009* (Vic) pt 6.1.

⁷⁴ See, for example, *Transport Operations (Road Use Management – Accreditation and Other Provisions) Regulation 2015* (Qld).

locations, the Northern Territory caps the amount inspectors can charge.⁷⁵ This intervention is unlikely to be necessary in more competitive markets.

5.6.5 Dealers, second-hand dealers and distributors

Dealers, second-hand dealers and distributors are established and regulated parties. However, rather than specifically capturing safety the existing regulation generally addresses the greater knowledge that these parties have than customers about the products they are supplying ('information asymmetries'). In chapter 4 we suggested that dealers, second-hand dealers and distributors have a minor influence on the in-service safety of automated vehicles. Existing regulation may be sufficient for these parties.

Consumer protection laws specific to dealers and second-hand dealers

Some states and territories separately regulate motor vehicle dealers. Regulation includes requirements to hold a motor dealer licence, and rules against odometer tampering or making false representations about a vehicle. Second-hand dealers are also generally required to hold a licence to trade.⁷⁶

The main objective of this regulation is consumer protection. Requiring minimum standards, accountability and transparency for dealers could indirectly improve automated vehicle safety. However, this regulation is not targeted towards vehicle safety. The focus of the existing regulation is generally on ensuring consumers for these industries are better informed.⁷⁷

Australian Consumer Law

Consumer guarantees

Consumers can claim a remedy from suppliers if the product does not meet any one or more of the consumer guarantees, such as that the product is fit for purpose. As dealers and second-hand dealers supply vehicles and vehicle components to consumers, they would be a supplier under the Australian Consumer Law.

The Australian Consumer Law is concerned with consumer protection rather than safety more broadly.

Misleading and deceptive conduct

The Australian Consumer Law's prohibitions against misleading or deceptive conduct and making false or misleading representations in trade or commerce apply to dealers, second-hand dealers and distributors.⁷⁸ These provisions should further incentivise these parties to ensure any representations they make about a vehicle, including its safety and capability, are truthful.

In chapter 4, we explained that the role of dealers and distributors in the in-service safety of automated vehicles is generally the provision of information to individuals or companies, such as information about the ADS' capabilities. Therefore, provisions requiring that the information provided is not false or misleading appear to sufficiently cover the limited role of dealers and distributors in the in-service safety of automated vehicles. Component (not ADS) manufacturers

⁷⁵ *Motor Vehicles (Fees and Charges) Regulations 2008* (NT) sch 1.

⁷⁶ See, for example, *Second-Hand Dealers and Pawnbrokers Act 2003* (Qld) pt 3.

⁷⁷ See, for example, *Motor Dealers and Repairers Act 2013* (NSW) s 3.

⁷⁸ Australian Consumer Law ss 18, 29.

Component manufacturers are existing parties. Our analysis suggests that they are sufficiently covered under existing regulation.

Component manufacturers are covered by similar regulation to ADS manufacturers, as both produce components that specifically relate to the operation of automated vehicles. Regulation covering ADS manufacturers is discussed in section 5.4.3. Component manufacturers:

- have a duty under negligence law to design their product in a way which minimises the risk of the product causing injury
- are likely to have a contractual relationship with the ADSE, which the ADSE could use to minimise its liability if any in-service safety issues arise because of the design of a component. This would place strong incentives on component manufacturers to provide for the in-service safety of automated vehicles
- are subject to consumer guarantee and safety defect provisions in the Australian Consumer Law.

Like telecommunications service providers, the ADSE can manage the risk where a component fails. ADSEs must self-certify at first supply how the automated vehicle will come to a safe state if it cannot operate safely.

Questions

4. Have we accurately described the regulation that already applies to relevant parties that would help ensure the in-service safety of automated vehicles?
5. Do you think there are any new risks posed by second-hand ADS components, after-market modifications or the transfer of ownership of automated vehicles, which may not be adequately addressed by existing regulation designed for conventional vehicles?
6. Do you think the parties with an influence on in-service safety are sufficiently covered by Australia's current legal frameworks?

6 Regulating to ensure automated vehicles operate safely

Key points

- There are several approaches governments can take when developing regulation. This paper focuses on three approaches and their current use in Australian transport law: prescriptive rules; performance-based regulation; and general safety duties.
- A mix of approaches, including a general safety duty on ADSEs, ADSE executive officers and repairers, could address the new in-service safety risks automated vehicles will introduce.
- More prescriptive rules may be appropriate for the ADSE and ADSE executive officers, and other parties such as the fallback-ready user, where standardisation is important and flexibility is not required. This could include ensuring that automated vehicles obey the same road rules as human drivers

6.1 Purpose of this chapter

The purpose of this chapter is to analyse regulatory approaches to providing for the in-service safety of automated vehicles. We describe three regulatory approaches to safety:

- prescriptive rules
- performance-based regulation
- general safety duties.

This chapter analyses the advantages and disadvantages of the three regulatory approaches and how they may apply to the in-service regulation of automated vehicles.

The regulatory approaches we consider in this chapter aim to address our conclusion from chapter 5 that existing regulation is: not designed to regulate the in-service safety of automated vehicles, is fragmented, and is inadequate to address new risks posed by the in-service operation of automated vehicles.

6.2 Previous consultation on safety duties

6.2.1 Features of safety regulation

We previously consulted on how to approach safety of automated vehicles. Generally, stakeholders agreed with the following policy features identified by GM Holden in its submission⁷⁹ to the 2018 RIS:

- promote safety as the top consideration
- enable and do not hamper innovation
- flexible and adaptive to evolving technology

⁷⁹ GM Holden's submission is available on our website at: <https://www.ntc.gov.au/submissions/history/?rid=162799&pid=9404>.

- not overly prescriptive and technically-specific; otherwise, policies will quickly become out-of-date and will stymie safe and continuous development.

In deciding on the appropriate approach, we agree with the broad view of both government and industry stakeholders that the regulatory approach should ensure safety while also enabling innovation.

There are several regulatory approaches which could be taken, and the appropriate method will differ depending on the entity being regulated.

6.2.2 General safety duty

In 2017 and 2018 we consulted on how governments should assure the safety of automated vehicles.⁸⁰ We asked for feedback on whether an ‘overarching and positive general safety duty on the ADSE to ensure the safety of the ADS so far as reasonably practicable’ should be part of Australia’s automated vehicle law.

When describing the advantages of the proposed general safety duty, we noted that it would:

- support the mandatory self-certification approach as an ongoing duty throughout the life cycle of the ADS
- aim to ensure that in-service safety risks and hazards that are not identified through the safety assurance system process are managed, and that unsafe behaviours that are not otherwise captured by prescribed offences are prevented
- not be prescriptive and would therefore accommodate significant advances in safety technology
- provide industry with flexibility in how they manage risks compared with more prescriptive requirements
- allow for more proactive enforcement because risk-related behaviour can be addressed before an incident occurs.

6.2.3 Consultation feedback on general safety duty

Support for a general safety duty

There was strong support from many stakeholders for a general safety duty on the ADSE to ensure the safety of the ADS as far as reasonably practicable.

Generally, state and territory road transport agencies, enforcement agencies, insurers, law firms, consultancies and research bodies supported a general safety duty.

The key reasons given in support of a general safety duty align closely with the features identified by stakeholders in section 6.2.1 as important for the regulation of automated vehicles. They are summarised below:

- **Best provides for safety**—many stakeholders considered that a general safety duty better provides for community safety than other options such as use of existing regulation or new prescriptive rules by:
 - providing an overriding incentive for the ADSE to ensure that the ADS is designed to monitor vehicle performance and safety, and to take corrective action if issues are identified over the life cycle of the ADS (See, for example, Queensland Government)

⁸⁰ Submissions received in this consultation period and referred to below are available online at: <https://www.ntc.gov.au/submissions/history/?rid=162799&pid=9404>

- requiring the ADSE to take necessary steps if deficiencies in the ADS become apparent, for example, ensuring that software updates are provided (See, for example, PwC)
- leading to greater hazard identification and more detailed root cause analysis, with the underlying problem being rectified rather than, for example, just replacing a defective piece of equipment (Nova Systems)
- providing a 'catch all' in the event safety risks not captured by the self-certification criteria are discovered later, perhaps as a result of rapid advancements in ADS technology (See, for example, PwC, South Australian Freight Council)
- encouraging the ADSE to take proactive measures to detect and address safety concerns before they result in harm to vehicle users (See, for example, PwC)
- including the potential for a learning loop or feedback mechanism from incidents, the prevention of further safety risks and taking action immediately, and the promotion of a safety culture within the organisation. It also ensures the ongoing performance of components and the overall system are monitored (See, for example, Department of Transport, Western Australia)
- encouraging comprehensive testing of products and services coming to market and reducing safety risks associated with the commercial pressure to launch a product and/or service to keep up with competitors if they are losing market share or market capitalisation (See, for example, Department of Transport, Western Australia)
- ensuring the ADSE remains responsible for controlling risks within its domain (See, for example, Department of Transport, Western Australia).
- **Allows appropriate allocation of risk**—a general safety duty will ensure that risks associated with the use of automated vehicles are managed by those best placed to do so (See, for example, Victorian Government).
- **Flexibility**—an outcome-focused, risk-based approach to regulation that it is not prescriptive, is flexible enough to address changes in circumstances and risk factors (See, for example, Victorian Government).
- **Suitable for rapidly developing technology**—a general safety duty which relies on what is reasonably practicable at the time is suited to rapidly-developing technology. Technological approaches for ADSs to deal with driving safely will be complex and dynamic. It will not be feasible to use only prescriptive certification to assure safety (See, for example, Victorian Government, QBE).
- **Enables innovation in risk management**—a general safety duty does not limit or impede innovation in risk management and control (See, for example, Victorian Government).
- **Covers full life cycle of vehicle**—a general safety duty can cover the full life cycle of software and hardware, including updates once the automated vehicle is in service. This is important because risks will arise for the full life cycle of the vehicle as updates and patches will be made to the software once the automated driving system is in use on roads (See, for example, Victorian Government. QBE).
- **Alignment and integration with other successful transport safety regulation**—it is consistent with the regulatory approach used for other transport sectors including rail safety, marine safety and commercial passenger vehicle safety. Safety management systems approaches have been demonstrated as effective at managing

risks in those sectors (See, for example, Victorian Government, Department of Transport, Western Australia).

- **Business model neutral**—a general safety duty is business model neutral. Automated vehicles may be owned privately, or on-demand subscription services may become prevalent. A general duty accommodates different business models by allocating responsibility according to the parties best placed to manage those responsibilities (See, for example, Queensland Government).
- **Does not impose a significant regulatory burden**
 - a general safety duty will largely replicate the duty which would be owed in negligence⁸¹ by the ADSE to those who could foreseeably be harmed if the ADS is not safe. Its inclusion in the safety assurance reforms will, however, enable the government regulator to take action against the ADSE in the event the duty is breached. This is consistent with community expectations. This also means the imposition of a primary safety duty on the supplier/importer will not impose significant additional costs as the supplier/importer would need to have incurred similar costs to discharge its duty of care in negligence (See, for example, PwC)
 - a general safety duty does not create a new obligation that results in additional regulatory burden, because similar public safety duties apply in WHS legislation. The effect of including the general safety duties in the scheme is to provide sector-specific regulators with the capacity to monitor compliance and enforce these duties (See, for example, Victorian Government).

Concerns about a general safety duty

Some individuals and agencies we consulted in 2018 did not support—or expressed concerns about—a general safety duty. Generally, manufacturers and peak bodies representing manufacturers did not support a general safety duty. The Department of Infrastructure, Transport, Cities and Regional Development considered further work should be done to assess the merits of a general safety duty.

The key concerns about a general safety duty are summarised below:

- **Existing regulation provides sufficiently for safety**—mechanisms for vehicle and vehicle component recalls under vehicle standards rules, Australian Consumer Law and the Road Vehicle Standards Act provide sufficiently for safety (See, for example, Federal Chamber of Automotive Industries, Truck Industry Council).
- **Concern that it could be inconsistent with international standards**—submissions emphasised the desirability of Australia aligning with vehicle standards that are currently being developed through the United Nations Economic Commission for Europe (UNECE) World Forum for Harmonization of Vehicle Regulations (WP.29) (See, for example, BMW, Federal Chamber of Automotive Industries, Truck Industry Council, Heavy Vehicle Industry Australia, Department of Infrastructure, Transport, Cities and Regional Development).
- **Scope of the general safety duty is not clear**—some stakeholders expressed concern that the scope of a general safety duty is unclear. They suggested that uncertainty with how to comply with the duty could mean manufacturers may not

⁸¹ The duty of care owed by ADSEs in Australian tort law, specifically negligence, is discussed in more detail in Chapter 5.

introduce new ADSs into Australia. (See, for example, Federal Chamber of Automotive Industries, Truck Industry Council, Department of Infrastructure, Transport, Cities and Regional Development).

- **An ADSE-only safety duty does not adequately regulate other parties**—many factors that affect safety are controlled by parties other than the ADSE and there is a need to consider regulation of these parties (See, for example, ADVI).

6.3 Regulatory approaches to safety

The previous chapter analysed the current legal frameworks in place in Australia and their application to parties who may have an influence on the safe operation of automated vehicles. It concluded that those frameworks provide inadequate regulation of some parties such as ADSEs, ADSE executive officers, repairers, remote drivers and fallback-ready users. It also concluded that current road users may require different regulation to ensure safe interaction with automated vehicles.

There are several regulatory approaches that could be implemented to ensure relevant parties with an influence on the in-service safety of automated vehicles operate safely.⁸² In this section we explain three regulatory approaches to safety:

- prescriptive rules
- performance-based regulation
- general safety duties.

We give examples of how the three regulatory approaches are currently used in Australian transport safety regulation. We also assess the advantages and disadvantages of each approach; and describe the situations to which each regulatory approach is best suited.

The approaches are not mutually exclusive—governments can use a mix of approaches. For example, a general safety duty could easily operate alongside any performance-based rules focused on the dynamic driving task.

6.4 Prescriptive rules

Prescriptive regulation is a rule or statement that specifies, in precise terms, what is required. Prescriptive regulation may be appropriate:

where there is a single, commonly agreed means of controlling a hazard or risk. It has the advantages of certainty, clarity and uniformity and is often preferred by small businesses without the staff, skills or capacity to develop innovative responses to regulatory problems and prefer to be clearly directed as to what is required to comply with the law (Freiberg, 2017, p. 234).

Often, the underlying aim of a highly detailed prescriptive provision is to put clear and detailed duties on corporations or individuals to ensure safety.

6.4.1 Prescriptive rules in transport

The following are examples of prescriptive rules currently used in road safety regulation:

⁸² For further information on the regulatory approaches discussed below, refer to: Arie Freiberg, *Regulation in Australia* (The Federation Press, 2017); Martin Lodge and Kai Wegrich, *Managing Regulation: Regulatory Analysis, Politics and Policy* (Palgrave Macmillan, 2012); Robert Baldwin, Martin Cave and Martin Lodge, *Understanding Regulation: Theory, Strategy and Practice* (Oxford University Press, 2nd ed, 2012); New Zealand Productivity Commission, *Regulatory Institutions and Practices* (2014).

- **Road and traffic rules**—Road rules for human drivers are generally prescriptive, inflexible and leave little room for interpretation. For example, blood alcohol limits; the use of a mobile phone while driving; or driving through a red traffic light.
- **Transportation of dangerous goods**—Rules concerning the transport of dangerous goods are generally prescriptive. For example, requiring that packages containing explosives to be marked “EXPLOSIVES” in capital letters of a certain size (National Transport Commission, 2018c).
- **Heavy vehicles**—Heavy vehicle regulation can impose strict limits on vehicle mass and dimension, which must not be exceeded if the vehicle is to be driven on a public road.

An example of highly detailed prescriptive regulation aimed at ensuring road safety is regulation of tyres. The Australian Light Vehicle Standards Rules include the following requirements for tyre tread:

(1) A tyre on a motor vehicle must not have cleats or other gripping devices that could damage road surfaces.

(2) Except at tread wear indicators, a tyre fitted to the vehicle must have a tread pattern at least 1.5 millimetres deep in a band that runs continuously:

(a) across the tyre width that normally comes into contact with the road; and

(b) around the whole circumference of the tyre.

(3) A vehicle must not be fitted with a tyre that has been treated by recutting or regrooving the tread rubber, unless the tyre was:

(a) constructed with an extra thickness of rubber designed for recutting or regrooving; and

(b) labelled to indicate the construction.

The detailed requirements about tyre tread are aimed at ensuring road safety. Loss of vehicle control can occur when tyres with insufficient tread depth are used on wet roads. Requirements about tyre tread are aimed at preventing this threat to road safety.

Table 2. Advantages and disadvantages of a prescriptive rules approach to regulation

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Provides a high degree of consistency and certainty for regulated parties, compared to more flexible regulatory approaches that can leave more to interpretation. ▪ Informs the regulator’s discretion for enforcement action through objective criteria. ▪ Is generally measurable meaning breaches are clear and straight-forward to prove and enforce. 	<ul style="list-style-type: none"> ▪ Removes flexibility for parties to comply in potentially more efficient and innovative ways and therefore may have unnecessarily high administrative and compliance costs. ▪ Creates a ‘one size fits all’ approach, which is either under-inclusive (fails to address certain risks), or over-inclusive (excessive to address the risks). ▪ Does not keep up well with rapid changes in technology and may require frequent adjustments to avoid becoming obsolete, increasing the cost and complexities of compliance. This is particularly problematic when technological changes are expected to outpace government’s ability to create

	<p>prescriptive rules to cover new and emerging risks.</p> <ul style="list-style-type: none"> ▪ Allows for ‘tick box’ compliance. Parties are required to comply with a technical requirement without needing to consider a rule’s underlying objective. A party could comply with every rule and still fail to account for a specific safety risk. ▪ Generally requires the regulator to have a greater role in identifying risks and developing solutions, which can increase costs to government and regulated parties, particularly if the costs of regulation are recovered from regulated parties.
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6.4.2 Where prescriptive rules are best used

Prescriptive rules are best used when:

- standardisation is very important
- the risks are static and well understood
- there is an agreed or widely accepted standard for mitigating the risks and achieving a safety outcome, and the rule is unlikely to require changing
- the level of harm from non-compliance is severe, and a high level of certainty is desirable. Regulated parties have neither the ability nor the need to be innovative in complying.
- some parties, particularly smaller businesses, prefer greater precision about what is required to comply.

6.5 Performance-based regulation

Performance-based regulation specifies the outcomes or objectives that must be achieved but not the means by which they must be met (Freiberg, 2017, p. 235).

6.5.1 Performance-based regulation in transport

A number of **Vehicle Standards** are performance-based, such as a requirement that seat belt buckles be ‘capable of withstanding repeated operation’⁸³ and emission limits that govern the concentration of pollutants which may be discharged by a vehicle.⁸⁴

Load Restraint Guidelines (rules for how to contain or restrain loads so that they do not fall off vehicles in traffic) require loads to be restrained in a way that ‘prevents the load from moving’ and is ‘capable of withstanding’ the vehicle’s movement (National Transport Commission, 2018d).

Australasian New Car Assessment Program (ANCAP) provides safety ratings for new vehicles based largely on the vehicle’s performance in crash tests.

⁸³ Vehicle Standard (Australian Design Rule 4/06 – Seatbelts) 2018.

⁸⁴ Vehicle Standard (Australian Design Rule 79/04 – Emission Control for Light Vehicles) 2011.

Table 3. Advantages and disadvantages of performance-based regulation

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Provides some flexibility for parties in dynamic industries to adjust to changing circumstances. ▪ Enables parties to decide the most cost-effective means of compliance. This allows parties to tailor compliance to suit their specific circumstances. ▪ It is generally clearly measurable where actions either meet the standard or not. ▪ Provides some flexibility for how parties achieve the standard. 	<ul style="list-style-type: none"> ▪ Creates some difficulties in proving and enforcing breaches where certain outcomes cannot be tightly defined or easily measured. ▪ Requires an involved regulator to ascertain whether the outcomes or objectives are met, rather than relying on parties to attest to the general safety of their product. ▪ Provides limited incentives for parties to continuously improve or strive for best practice.

6.5.2 Where performance-based regulation is best used

Performance-based regulation is best used when:

- the outcome or goal can be tightly defined, and a targeted output can be easily and objectively measured
- the targeted output has a clear link to the desired regulatory outcome
- parties are better placed than regulators to identify the best way to achieve the outcomes or objectives
- competition and innovation are likely to drive more efficient achievement of outcomes or objectives.

6.6 General safety duties

A general safety duty is an example of ‘principles-based’ regulation, which moves away from reliance on detailed, prescriptive rules towards more broadly-stated principles (Black, et al., 2007).

While broad and general, these principles have a clear purpose, such as safety. Requirements that a party ‘act in the best interests of their client’, or ‘treat its customers fairly’ are examples of principles-based regulation.

The focus of the regulation is whether a party has achieved the regulation’s purpose, as opposed to whether prescriptive rules or performance-based outcomes or objectives have been met.

In the case of a safety duty for automated vehicles, a general safety duty would place an overarching and positive obligation on relevant parties to ensure the safe operation of the ADS. The likely standard would be to ensure the safety of the ADS ‘as far as reasonably practicable’.

Although terms such as ‘safe’ are qualitative and not quantitative as used in prescriptive rules), ‘safety so far as reasonably practicable’ has proven effective as a standard for evaluating conduct in other transport industries. This is discussed below at section 6.6.1.

As discussed in chapter 5, parties such as ADSEs already owe a duty under Australian negligence law to take reasonable care to ensure the use of the ADS did not result in a collision with another vehicle, road user or stationary object. A statutory safety duty could:

- 'codify' the existing negligence duty—that is create a written version of the duty in legislation
- provide greater clarity about what the duty means in the context of automated vehicle regulation
- allow a specialised regulator to enforce the duty
- attach a criminal sanction for breaching the duty (essentially making operating an automated vehicle without reasonable care a criminal offence).

Academic commentary suggests that transferring the common law duty of care into legislation provides leverage for regulators. It requires operators to maintain a reasonable level of risk awareness beyond mere compliance with directly applicable rules (Hopkins, 2012).

The case study below provides an example of how a duty of care under the common law was codified in the context of WHS law.

Development of general safety duties under Australia's Work Health and Safety Law

Australia's decision to establish a national framework for automated vehicles has some similarities with previous regulatory decisions concerning work health and safety.

Employers have long owed employees a duty of care under the common law. This duty requires employers to take reasonable steps to prevent their employees suffering an injury.

Australian WHS legislation in each state and territory essentially codifies the common law duty of care, while also creating a criminal sanction and establishing a regulator to monitor compliance with the duty.

The model WHS law which most state and territory legislation is based on has recently been independently reviewed (Boland, 2018). On the safety duty, the independent review concluded:

The duties framework is generally understood, settling in people's understanding and working well... and there is a general view that key definitions are sufficiently flexible to encompass changing work arrangements, emerging industries and new business models

6.6.1 General safety duties in transport

Heavy vehicles in most states and territories are subject to a 'chain of responsibility' framework which requires parties in the supply chain to take steps to address safety risks that are within their control. The duty depends on that party's role in the chain. For example, a person securing a heavy load to the back of a truck would have to do so carefully and safely, so that it does not create a hazard once the truck is on the road. For a large commercial freight operator, the chain of responsibility would likely require them to have policies to manage fatigue in their drivers. A smaller business might have a much less detailed policy, which still addresses the safety risks of a business of its size.

Commercial Passenger Vehicles⁸⁵ such as taxi and rideshare vehicles are regulated in most Australian states and territories through general safety duties which require drivers and commercial operators to take steps to address safety risks within their control. For a driver, this might mean they do not drive while fatigued, or they could decline to drive a vehicle they know or suspect to be unsafe. For a commercial operator, it may involve ensuring they

⁸⁵ Such as *Point to Point Transport (Taxis and Hire Vehicles) Act 2016* (NSW) pt 2.

maintain the vehicles in their fleet so that they are safe, and only hire drivers after performing due diligence checks that the driver is fit and proper.

Domestic Commercial Marine Vessels⁸⁶ are regulated by a number of safety duties. The Australian Maritime Safety Authority describes the purpose of these general safety duties as being to: eliminate or minimise the risk of incidents involving death, injury or damage; and encourage the development, maintenance, and continuous improvement of a safety culture within the domestic commercial vessel industry (Australian Maritime Safety Authority, 2019).

These general duties apply to various parties including:

- the owner of the vessel (who must provide and maintain a vessel that is safe)
- the master of a vessel (who must not operate a vessel that is unsafe)
- all parties aboard a vessel to take reasonable care for their own safety and the safety of others.

Rail Safety⁸⁷ law provides a number of general duties for rail transport operators; designers, manufacturers and suppliers; persons loading or unloading freight to perform their various roles safely. It also creates duties for officers⁸⁸ to exercise due diligence in ensuring that other parties comply with their safety duties.

While the general safety duty is the central feature of these frameworks, they also provide for more prescriptive regulation where necessary. For example:

- the Heavy Vehicle National Law provides for very clear limits on vehicle mass and dimension
- commercial passenger vehicle legislation limits participation in the industry to those who have licences
- rail safety workers are subject to stringent health checks in accordance with detailed standards, including things as prescriptive as tests for colour blindness where relevant to the worker’s role (National Transport Commission, 2017b).

Table 4. Advantages and disadvantages of a general safety duties approach to regulation

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Captures a wide range of risks that more prescriptive standards may not, including new and emerging risks. ▪ Places the onus of identifying and mitigating risks onto the regulated party, who likely has the most expertise and is best placed to identify and solve problems. ▪ Enables innovation and allows parties to adapt to changing circumstances (such as advances in technology). 	<ul style="list-style-type: none"> ▪ Requires (in some circumstances) guidance on interpretation from regulators, which can reintroduce prescription in a less transparent way. In the absence of such guidance, what constitutes compliance is left to interpretation, which may result in inconsistent enforcement approaches, and

⁸⁶ *Marine Safety (Domestic Commercial Vessel) National Law Act 2012* (Cth).

⁸⁷ *Rail Safety National Law Act 2012* (SA) sch ('Rail Safety National Law') ss 52-54.

⁸⁸ In summary, an officer is “an individual who makes or participates in making, decisions that affect the whole, or a substantial part of the business”. See Rail Safety National Law s 4.

<ul style="list-style-type: none"> ▪ Enables parties to decide the most cost-effective means of compliance. This allows parties to tailor compliance to suit their specific circumstances. ▪ Facilitates a co-operative and educative approach between the regulator and regulated parties (Black, et al., 2007, p. 195). ▪ Focuses on the purpose of the regulation rather than technical compliance with detailed rules. This makes a ‘tick box’ approach to compliance (where parties comply while circumventing the object of the rule) difficult. ▪ Provides flexibility to cover different parties, business models and circumstances in which automated vehicles will operate. ▪ Places responsibility for identifying risks and developing solutions onto the regulated parties (instead of the regulator). This allows the regulator to only target specific risk areas and makes it a relatively inexpensive form of regulation to administer, with lower costs for regulated parties. ▪ Engages senior management in ensuring safety risks are addressed through safety management systems. 	<p>uncertainty about what actions constitute compliance.</p> <ul style="list-style-type: none"> ▪ Risks that parties may, through an overly-cautious attempt at compliance, take steps beyond what is necessary to comply with their safety duty. There is a related risk that regulators then hold parties accountable to these voluntarily adopted, higher standards. ▪ Relies on parties having a compliance culture that prioritises safety. ▪ Risks safety management systems being developed for the benefit of the regulator, rather than something regulated parties will adhere to and implement. ▪ Judicial interpretation of the duty could result in a more onerous standard being applied than what was originally intended by legislators, particularly as industry standards improve over time.
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6.6.2 Where general safety duties are best used

General safety duties are best used when:

- the outcome or goal of the regulation can be qualitatively rather than quantitatively (easily or objectively) measured
- other parties, such as consumers for example, have the capability to monitor compliance, reducing the need for an intrusive regulator
- a high degree of trust and good communication exists between the regulator and regulated parties, with parties willing to deal with the regulator in good faith (Baldwin, et al., 2012, p. 305)
- a regulator can provide guidance on how to comply with the safety duty when needed
- industry is diverse and acceptable practices are likely to change over time
- regulated parties are relatively sophisticated and capable of developing their own risk management strategies consistent with the general duty’s application to their business
- competition and innovation are likely to drive more efficient compliance
- greater innovation in meeting regulatory objectives is desired.

6.7 Safety duties where there are multiple parties

A general safety duty can successfully operate in regulatory contexts where multiple parties have an influence on ensuring safety, and its operation adapts according to the degree of control a particular party has in controlling risk.

6.7.1 Chain of responsibility

The chain of responsibility in the Heavy Vehicle National Law creates a general safety duty⁸⁹ for multiple parties in the supply chain to the extent that they influence particular safety risks. It recognises that the actions of one party in the chain could create risks that only materialise at a later stage. For example, a person who loads a container on a truck would be obliged to perform the task safely, and to mitigate safety risks within their control. If this person performs the task unsafely, they create a risk which may not materialise until the vehicle is on the road, and which a driver may have no reason to suspect. Similarly, an operator directing truck drivers would be obliged not to direct a truck driver to drive at excessive speeds, or while impaired by fatigue.

6.7.2 Shared responsibility

Safety duty regimes often recognise the principle of shared responsibility.⁹⁰ For example, the safety duties in Victoria's commercial passenger vehicle regulation provide that vehicle safety is the shared responsibility of (among others): vehicle owners; drivers; booking service providers; suppliers of services and equipment to the industry. The level and nature of responsibility of these parties depend on the nature of the risk that the party creates from their involvement, and their capacity to control the risk.

6.7.3 Concurrent duties

The law can specify that a duty cannot be transferred (for example through contract), and that the duty applies whether or not another party has a similar responsibility. For example, WHS Law specifies that multiple people can concurrently have the same duty, and that each duty holder must comply with their duty, even if another person has the same duty.⁹¹

6.8 Compliance and enforcement

Different regulatory approaches can lend themselves to varying compliance and enforcement approaches.

The sections below briefly outline how the role of the regulator in compliance and enforcement is likely to differ depending on the regulatory approach. We will consider compliance and enforcement mechanisms for automated vehicles in detail in a subsequent phase of work.

6.8.1 Prescriptive rules and performance-based regulation

Prescriptive rules and performance-based regulation can lead to a relatively intrusive regulator, as that is what is necessary to capture breaches of a technical rule.

These regulatory approaches typically involve a traditional 'command and control' regulator that monitors and assesses clear breaches of rules, such as that an automated vehicle went

⁸⁹ Heavy Vehicle National Law s 26C.

⁹⁰ *Commercial Passenger Vehicle Industry Act 2017* (Vic) pt 2.

⁹¹ Model Work Health and Safety Law s 16.

through a red light. 'Command and control' regulation influences behaviour by imposing prescriptive standards backed by criminal sanctions (Baldwin, et al., 2012, pp. 106-107).

6.8.2 General safety duties

In contrast to other approaches, where a general safety duty applies the regulator's role is less about enforcing specific breaches and more about ensuring parties have proper systems in place for ensuring safety. For corporations, senior management is engaged in ensuring safety risks are addressed and the regulator's role is more about ensuring firms have proper systems in place (Baldwin, et al., 2012, p. 147).

General safety duties can be efficient and effective, because parties have both the freedom and incentive to innovate. They can solve safety risks particular to their role, rather than needing to comply with prescriptive rules far removed from the risk itself.

If a regulator made a site visit, rather than inspecting specific hardware and software, it would audit safety management systems to ensure they are adequate to identify and address any safety risks.

Such auditing would require a sophisticated understanding of automated vehicle accident causation and prevention (Hopkins, 2012). It would also require the ability to properly engage with risk managers of potentially large corporations.

Importantly, a general safety duty requires the development of a shared understanding between the regulator and regulated parties as to what is expected in terms of compliance.

Regulated parties can seek greater guidance on how to comply with the safety duty. The regulator may have a role in educating parties and producing guidance materials to inform them of what the regulator considers to be safe systems and behaviours. The regulator will have a role in providing regulated parties with the certainty and predictability they require to develop their own safety policies and procedures (Black, et al., 2007, p. 203). This relationship can be the basis of a collaborative approach between regulated parties and the regulator.

Because of obligations on the regulated party to identify and address particular risks, the regulator plays a smaller role in identifying risks and developing solutions than a regulator does in prescriptive rules. However, the regulator can still take a more assertive enforcement approach if necessary.

6.9 Regulating for in-service safety of automated vehicles

This section considers how the three types of regulatory approaches described above—prescriptive rules, performance-based regulation, and general safety duties—might be used to ensure the safe operation of automated vehicles. It assesses the parties who we suggest should be subject to safety duties and obligations and the type of regulatory approach that should apply to them.

Appendices B and C respectively provide illustrative examples of prescriptive rules and general safety duties that could apply to ADSEs, ADSE executive officers and repairers. These appendices are provided as examples only and are not proposed draft legislation.

6.9.1 Prescriptive rules

ADSEs

Certain on-road behaviours may need to be standardised for automated vehicles, just as they are for human drivers. As discussed in the overview of prescriptive regulation above, some aspects of ADS regulation may require a prescriptive approach. This may be necessary to ensure automated vehicle behaviour is predictable to other road users, rather

than leaving every driving action to the ADS's assessment of the safest course. For example, ensuring that an automated vehicle stops at an intersection or gives way to another road user may be more suited to a clear prescriptive rule than a general safety duty. Prescriptive rules surrounding the dynamic driving task are discussed in more detail in chapter 7.

Separate to rules regulating the on-road behaviour of automated vehicles, some rules involving interaction with a regulator may need to be prescriptive. For example, an ADSE could be required to report breaches of road rules, crashes and cybersecurity vulnerabilities (National Transport Commission, 2018f).

Other road users, remote drivers and fallback-ready users

Ensuring automated vehicles operate safely on public roads could require discrete and relatively prescriptive rules for parties other than ADSEs. Some of these other parties, such as other drivers, cyclists, pedestrians, remote drivers and fallback-ready users, may be better regulated by specific clear rules.

Some in-service safety risks may arise because of the behaviour of other road users and their interaction with automated vehicles. For example, other road users may become frustrated with a slow-moving automated vehicle and take risks when overtaking. Others may exploit ADS safety features by failing to give way to automated vehicles, knowing the ADS will behave safely and stop to avoid a collision. Pedestrians may step in front of an automated vehicle relying on it to stop safely in a way that they would not for a human driver.

General safety duties are unlikely to be effective to prevent safety risks arising from other road users—it would be impractical and ineffective for a regulator to enforce a general safety duty on all road users. If additional regulation is required for other road users, it may be more effective to create specific prescriptive offences against interference with the safe operation of an automated vehicle.⁹²

Remote drivers⁹³ may require their own licensing regime, and prescriptive rules around fitness to drive, similar to other human drivers, such as restrictions on blood alcohol content.

Transport ministers have decided that fallback-ready users should have certain duties, including that they remain sufficiently vigilant in order to respond to requests to intervene. It is likely that these duties will require implementation through prescriptive rules.⁹⁴

6.9.2 Performance-based regulation

Some areas of automated vehicle regulation will be achieved through a performance-based approach. Vehicle standards under the Road Vehicle Standards Act will impose certain performance-based standards, such as for seat belts and airbags. These will apply to automated vehicles just as they do to conventional vehicles.

Ministers have agreed that specific safety criteria for automated vehicles will be implemented under the Road Vehicle Standards Act.⁹⁵ The safety criteria include performance-based rules

⁹² Some jurisdictions have already offences for interference with automated vehicle trials and trial vehicles. See, for example: *Road Transport Act 2003* (NSW) s 148T; *Motor Vehicles Act 1959* (SA) s 134I.

⁹³ For an explanation of the role of remote drivers, refer to chapter 4.

⁹⁴ The Transport and Infrastructure Council decided in May 2018 that fallback-ready users should be required to:

- i) Remain sufficiently vigilant to respond to ADS requests, mechanical failure, or emergency vehicles and regain control of the vehicle without undue delay when required;
- ii) Hold the appropriate licence for the vehicle type;
- iii) Comply with drug, alcohol and fatigue driver obligations.

⁹⁵ For further information on the decision for regulation at first supply, refer to section 1.8.3, and Appendix A (Safety criteria and obligations).

such as the requirement that an ADS is incapable of operating in areas outside of its defined operational design domain.

Regulation through the safety criteria will impose goals for automated vehicles without specifying how the goal is to be achieved. ADSEs will be incentivised to find innovative ways to achieve the various objectives.

The NTC is not proposing any further performance-based rules for the in-service regulation of automated vehicles. However, an ADSE must continue to comply with safety assurance criteria imposed at first supply, including those involving the ADS's performance.

6.9.3 General safety duties

As discussed in section 6.6.2, general safety duties can provide flexibility and enable innovation. The approach works well where regulated parties, rather than a regulator, are best placed to come up with solutions to manage risks.

General safety duty for ADSEs

Chapter 5 outlined that separate to any purpose-built automated vehicle regulation, an ADSE will have certain duties in Australian WHS law, consumer laws and negligence which mean it can be held liable for harm caused by unsafe driving.⁹⁶

The duty of care in negligence would require the ADSE to take reasonable steps to mitigate risks to people who could be harmed by their vehicle. The duty will be owed to people who purchase the vehicle as well as other road users.

A significant limitation of relying on liability in negligence to ensure compliance is that it requires an injured person to take the ADSE to court. This can be risky and stressful for the injured person. In any litigation, it is likely that there would typically be a significant power imbalance between a injured person and an ADSE.

It is also possible that an ADSE may assess the risk of litigation as being preferable to the costs of taking the action to address the risk to safety, particularly where the ADSE is insured. Some ADSEs may simply factor in the cost of litigation, including damages, and reasonably conclude it is not in the best interests of shareholders to incur the costs of addressing the risk.

State and territory criminal offences for dangerous driving are examples of transport laws where criminal sanctions were deemed necessary to deter unsafe driving and regulate the creation of on-road safety risks. Potential criminal consequences, including imprisonment, would encourage parties to prioritise addressing safety risks. If potential financial liability in negligence was the only legal consequence, some parties may not prioritise safety as highly.

A party will only be liable in negligence if someone's injury is caused by a party's lack of care. In contrast, a criminal offence can capture the creation of the risk, regardless of whether a person suffers actual harm.

Governments have imposed general safety duties (with criminal sanctions) on parties in many industries including commercial passenger vehicles, marine vessels, rail, heavy vehicles, and work health and safety. Such duties were introduced because governments decided that acts or omissions by parties in these industries could cause unreasonable risks to public safety, which warranted criminal sanctions.

A general safety duty has been effective in regulating parties in various transport industries, including innovative and disruptive business models such as ridesharing. It seems likely that the automated vehicle industry will have similar features to these industries. A general safety

⁹⁶ For additional detail on the applicability of negligence to an ADSE see section 5.4.1.

duty would allow a flexible approach to ensuring safety for each ADSE, rather than having prescriptive rules that attempt to cover different business models and contexts.

To satisfy a safety duty, an ADSE would be required to show it has systems in place to respond to safety risks. These could range from policies to ensure systemic software errors are quickly identified and addressed, to mechanisms which prevent an ADS from operating when it detects it is approaching the limits of its operational design domain. Many of these systems will have been a part of the Statement of Compliance submitted by ADSEs when they applied for approval under the Road Vehicle Standards Act.

A specialised and responsive regulator which is tasked with providing relevant guidance to industry can mitigate any concerns that a general safety duty may be too broad. A single, specialised regulator would also avoid uncertainty and inconsistencies that can arise when multiple regulators are responsible for enforcing a similar duty. ADSEs are likely to be large, capable corporations and it is likely they will develop their own innovative solutions to safety risks.

The correlation with other effective uses of a general safety duty in transport suggests that a general safety duty may be the most appropriate approach for regulating ADSEs. This may be particularly appropriate for ADSEs given their role as systems managers and their corporate status.

General safety duty for ADSE executive officers⁹⁷

Large fines against corporations for breaches of a general safety duty would effectively punish shareholders who were not in a position to address a particular risk. Such fines do not adequately target the individuals whose acts or omissions may have put public safety at risk.

For this reason, some regulatory frameworks governing corporations also impose individual criminal liability on directors and other officers to ensure safety is achieved.

Given the likelihood that ADSEs will be corporations, it may be appropriate for general safety duties to apply to certain ADSE executive officers to ensure everyone in a position to influence ADS safety is appropriately accountable (Council of Australian Governments, 2012).

General safety duty for repairers

If repairs are required, the repairer is in a position to influence the safety of the vehicle.

As discussed in chapter 5, under Australian WHS law, vehicle repairers must ensure that the health and safety of other persons is not put at risk from their work.⁹⁸

WHS duties apply to a broad range of industries and are enforced by eight separate state and territory regulators. WHS regulators may lack the specialised knowledge necessary for enforcement where compliance with such a duty is achieved through very technical means involving artificial intelligence, software and algorithms.

A specialised regulator could centralise the necessary expertise and enforce such a duty in a more consistent way.

As repairers are already required under WHS law to repair vehicle components without negligence and in a way that does not create new safety risks, a general safety duty focused on repairs to automated vehicles should not create any additional regulatory burden. A

⁹⁷ The definition of “officer” used in work health and safety regulation is the same as the definition in the *Corporations Act 2001* (Cth) s 9.

⁹⁸ Model Work Health and Safety Law s 19(2); *Occupational Health and Safety Act 2004* (Vic) s 23; *Occupational Safety and Health Act 1984* (WA) s 21.

general safety duty on repairers would provide greater clarity for repairers in the context of automated vehicles. It would also allow a specialised regulator to monitor compliance in the area of automated vehicle safety.

An alternative approach to including vehicle repairers in a general safety duty would be for state and territory vehicle repair regulation to be reviewed to ensure it remains adequate for repairs of automated vehicles.

6.9.4 What should be the limits of a general safety duty?

Without qualification of a duty of care, the duty holder would be guilty of an offence if the outcome—elimination of risk to health or safety—is not achieved. This would apply regardless of the efforts of the duty holder (Stewart-Crompton, et al., 2008, p. 39).

When establishing the model workplace health and safety law, Australian governments concluded that general safety duties need to be subject to some form of qualification. For example, that the steps regulated parties take to minimise safety risks be ‘reasonably practicable’.

What is considered ‘reasonably practicable’ varies between industries and over time as technology and practices evolve (Hopkins, 2012).

Legislation could define ‘reasonably practicable’ or provide a list of factors that could be relevant in determining whether an action is reasonably practicable. Alternatively, it could be left to the courts to interpret (Stewart-Crompton, et al., 2008, p. 42).

The National Review into WHS laws concluded:

The standard of ‘reasonably practicable’ is a high one, requiring the duty holder to consider all of the circumstances and take measures that are commensurate to the likelihood and seriousness of the harm which may result from the relevant activities, and relieved only by consideration of what is not possible or what is clearly unreasonable in the circumstances. A duty holder must clearly understand that this standard must be met. (Stewart-Crompton, et al., 2008, p. 40)

In a submission to the NTC, the Victorian Government stated that what constitutes ‘reasonably practicable’ will evolve over time to reflect change in the global market (National Transport Commission, 2018f).

6.9.5 Should a general safety duty be limited to public roads?

Australian driving law is most concerned with the regulation of vehicles when they are being driven on public roads, and not on private land. For example, the Australian Road Rules only apply to vehicles and road users on roads and road-related areas.⁹⁹ Similarly, motor vehicles are only required to be registered by state and territory vehicle registration law if they are to be used on public roads.

Other safety frameworks do not have the requirement of a public road, for example general duties in the Heavy Vehicle National Law, or WHS law would apply regardless of whether a vehicle or vehicle component is on a public road.

An automated vehicle will drive on private property, such as when it enters and exits a residential driveway or parks itself in a garage. While not on public roads, there are still safety risks when a vehicle performs these manoeuvres. If a vehicle injures a child while entering a driveway, or collided with the side of a garage, presumably the community would expect the in-service safety regulator to be aware of the incident.

⁹⁹ Australian Road Rules r 11.

Even if the duty and related jurisdiction of the regulator were limited to the ADS's safety on public roads, any collisions or near misses that occur on private land may still be relevant to an ADS's safety on public roads.

It seems reasonable that if a general safety duty approach were chosen, the duty should apply at all times the ADS is engaged. This would also simplify the regime, so that the same obligation applies at all times, and a regulator does not have to first determine whether the incident occurred on public roads before investigating an ADS safety failure.

6.9.6 A cause of action linked to a general safety duty

Some frameworks which impose a certain safety standard while primarily allowing for public enforcement by a regulator, also provide a cause of action for injured persons where that standard is breached. Australia's consumer protection law uses such an approach:

138 Liability for loss or damage suffered by an injured individual¹⁰⁰

- (1) *A manufacturer of goods is liable to compensate an individual if:*
 - (a) *the manufacturer supplies the goods in trade or commerce; and*
 - (b) *the goods have a safety defect; and*
 - (c) *the individual suffers injuries because of the safety defect.*
- (2) *The individual may recover, by action against the manufacturer, the amount of the loss or damage suffered by the individual.*

A cause of action would be available to individuals who are injured. Additionally, if a group of people suffered loss or injury due to the same breach of the safety duty, the action could be brought by one person on behalf of the larger group via a class action.

The main advantage of such a cause of action is that, compared to litigation in negligence, it provides a more direct avenue for injured parties to access compensation.

Allowing the public to litigate safety duty breaches would mean the duties owed by regulated parties could be upheld without first relying on a regulator to take action. This provides a second avenue of private enforcement of the general safety duty as opposed to only public enforcement by a regulator. This could reasonably be expected to increase the likelihood of compliance, as it increases the potential that regulated parties would be held accountable for failing to comply with the duty.

Judicial decision-making would provide ADSEs with greater guidance on their legal obligations. On the other hand, ADSEs may face increased costs due to greater exposure to litigation.

6.9.7 Summary of NTC conclusions on duties

As discussed in section 6.9.2, the agreed approach to automated vehicle safety at first supply relies on performance-based regulation.

Automated vehicle in-service safety risks could be adequately addressed through a mix of regulatory approaches. In particular, the regulatory framework could incorporate a general safety duty, together with some prescriptive rules or performance-based regulation where appropriate.

For the reasons discussed above, the NTC considers a general safety duty should apply to both ADSEs and their executive officers, and potentially repairers. Any general safety duty may need to be supported by additional prescriptive rules to best achieve the regulatory objective. They may be appropriate if the prescription does not excessively interfere with

¹⁰⁰ Australian Consumer Law s 138.

innovation, and a high degree of standardisation is necessary. For example, prescriptive rules about on-road behaviour of an ADS may be appropriate.

The inclusion of a general safety duty would greatly reduce the need for many prescriptive rules. The types of prescriptive duties that could apply to ADSEs are discussed at 6.9.1.

Remote drivers and fallback-ready users could be more effectively regulated by more focused, prescriptive regulation, where flexibility is not required. This also applies to other road users if additional regulation is required. For example, it would be appropriate for remote drivers to be bound by blood alcohol content requirements of other drivers. In the case of a fallback-ready user, this might mean a specific offence in the Australian Road Rules for failing to respond to a transition demand. Such rules are unlikely to change over time and are unlikely to create barriers to innovation.

Most other parties identified in chapter 4 are adequately regulated through the existing frameworks. The coverage of these parties under existing regulation is discussed in chapter 5.

Questions

7. Do you think that a general safety duty to ensure the safe operation of the ADS 'so far as reasonably practicable' is appropriate to address the safety risks?
8. If a general safety duty were introduced, which parties should it apply to?
9. If a general safety duty were introduced, should it apply on public and private land (such as residential driveways)?
10. Should people injured by breaches of the duty have a cause of action, or should the ability to enforce a general safety duty be limited to a regulator?

7 Regulating the dynamic driving task for automated vehicles

Key points

- The Australian Road Rules create uniform rules for road users such as drivers, cyclists and pedestrians. These rules help to ensure drivers are predictable to other road users, which is necessary to ensure the safe and efficient movement of traffic. To prevent accidents, the ADS will need to be similarly predictable to other road users.
- Despite some jurisdictional differences, the road rules are generally nationally consistent on key obligations relating to the dynamic driving task such as stopping at stop signs and when a driver must give way to another road user.
- The road rules were designed to address the risks presented by human road users. It lists obligations that can be understood and complied with by humans. The road rules were not designed to regulate an ADS, which may present different risks to human drivers.
- A decision needs to be made on what driving laws are required for ADSs and how ADS driving rules should be implemented in Australian law.

7.1 Purpose of chapter

The purpose of this chapter is to:

- consider what driving rules are required to provide for an ADS
- describe some approaches for how ADS driving rules could be implemented in Australian law.

7.2 Relevant Transport and Infrastructure Council decisions

In May 2018 transport ministers agreed that Australia would develop a new purpose-built national law to regulate the on-road operation of automated vehicles. Ministers agreed, among other matters, that this law should:

- provide that an ADS may perform the dynamic driving task
- define the dynamic driving task in a way that aligns with the SAE standard J3016
- provide the dynamic driving task obligations
- provide that the ADSE is responsible for compliance with dynamic driving task obligations when the ADS is engaged.

In November 2018 transport ministers agreed that an ADSE must demonstrate the ability of its ADS to operate in compliance with relevant road traffic laws.¹⁰¹

¹⁰¹ Transport ministers agreed that the ADSE must self-certify against a set of safety criteria to demonstrate how it will manage safety risks before their ADS can be supplied to the Australian market. One such criterion covered compliance with relevant road traffic laws.

7.3 The dynamic driving task

An ADS is the combination of hardware and software designed to perform the ‘dynamic driving task’. This section clarifies what an ADS is designed to do, and what functions remain with a human.

Driving can be divided into ‘strategic’ and ‘dynamic’ tasks. Strategic driving tasks include trip planning, such as where and when to travel, and route selection. Dynamic driving tasks include the operational and tactical actions required to operate a vehicle, such as steering and controlling speed. The SAE standard J3016 provides the common international understanding about what the dynamic driving task involves (SAE International, 2018). It describes the dynamic driving task as:

All of the real-time operational and tactical functions to operate a vehicle in on-road traffic, excluding the strategic functions such as trip scheduling and selection of destinations and waypoints, and including without limitation:

Lateral vehicle motion control via steering (operational);

Longitudinal vehicle motion control via acceleration and deceleration (operational);

Monitoring the driving environment via object and event detection, recognition, classification, and response preparation (operational and tactical);

Manoeuvre planning (tactical); and

Enhancing conspicuity via lighting, signalling and gesturing, etc. (tactical).

7.4 Human drivers compared to an ADS

7.4.1 Human drivers

Human drivers make decisions relying on information gathered through their senses and drawing on previous experience and situational awareness to predict the behaviour of other drivers.

Vehicle collisions can be caused by factors unique to humans. Road rules and other laws that apply to human drivers are designed specifically to address a road environment where risks are attributable to human faults. These include: impatience (leading to speeding and tailgating); impulsiveness (leading to running red lights and unsafe lane changes); impairment by alcohol, drugs or fatigue; and distraction (such as through mobile phone use).

7.4.2 ADS

An ADS emulates the driving task performed by human drivers. However, an ADS achieves safe driving through very different means, relying on vehicle components such as sensors and software. Many of its risks relate to failures of vehicle components. These include hardware and software failures, such as a sensor failing to detect a lane is closed or a software failure which leaves the ADS unable to process and react to data, and cybersecurity failures.

There are some things that humans do very well, and which an ADS may not easily replicate. For example, ‘[h]uman drivers are excellent reasoners about other drivers’ behaviours, based on their experiences, even with a small amount of data (eye contact)’ (Campbell, et al., 2010).

On the other hand, the ADS is immune to many inherently human risks such as fatigue, impatience, impairment or distraction.

As the risks posed by ADSs differ from those posed by human drivers, it follows that regulation of automated vehicles could also differ to the rules for human drivers.

Table 5. Driver comparison

	Human Driver	Automated Driving System
Input	Senses such as eyesight and hearing	Sensors including camera, radar and lidar, are able to “see” the environment with greater accuracy than the human eye, and without the human “blind spot”. Can receive information from other sources (such as C-ITS) about the state of the road ahead, and any oncoming traffic not yet in view of its sensors.
Decision-making process	Processed by the brain, drawing on past experience, familiarity with the road and the vehicle, human intuition and situational awareness	Input data processed by software. Computation may allow the ADS to better track and predict the movement of other road users.
Decision-making standards	Social norms learned over time and from observing other drivers	Makes decisions according to programming, which may include certain values set concerning harm, or compliance with standards.
Limitations	Requires training to become a safe driver Can be impaired by alcohol, drugs, fatigue, distraction	Constrained to an ‘Operational Design Domain’. May require assistance of human operators such as fallback-ready users to safely perform the driving task.

7.5 Prescription in driving rules

Chapter 6 discussed the circumstances where prescriptive regulation is appropriate and concluded that prescription is warranted when standardisation is important, and a rule is unlikely to require regular changes.

The European Commission’s High-Level Expert Group on Artificial Intelligence noted in its *Ethics Guidelines for Trustworthy AI* that predictability is required for people to trust AI systems (High-Level Expert Group on Artificial Intelligence, 2019). Trust is emerging as a key theme in the discussion of testing, validation and regulation of automated vehicles (AI4People, 2018).

As described in chapter 5, all road users have a general duty to drive safely under Australian negligence law. However, the Australian Road Rules are necessary to ensure the safe and efficient movement of traffic. These rules allow road users to better predict the behaviour of other vehicles. For example:

When driving past another car on the road, a car may come within 1 m of the other car. This is possible because the drivers both obey certain ‘rules of the road’; just as importantly, both also trust that the other will obey these rules (Campbell, et al., 2010, p. 4661).

An ADSE’s duty of care under negligence law requires it to take reasonable care to ensure its ADS avoids collisions. However, a general requirement to behave safely (such as a general safety duty discussed in chapter 6) may be too subjective to ensure automated vehicles are predictable to other road users, and to achieve efficient movement of traffic.

7.6 Rules for human drivers—the Australian Road Rules

7.6.1 State and territory road rules based on model Australian Road Rules

While states and territories have legislative responsibility for the regulation of human road users, Australia aims for a nationally consistent approach to road rules. The model Australian Road Rules provide rules for ‘road users’ which includes drivers, cyclists, passengers and pedestrians. They provide a list of relatively prescriptive rules with which human road users must comply.

The objects of the Australian Road Rules are to:

- provide uniform rules across Australia for all road users
- specify behaviour for all road users that supports the safe and efficient use of roads in Australia.¹⁰²

The Australian Road Rules are developed to regulate human behaviour on public roads, and not, for example, how vehicles are to be driven on private land such as mine sites or farms.

The Australian Road Rules are model law and have no legal effect until implemented under state or territory law.

While the Australian Road Rules are relatively prescriptive, enforcement discretion means there is more flexibility in their application than the rules themselves might suggest. Not every technical breach of the road rules is detected or results in enforcement action, and Australian drivers are not expected to comply with the road rules if doing so would put someone in danger.

7.6.2 Dynamic driving task rules and other duties

The Australian Road Rules provide dynamic driving task obligations for human drivers, and place some other duties on a human driver to help ensure road safety. Examples of rules that are not directly about the dynamic driving task include:

- rules 265(3) and 266, which require drivers to ensure passengers are wearing seat belts
- rule 293, which requires a driver to remove from the road anything which may have fallen from the driver’s vehicle.

In May 2018, transport ministers agreed that the new national law should provide the dynamic driving task obligations, and that the ADSE should be responsible for complying with these obligations when the ADS is engaged. This chapter considers how to implement these decisions; it does not address non-dynamic driving tasks.

7.6.3 State and territory implementation of road rules

States and territories generally incorporate the model Australian Road Rules into their own road traffic law. However, not every provision is replicated in each state and territory. There are also several provisions in the model Australian Road Rules that specify matters for state and territory governments to decide.¹⁰³

States and territories can deviate from the model law and do so when they consider it appropriate. They implement updates to the model law in their own time, and subject to any

¹⁰² Australian Road Rules r 3.

¹⁰³ For example, many road rules leave open the place for ‘another law’ of the jurisdiction to alter the rule, including for fundamental rules such as the definition of a ‘road’ (r 12) and the penalty for breaching a road rule (r 10).

other reform priorities they may have. As a result, despite efforts toward national consistency, the road rules vary across states and territories.

Examples of these differences include:

- While all jurisdictions have the rule against pedestrians causing a traffic hazard by moving into the path of a driver (rule 236), the ACT permits certain on-road commercial activities such as offering to clean the windscreen of a vehicle. This is allowed territory-wide except for within 50 metres of five prescribed intersections¹⁰⁴
- Although hook turns are provided for in the Australian Road Rules, Victoria is the only state where they are a common part of driving
- Some but not all jurisdictions have created rules requiring drivers to reduce their speed when passing emergency services.

State and territory governments can also amend their road rules at any time they consider it appropriate. This means there will continue to be some variation between jurisdictions.

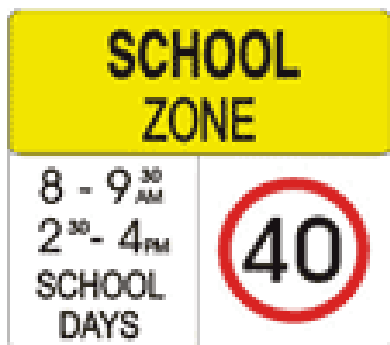
7.7 Differences in state and territory road rules with implications for automated vehicle regulation

To understand the implications for automated vehicles of any differences in the road rules between jurisdictions, state and territory transport agencies have compared their road rules to the Australian Road Rules and identified the variations.

The analysis of jurisdictional differences suggests that the road rules are largely consistent when it comes to the dynamic driving task. However, there are some jurisdictional differences which may pose a problem if applied to an ADS.

For example, school zones in most states and territories have variable speed limits based on school hours, like that in Figure 10.

Figure 10. School zone variable speed sign



However, in South Australia school zones have a speed limit of 25km/h (illustrated in Figure 11) at any time a child is in the vicinity, which includes a child who is on the road, footpath, median strip, and on a bike. The rule applies 24 hours a day, and all year around and not, for example only on school days (Department of Planning, Transport and Infrastructure, n.d.).

¹⁰⁴ *Road Transport (Road Rules) Regulation 2017 (ACT) rr 236(3)-(5).*

Figure 11. School zone sign in South Australia



An ADS could be programmed to slow to a certain speed in certain areas at specific times of the day, as required in most Australian school zones. However, a variable speed limit like that in South Australia, which requires a driver to identify a child, may be difficult for an ADS.

If an ADS cannot distinguish a child from adults or other objects, the only way an ADSE could ensure compliance would be for it to program the ADS to decrease its speed to the lower speed limit at all times it is in school zones. This could create new hazards if frustrated human drivers attempt to overtake the slow-moving vehicle.

The NTC is responsible for maintaining the Australian Road Rules and works with state and territory transport agencies to improve national consistency. However, at least in the short term, there will continue to be some jurisdictional differences in road rules.

7.8 Approaches to regulating the dynamic driving task

7.8.1 Developments in Singapore

Singapore has published provisional standards to guide the industry in development and deployment of level 4 and level 5 autonomous vehicles (Enterprise Singapore, 2019). The standards include performance-based behavioural guidelines which translate Singapore's road rules into something that can be more readily complied with by an automated vehicle.¹⁰⁵

7.8.2 Developments in the United Kingdom

The United Kingdom's Law Reform Commissions are considering how to adapt road rules for artificial intelligence decision-making. The Commissions consider it will be a difficult exercise, and will require policymakers and engineers working together, to give precision to

¹⁰⁵ Singapore Standards Council, Technical Reference 68.

areas which are currently left to human discretion (Law Commission of England and Wales and Scottish Law Commission, 2018, p. 165).

The Commissions noted the requests from software developers for a 'Digital Highway Code' —a publicly available, machine readable set of driving codes and conventions, including 'polite behaviour' on the road such as when the ADS should let other road users merge into its lane (Law Commission of England and Wales and Scottish Law Commission, 2018, pp. 169-170).

While noting the likely desirability of having such a Code, the Commissions consider it would be difficult to produce, as it involves giving precision to areas that are currently left to human discretion. It also requires identifying whether rules should be strictly followed, or subject to exceptions in the interests of safety and traffic flow. The Commissions suggest that developers are entitled to ask regulators for guiding principles about how far to encode the current road rules, and how far rules should be subject to exceptions in the interests of safety and traffic flow.

Expert members of the Intelligent Transport Systems United Kingdom submitted to the Commissions that a 'Digital Highway Code' should define automated vehicle behaviour and include road managers in the 'system of systems' that automated vehicles must operate in (ITS United Kingdom, 2019).

7.9 Approaches identified by the NTC

The NTC has identified four approaches that could reasonably be used to regulate the dynamic driving task for automated vehicles in Australia. These are outlined below.

It may be possible to use a mixture of these approaches. For example, requiring substantial compliance with the Australian Road Rules may be suitable as an interim measure while a national driving law for automated vehicles is drafted. This would allow those national rules to be drafted with the benefit of gathering information of automated vehicle use on Australian roads, while also providing a relatively quick way to enable early adopters of automated vehicle technology.

Chapter 10 discusses the four main options of this RIS. Some dynamic driving task approaches may be more straight-forward to implement under some options than others. For example, a single national driving code for automated vehicles would be simpler to implement if there were a single regulator and law with national application than if each state and territory were to regulate automated vehicles separately.

7.9.1 Approach 1: National automated vehicle driving code

Under this approach, new road rules covering dynamic driving task obligations would be drafted for ADSs. The road rules would be made under a national law regulating automated vehicles, and would likely be enforced by a national, in-service regulator.

The code would be consistent with the dynamic driving task obligations in the state and territory road rules. While still being a single instrument which applies nationally, the code could account for the minor variations in dynamic driving task obligations in the state and territory road rules by providing some different rules where an ADS is in a particular state or territory.

The national automated vehicle driving code would need be updated if a state or territory amended their road rules in a way which altered the dynamic driving task obligations.

Advantages

Road rules could be written for automated vehicles, in language that ADSs can readily comply with, but which are consistent with the equivalent obligations in state and territory road rules. For example, the road rules could be developed in more technical language

which can be written into software or could be performance-based in-service engineering standards. This would mean ADSEs would not need to attempt to convert the state and territory road rules to apply them to ADSs.

ADSEs would only need to comply with a single national code which accommodates jurisdictional differences, rather than eight separate regimes in each state and territory. As the rules would have a single source and should be clearly drafted in a way that best enables compliance by ADSs, this approach appears to be the least burdensome for ADSEs.

Disadvantages

Dynamic driving task obligations for an ADS would be specified in a separate law to the rules applying to human road users, all of whom are regulated by state and territory road rules. This means state and territory road rules would need to be monitored for amendments, and the national automated vehicle driving code revised to include relevant updates. For example, if another jurisdiction adopted South Australia's approach to regulating speed in school zones, the regulator would need to update the code so it is consistent with the change for automated vehicles operating in that jurisdiction.

7.9.2 Approach 2: Require ADSs to substantially comply with the dynamic driving task road rules in each state and territory

Under this approach, state and territory governments would legislate to require an ADS to substantially comply¹⁰⁶ with the road rules related to the dynamic driving task in a state or territory. The states and territories could exempt the ADS from complying with rules unrelated to the driving task, or which cannot apply to an ADS. They could assign responsibility for any obligations which an ADS cannot perform; for example, to a fallback-ready user. Breaches could be enforced by a national regulator or state and territory police. Breaches could also provide grounds for a recall under the Road Vehicle Standards Act.

Advantages

The driving task for ADSs and human road users would be regulated together, ensuring future amendments to the road rules can be progressed holistically.

Allowing 'substantial compliance' means an ADS would not be required to comply with rules unrelated to the dynamic driving task and which are only relevant to human drivers (such as bans on mobile phone use); or to adapt road rules written for with human compliance in mind (such as where road rules require a driver to have a 'clear view' of the road, an ADS would substantially comply by ensuring it has adequate information on the state of the road).

This approach could be implemented relatively quickly, making it particularly suitable as an interim measure while there are few automated vehicles on the road. This would allow a national driving law to be developed later and with the benefit of more information.

Disadvantages

ADSEs would be required to monitor amendments to the road rules in eight jurisdictions. They would need to consider whether they need to update their ADS each time an amendment is made, and whether or not an amended rule is a part of the dynamic driving task. This would potentially be a barrier to market entry, or at least an added cost for the automated vehicle industry, which would be passed on to consumers and perhaps delay the introduction of automated vehicles in Australia.

¹⁰⁶ An example of 'substantial compliance' used in vehicle standards can be found in the *Road Vehicle Standards Rules 2019* (Cth) r 76. Substantial compliance with a standard can be adequate if the non-compliance is only minor and inconsequential, the vehicle complies with standards to an extent that makes it suitable for use on public roads, and the vehicle would not pose a risk to public safety.

The Australian Road Rules were designed to address the risks posed by human drivers, not risks posed by an ADS. 'Substantial compliance' with road rules written for human drivers may not be adequate to ensure ADSs behave predictably or address new risks specific to ADSs. If this option were chosen, states and territories may create new, ADS-focused rules, which could lead to significant inconsistencies.

In addition, 'substantial compliance' is a broad concept, and there is a risk that it is unclear to industry, or inconsistently interpreted by enforcement agencies in each state and territory.

7.9.3 Approach 3: Regulate ADSs through the Australian Road Rules

Under this approach, the ADS would be included as a new type of road user in the Australian Road Rules. The states and territories would amend their road rules to implement the change in their jurisdiction. Instead of requiring substantial compliance with the rules written for human drivers (approach 2), specific rules could be made for the risks unique to automated vehicles.

Advantages

As with approach 2, this approach has the advantage that rules for ADSs would be in the same place as the rules for human road users. Revisions to the Australian Road Rules could be considered in a holistic way which accounts for any impacts on the regulation of other road users. This may also encourage greater national consistency in the regulation of other road users, as well as automated vehicles.

Disadvantages

Like road rules today, this approach would make use of eight distinct but similar bodies of law. ADSEs would be required to keep track of amendments to the road rules of all eight states and territories and decide whether they need to update their ADS when an amendment is made in one or more states or territories. This could be a barrier to market entry. Alternatively, it may add costs for the automated vehicle industry which are passed on to consumers. Added cost may reduce the uptake of automated vehicles in Australia.

Each state and territory would be responsible for maintaining their law. This would result in duplication of effort across government. In addition, inconsistencies would likely arise in the implementation of ADS obligations between states and territories, meaning different driving rules would apply in different jurisdictions.

ADSEs may not be based in the state or territory where an infringement occurs. This could pose practical and logistical difficulties for state and territory enforcement agencies. States and territories may be required to amend their legislation to give police, or the relevant regulator, new powers to enforce breaches of the road rules against ADSEs.

7.9.4 Approach 4: Rules made under the Road Vehicle Standards Act

The Road Vehicle Standards Act regulates new vehicles and vehicle components as they enter the market. In granting approval for an automated vehicle or ADS component to be supplied in Australia, the minister can impose conditions on the ADSE, which could include conditions about performance.

Under this approach, rules regulating the performance of the dynamic driving task would be made for ADSs under the Road Vehicle Standards Act. If the ADS failed to perform the dynamic driving task as required by the rules, that could be grounds for a recall. Rules and recall notices would be made by the Commonwealth minister.

Advantages

As a Commonwealth law, this approach would achieve national consistency. The Road Vehicle Standards Act already regulates the standards at first supply so there may be some efficiencies in having the ADS driving task regulated under the same framework.

It could be convenient for industry for in-service vehicle standards regulating driving performance to be made under the same Act which regulates standards at first supply. A separate in-service regulator could still separately enforce a general safety duty.

Disadvantages

As it is primarily concerned with the first supply of new vehicles, the Road Vehicle Standards Act would probably require amendment to clearly authorise in-service regulation of ADSs. To achieve regulatory certainty and ensure that only the Commonwealth law applies, the states and territories may need to exempt ADSs from their own road and transport laws. States and territories currently regulate driving and the road network, and some states may prefer to retain regulatory responsibility for this aspect of in-service safety. These concerns may be eased if ADSEs are also required to comply with a separate general safety duty.

The Commonwealth agency administering the Road Vehicle Standards Act is not presently resourced to monitor the in-service performance of automated vehicles. It would rely on ADSEs and state and territory road transport agencies to alert it to in-service issues when they present.

Questions

11. Do you think there should be specific driving rules for ADSs like the Australian Road Rules, or would it be sufficient to simply require them to 'drive safely'?
12. What approach to regulating the dynamic driving task for ADSs most efficiently achieves safe outcomes? Please provide reasons.

8 Governance arrangements for the in-service safety of automated vehicles

Key points

- An in-service safety regulator will require functions and powers to effectively regulate in-service safety.
- The size, nature and growth of the automated vehicle market may inform the appropriate form of the regulator's governance arrangements.
- The regulator's institutional arrangements could vary in terms of level of independence, whether it sits at the national or the state and territory level, and whether it sits within an existing or new body.
- The regulator will require adequate funding to effectively carry out its functions. This funding will ideally reflect an equitable distribution of benefits received by users of the system.
- All these factors are interdependent.

8.1 Purpose of this chapter

The purpose of this chapter is to outline the governance arrangements of a regulator for the in-service safety of automated vehicles. It considers:

- the functions and powers a regulator would need to effectively regulate in-service safety
- the scope of the regulatory task
- the institutional arrangements¹⁰⁷ that could accommodate the necessary functions and powers of a regulator
- the regulator's funding arrangements.

We are seeking your feedback on the appropriate form of these governance arrangements.

8.2 Context of governance arrangements

A regulatory body is required to administer any new in-service safety duties and obligations. This body or bodies will be the regulator for the in-service safety of automated vehicles.

Currently, the Commonwealth government and state and territory governments share responsibility for regulating road transport to ensure safety outcomes.

The Commonwealth government regulates the safety of new and imported conventional vehicles at first supply to the Australian market. In November 2018, the transport ministers agreed the Commonwealth government would also regulate the safety of automated vehicles at first supply.

Once conventional vehicles are on roads, responsibility for safety shifts to state and territory governments, through their transport agencies and the National Heavy Vehicle Regulator.

¹⁰⁷ In this consultation RIS, 'institutional arrangements' refers to the structural features of a regulator.

They administer in-service vehicle standards for light and heavy road vehicles. This in-service system covers licensing, registration and roadworthiness.

The regulator for in-service safety of automated vehicles will need to ensure the relevant parties can assure the safety of an ADS over its full life cycle. Its responsibilities will be equivalent to the responsibilities states and territories have to ensure vehicles are roadworthy and drivers comply with road rules.¹⁰⁸ This will include being the body responsible for ensuring compliance with in-service aspects of the ADSE's statement of compliance.¹⁰⁹

8.3 Requirements for an effective regulator for in-service safety

The design of the regulatory body that will administer the in-service safety assurance system is key to the system's success. The regulator must have the correct mandate (functions), regulatory tools (powers), structure (institutional arrangements) and funding to be able to effectively regulate in-service safety.

Government stakeholders have suggested that the design of an in-service regulator should be guided by the following principles:

1. The regulator ensures in-service automated vehicle safety risks are comprehensively addressed by the relevant duty holder.
2. The regulator ensures a nationally consistent approach to in-service safety in cooperation with Commonwealth, state and territory governments.
3. There are clearly defined roles and responsibilities for the Commonwealth, states and territories, industry and users to facilitate market entry, consumer confidence and safety.
4. The regulator can accommodate international standards as they develop.
5. There is minimal overlap and duplication with existing regimes.
6. The size of the regulator is efficient and scalable.
7. The regulator can recover some or all of the efficient costs of its regulatory activities.¹¹⁰

These principles should guide decisions about the appropriate form of the regulatory function.

8.4 Functions of a regulator

A regulator will need to undertake a range of functions to ensure in-service automated vehicle safety risks are comprehensively addressed by relevant duty holders. The regulator's key function will be to ensure relevant parties assure the safety of an ADS over its full life cycle. This may require the regulator to undertake both proactive and reactive functions. Regulatory functions could be mandatory, or permitted by legislation but not required. We have identified the following potential functions, which are described below: monitoring, data collection and sharing, conducting and defending proceedings, education and information sharing or research, creation of standards, customer service.

Different types of safety duties may require the regulator to have different functions. One of the advantages of a general safety duty on parties is its capacity to be relied on to require

¹⁰⁸ Licensing and registration functions would remain with existing state and territory regulators.

¹⁰⁹ Safety criteria with in-service aspects that an ADSE must comply with include compliance with relevant road traffic laws, installation of system upgrades by owners or operators, some aspects of education and training and data recording and sharing with relevant parties.

¹¹⁰ Principles agreed by Automated Vehicles Senior Advisory Group in November 2018. This group consists of senior officials from Commonwealth, state and territory governments and is chaired by the NTC.

parties to address emerging safety risks before they eventuate. However, to address risks in this way, a regulator may need to place more reliance on its proactive functions, than for prescriptive duties. For example, ongoing monitoring of parties covered by the safety assurance framework, or broader data collection to detect emergent safety risks before an incident eventuates.

The regulator will need a monitoring function to proactively observe compliance and non-compliance by parties with their duties over the life of an ADS. Specific monitoring powers are discussed in section 8.5. The regulator will also need an enforcement function to enforce compliance with duties. Again, this is discussed in section 8.5.

Data collection and sharing will be key functions for the regulator. ADSEs will be required to record and share data with relevant parties.¹¹¹ The regulator will need access to data relevant to the enforcement of road traffic laws and the general safe operation of the ADS. It is also likely that the regulator will need to share data. For example, it may be necessary to have data sharing arrangements with relevant agencies like police and road managers.

Some government regulators in Australia create the standards they enforce. For example, the Department for Infrastructure, Transport, Cities and Regional Development, through its responsible Minister, makes road vehicle standards and rules under the Road Vehicle Standards Act. In the same way, a regulator for in-service safety of automated vehicles that administered prescriptive duties could develop these duties itself.¹¹²

It may be necessary for the regulator to conduct and defend proceedings related to its functions or decisions.

Some safety regulators have an education, information or research role. For example:

- the Civil Aviation and Safety Authority is required to use education, training and advice to encourage greater acceptance by the aviation industry of obligations to maintain high standards of safety.¹¹³
- New South Wales Roads and Maritime Services has a function of carrying out or promoting research or investigations including ‘the cause of accidents, their incidence and the ways and means that may be adopted for their prevention or for controlling or mitigating their effects’.¹¹⁴

Automated vehicles encompass new unfamiliar technologies, and any new duties would also be unfamiliar. An education and information-sharing function for a regulator could be beneficial to bring greater attention and adherence to the limits of the technology, and any relevant duties.

Some regulators have customer service functions. Existing state and territory road transport regulators like VicRoads have service centres where people apply for driver licences, register vehicles and buy number plates. An in-service regulator might house any required customer service functions itself. Alternatively, it may share responsibility and resources for these functions with another entity. This model is used for heavy vehicle regulation—road transport agencies deliver particular frontline services on behalf of the National Heavy Vehicle Regulator.

¹¹¹ This requirement comes from the ‘data sharing and recording’ safety criteria, which ADSEs must self-certify against at first supply.

¹¹² Another regulatory model is to separate legislative and policy development from compliance and enforcement. For example, Safe Work Australia is a statutory body that develops and evaluates the model work health and safety legislative framework, while state and territory regulators regulate and enforce work health and safety laws in their jurisdictions.

¹¹³ *Civil Aviation Act 1988* (Cth) s 9(2)(a).

¹¹⁴ *Transport Administration Act 1988* (NSW) s 52A(2)(d)(ii).

The size of the regulator will need to correspond to its required functions and should be efficient and scalable. If the deployment of automated vehicles is limited, at least at first, it may be reasonable to have a smaller regulator with more limited functions. In this scenario, proactive functions are likely to be less important at first. We discuss the scope of the regulatory task at section 8.6.

8.5 Powers of a regulator

Transport safety regulators in Australia generally have broad powers to take any action that allows them to perform their functions.¹¹⁵ Our overarching assumption is the in-service safety regulator will require a range of tools to enable it to respond to non-compliance in a way that is proportionate to the risk and the ability of the duty holder to address that risk. The tools required will be dependent on the duties and obligations the regulator is required to administer and enforce.

The powers a regulator would need broadly fit into two categories—compliance and enforcement.¹¹⁶

Compliance powers will need to include proactive powers if the regulator is to effectively address safety risks before an incident eventuates. This is particularly important if regulated parties are subject to general safety duties. Proactive powers include investigative powers like inspection, audit, rights of entry and powers to require data and information from regulated parties.

Compliance powers will also be used reactively, when the regulator needs to investigate suspected contraventions of duties and obligations. Reactive investigations may form the bulk of the regulator's use of its powers, especially if the regulator administers only prescriptive safety duties rather than a general safety duty.

Enforcement powers could include improvement notices, formal warnings, infringement notices, fines and enforceable undertakings. More serious penalties could include variation or withdrawal of permissions to operate, ADS recalls and criminal prosecutions. These powers will need to be considered in the context of existing enforcement powers within the Road Vehicle Standards Act for first supply of automated vehicles and at a state and territory-level for conventional vehicles.

Question

13. What functions and powers does the regulator need to effectively manage in-service safety? Would these differ depending on whether the regulator is enforcing a general safety duty, or only prescriptive duties?

8.6 Scope of the regulatory task

The functions and powers a regulator will need to effectively manage in-service safety will be informed by the scope of the regulatory task. There are varying views about the nature, growth (uptake) and size of the automated vehicle market.

It is important that the regulator is efficient and scalable. The size of the regulatory task would be smaller, and require a smaller regulator, if the market consists of a small number of

¹¹⁵ For example, *Civil Aviation Act 1988* (Cth) s 12(1); *Heavy Vehicle National Law* s 658(c); *Transport Integration Act 2010* (Vic) s 88(1).

¹¹⁶ Detailed compliance and enforcement powers for in-service safety will be addressed in the next phase of the NTC's work on in-service safety of automated vehicles. That work will be guided by the outcomes of this RIS process, as well as the NTC's work on government access to C-ITS and automated vehicle data.

established operators, who are already familiar with regulatory compliance (for example, conventional vehicle manufacturers).

If a general safety duty is placed on repairers, the scope of the regulatory task will be much larger. There are currently 22,500 repairers in Australia operating across 39,000 outlets. Again, the regulator would need to be efficient and scalable to manage an evolving market, as the regulatory task might be smaller should repairs be undertaken only by repairers approved by manufacturers or commercial operators, or in-house.

Major vehicle manufacturers and newer technology companies' predictions suggest ADS technology (SAE level 3 or above) will be commercially available to overseas markets between 2019 and 2021. However, there is a large degree of uncertainty in these timelines and it is not known when ADS technology will be made available in the Australian market.

Figure 12 shows a timeline of manufacturers' predicted release dates of their ADS technology.¹¹⁷

Figure 12. Timeline of manufacturers predicted release of automated vehicles

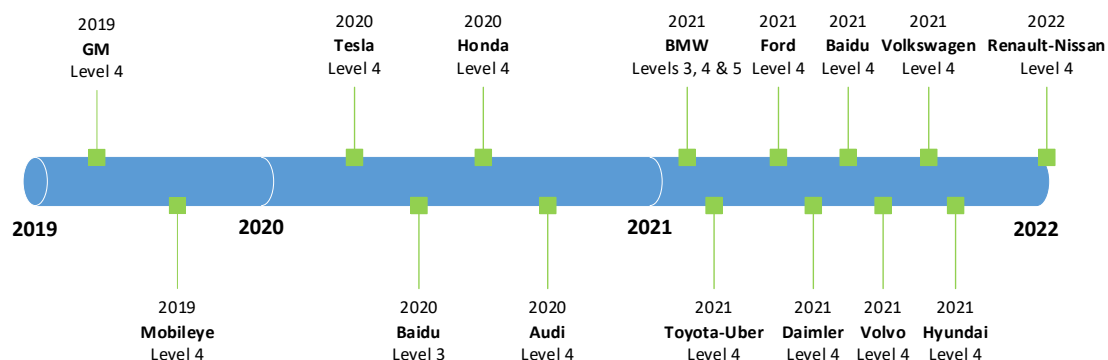
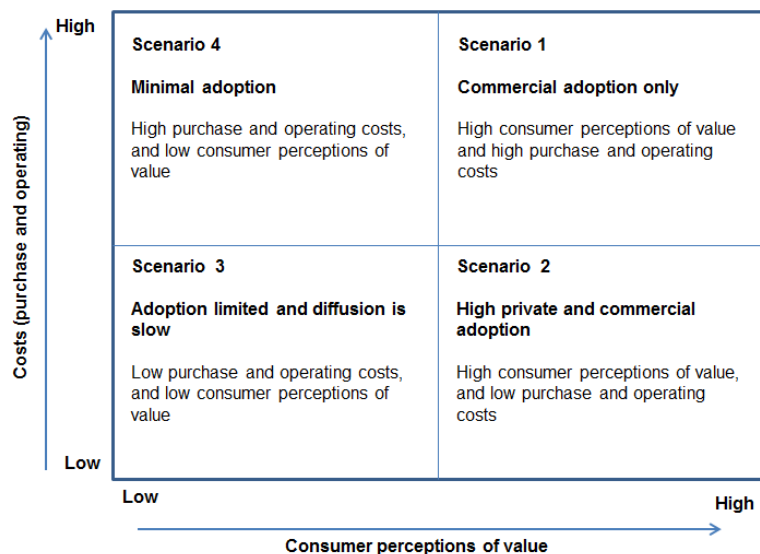


Figure 13 illustrates four different potential uptake scenarios.

Figure 13. Automated vehicle uptake scenarios



¹¹⁷ Manufacturer predicted release timeframes are subject to change and are accurate at the time of writing. The timeline is based on manufacturer announcements.

At this stage we cannot know which scenario is most likely to eventuate. It is unclear how many people will use automated vehicles, if private vehicle ownership will continue to be common or if shared or fleet models may become dominant. Some vehicle manufacturers intend to deploy automated vehicles in fleets first, rather than for private ownership.

ADSEs could be one or more of several parties, including manufacturers that currently supply vehicles (for example, Toyota), commercial operators (for example, Uber) or component (ADS) manufacturers (for example, Bosch).

In an uptake model with largely commercial ownership, the benefits of a single national regulator may be greater than in an uptake model with largely private ownership. This is because commercial operators are likely to operate across state and territory boundaries; for example, an Uber automated vehicle fleet.

The Federal Chamber of Automotive Industries (FCAI) suggests that mass market introduction of levels 4 or 5 vehicles is unlikely before 2030 (Federal Chamber of Automotive Industries, 2018, p. 6). It expects a small number of level 4 or 5 vehicles will be released before 2030, which will most likely be niche products and/or within closed fleets (Federal Chamber of Automotive Industries, 2018, p. 7).

We consider it reasonable to assume that commercial deployment of automated vehicles will be limited in its scope initially. This has implications for decisions on the governance arrangements for the regulator. On the one hand, it may reduce upfront costs to have a regulatory model based on existing in-service governance arrangements for the regulation of conventional vehicles. However, in the long term, setting up an initial regime and then a further regime to account for the growth of the market may be an inefficient regulatory approach.

Question

14. Have we accurately described the scope of the regulatory task? Please provide data and evidence where possible to support your answer.

8.7 Possible models for a regulator – institutional arrangements

The functions and powers of the regulator will determine the most appropriate institutional arrangements to support those requirements. There are three key institutional questions to resolve:

1. Should the regulator be an independent agency or a government agency?
2. Should the roles and responsibilities be administered at a state and territory level, national level, or through a combination of both?
3. Should the regulator be a new agency or form part of an existing agency?

8.7.1 Level of independence

Independence of a regulator from government is never absolute; the OECD notes that independence is 'a matter of degree and nature' (OECD, 2014, p. 48).

Safety regulators in Australia have varying levels of independence. Some national regulatory functions are administered wholly within a government department. For example, the first supply regulator for automated vehicles will be the relevant federal government Minister and the Department of Infrastructure, Transport, Cities and Regional Development, under the Road Vehicle Standards Act.

The National Heavy Vehicle Regulator is a single national regulator established by statute as a body corporate, separate to any government.¹¹⁸ Despite this independence from government, it still has a level of government oversight. Its Board is appointed by ministers, members can be removed from office by ministers for specified reasons, and its chief executive is appointed by the Board. Its responsible Minister may give directions about any policies applied by it in exercising its functions.¹¹⁹ The National Heavy Vehicle Regulator must also provide annual reports, corporate plans and any other requested reports to ministers.

The Office of the National Rail Safety Regulator is also a single national regulator, established as a body corporate.¹²⁰ It also has a level of government oversight, for example, its members are appointed by ministerial appointment.¹²¹ Unlike the National Heavy Vehicle Regulator, its legislation notes that it is independent and not subject to ministerial direction except as provided for in the law.¹²² These circumstances are limited—the key direction being to investigate a rail safety matter.¹²³

8.7.1.1 Benefits of a government regulator or government oversight

There will be a strong link between the regulator and other government agencies, particularly enforcement agencies. Links including data sharing between a government regulator and other government agencies may be more easily established than with an independent regulator. This would particularly be the case if the regulator is an existing body.

The New Zealand Productivity Commission suggests government oversight might be more appropriate where decisions involve the exercise of coercive state power (New Zealand Productivity Commission, 2014, p. 218). There may be benefit in a government regulator for in-service safety of automated vehicles because the regulator will have coercive powers, for example, to make decisions relevant to parties' continued access to the market and to impose sanctions.

Consumers may have increased confidence in the safety of automated vehicles if there is government oversight of the regulator. Automated vehicles will use innovative and emerging technologies that are potentially high-risk. In the NTC's previous consultations, many people have told us that that if governments do not introduce visible measures to oversee automated vehicle safety community confidence will be diminished.

Ultimately, a government regulator can also be held to account through the electoral process. Voters can vote for the responsible minister for the in-service safety regulatory function, or the government itself. An independent regulator is more removed from this democratic accountability.

8.7.1.2 Benefits of an independent regulator

The key argument for a regulator with more independence is to diminish outside influence, particularly political influence. This could be important in a sector where public safety should be the primary concern. Government regulators may be more susceptible to lobbying by regulated parties—and may be more responsive to this type of lobbying or media attention—due to the political pressure this brings and potential electoral consequences.

¹¹⁸ Heavy Vehicle National Law s 657(1)(a).

¹¹⁹ Heavy Vehicle National Law s 651(1).

¹²⁰ Rail Safety National Law s 12(2)(a).

¹²¹ Rail Safety National Law ss 17, 21.

¹²² Rail Safety National Law s 14.

¹²³ Rail Safety National Law s 41.

The regulator may have the ability to restrict ADSEs from operating if they breach in-service safety duties, effectively stopping their participation in the market. It is important for a regulator to be seen as impartial if making these types of decisions. Industry (and the public) may have more confidence in the impartiality of an independent regulator than a government regulator, even if in practice the level of impartiality would be the same.

The New Zealand Productivity Commission suggests that more regulatory independence is required where 'a consistent approach over a long period of time is needed to create a stable environment' (New Zealand Productivity Commission, 2014, p. 218). For in-service safety of automated vehicles, a consistent approach will be an important feature to create certainty for regulated parties about their duties over the full life cycle of ADSs.

8.7.2 Single national regulator or multiple state and territory regulators

The in-service safety regulator for automated vehicles could be a single national regulator or multiple state and territory regulators. There are examples of both across safety regimes in Australia. For example, work health and safety is regulated by regulators in each state and territory (and Comcare in the Commonwealth), whereas therapeutic goods are regulated nationally by the Therapeutic Goods Administration.

8.7.2.1 Benefits of a single national regulator

National inconsistency to in-service safety approaches is a fundamental part of our problem statement, because it has the potential to act as a barrier to ADSEs bringing their technology to Australia. Inconsistent regulation may place additional costs on industry and leave them with uncertain outcomes. In turn, if ADSEs are deterred from bringing their technology here, Australians will not unlock the full potential benefits of automated vehicles.

The key benefit of a national level regulator is the creation of a single market. This would also mean a greater likelihood of achieving consistency in safety approaches across Australia. Regulated parties operating across jurisdictions would face the same duties, and a single regulator would be more likely to provide consistent application of enforcement mechanisms. Aviation, maritime, rail, heavy vehicles and the first supply of light vehicles are all regulated at the national level. A national-level regulator has the potential to best address this part of our problem statement.

Similar industry concern was noted in the rail sector a decade ago. Before the change to a single, national regulator, a third of the rail industry operated across multiple states and needed to hold accreditation from two or more regulators. When the NTC consulted on this topic in 2008, those operators working across multiple states argued that dealing with up to seven regulators was unnecessarily burdensome. A consultant's report estimated that industry's inter-jurisdictional costs were approximately 25% of their total compliance cost (National Transport Commission, 2009, p. 20).

ADSEs that need to meet different requirements, or different applications of similar requirements, in multiple jurisdictions may pass on their compliance, administrative and delay costs to consumers.

As discussed previously, there is the potential for ownership models for automated vehicles to differ significantly from current ownership models. If private ownership reduces and an increased share of the market is taken by commercial operators operating across jurisdictions, the issue of dealing with multiple regulators and regulation could be an even greater problem.

Without a national regulator, states and territories will need to regulate the in-service safety of automated vehicles themselves. This ongoing duplication of effort could be an additional cost to government. These costs might also be passed on to industry.

Staff within the regulator will need to have many specialised skills to effectively regulate automated vehicle technology. It may be difficult to recruit this type of expertise, particularly for smaller jurisdictions, which could lead to adverse safety outcomes in these jurisdictions.

Finally, access to relevant data will be more efficient within a national regulator. Without a national regulator, states and territories would need to create their own separate data sharing mechanisms between in-service safety regulators.

8.7.2.2 Benefits of multiple state and territory-level regulators

A national-level regulator could lead to greater national consistency in safety approaches. There is also potential for nationally consistent rules administered at the state and territory level, or mechanisms like mutual recognition, to lead to consistency in safety approaches to a lesser extent. Without nationally consistent rules, however, the chances of national consistency are lessened further.

States and territories would have a greater ability to tailor the regulatory framework to respond to local priorities. This may be particularly important for jurisdictions with large remote areas; they may have unique situations that are less likely to suit 'one size fits all' frameworks.

States and territories (and the National Heavy Vehicle Regulator) would also remain in control of their road transport regulation. This means that in-service regulation of automated and conventional vehicles could be administered together. If this were the case, consumers might find the in-service safety system more accessible given their familiarity with existing processes.

A regulatory function within existing road transport agencies might have lower upfront costs for government and be simpler to implement (though costs could differ between large and small jurisdictions).

If the scope of the regulatory task is limited initially, there may be benefit in keeping in-service safety regulation at the state and territory level within existing road transport regulators, at least at first. This would leave open the option of transitioning to a national system once the nature of the market is clearer.

8.7.3 New or existing body

A new regulatory function will be required to undertake the functions and powers discussed in section 8.3. However, this will not necessarily require a new regulatory body. A new regulatory function could be given to an existing body.

If the regulator were to sit within an existing body, the most suitable, based on their relevant structures, knowledge and responsibilities, appear to be:¹²⁴

- The Department of Infrastructure, Transport, Cities and Regional Development—the first supply regulator for automated vehicles
- State and territory road transport agencies—current in-service regulators for conventional light vehicles.¹²⁵

¹²⁴ These are government bodies. If the preference was for the regulator were to be one of these existing bodies it would not be an independent regulator (excluding the National Heavy Vehicle Regulator, which is independent, being the regulator for heavy vehicles).

¹²⁵ The National Heavy Vehicle Regulator will also have a role in the regulation of automated heavy vehicles in states and territories where the Heavy Vehicle National Law applies.

8.7.3.1 Benefits of the regulator being a function within an existing body

If the regulator were an existing body, it could create efficiencies and it is likely that there would be less upfront set up costs for government.

The Department of Infrastructure, Transport, Cities and Regional Development will make the approval decisions to certify automated vehicles at first supply. It will have an ongoing role in the monitoring of ADSEs to ensure they comply with the safety criteria. Having the Department regulate in-service aspects of the safety criteria and other in-service duties could be efficient by providing one regulator for the whole sector. This may reduce costs for industry, as they would only need to deal with one regulator for the safety of automated vehicles.

A single automated vehicle safety regulator would remove potential issues of confusion about which regulator deals with in-service issues that are also relevant at first supply. It would also reduce the potential for different approaches to emerge between regulators.

Having both first supply and in-service safety regulated within the Department of Infrastructure, Transport, Cities and Regional Development would reduce potential barriers to data flows between separate regulators. Data flows will be central to both first supply and in-service regulators being able to carry out their functions.

It is expected that, over time, international standards will develop, and the safety criteria an ADSE is required to self-certify against at first-supply will largely transition to these international standards. If the Department was responsible for both first supply and in-service safety, it might be easier to manage interactions between new standards and tasks that still need to be administered by an in-service regulator.

If state and territory road transport agencies were the in-service regulators, government set up costs may be reduced because it does not require a new body. Additionally, where appropriate, regulatory processes for managing in-service safety for automated vehicles could be incorporated into in-service safety processes for conventional vehicles.

A single regulator for in-service safety of road transport within each jurisdiction (as well as the National Heavy Vehicle Regulator for heavy vehicles) may also remove confusion for regulated parties. For example, registered owners and commercial operators may own or manage both automated and conventional vehicles. They would only need to deal with one regulator for the in-service safety of their vehicles.

It could also reduce potential barriers to data flows about on-road issues such as network operations, which could aid safe operation of automated vehicles.

This decision would be better informed by more certain market predictions. However, if the number of ADSEs to be regulated was expected to be small at first, it could be a further reason to incorporate the in-service regulator function into either the Department or state and territory road transport agencies.

8.7.3.2 Benefits of the regulator being a new body

If the regulator was a new body, its staff, structure and governance could be established specifically to address the regulatory functions associated with in-service safety of automated vehicles. Existing bodies would not have this benefit if they became the regulator of in-service safety of automated vehicles. There would be a number of challenges for existing bodies we have identified as potentially suitable to be the in-service safety regulator for automated vehicles.

Under the Road Vehicle Standards Act, the role of the responsible minister and the responsible department is to create and administer the standards that road vehicles must comply with at first supply. There is some potential for the Department's role to extend beyond first supply into in-service safety; however, this remains untested. If the Department

took on a role as the regulator of in-service safety of automated vehicles, it would be a significant departure from its current functions, powers and expertise. To implement this, changes may be needed to the new Road Vehicle Standards Act.

State and territory road transport regulators (and the National Heavy Vehicle Regulator) would have the most relevant knowledge of in-service safety regulation. However, as is also the case with the Department, there is a gap in the skills required currently and those required in the future to effectively regulate in-service safety for automated vehicles. Issues arising from cybersecurity failures, for example, will require new expertise to detect problems. Particularly in the smaller jurisdictions, attracting this expertise may be a challenge.

There are also other issues specific to having state and territory regulators, like duplication of effort and cost. Differing approaches could also arise in relation to the standards required of industry to meet their duties and this could be a barrier to industry bringing their technology to Australia.

If the regulator were the Department of Infrastructure, Transport, Cities and Regional Development or state and territory road transport agencies, upfront government set up costs to establish a new regulatory function might still be substantial.

Questions

15. Have we accurately captured the benefits of the regulator being:
- a government body or an independent body?
 - a national body or state and territory bodies?
 - an existing body or a new body?

8.8 Funding models and cost recovery for a regulator

In this section we discuss how an in-service safety regulator could be funded. We are seeking preliminary views on an appropriate funding model. We will further consider funding arrangements only after Ministers have agreed how in-service safety will be regulated.

The regulator will require appropriate funding to effectively carry out its functions, and will ideally reflect an equitable distribution of benefits received by users of the system. Funding arrangements for the regulator will be closely tied to the governance arrangements chosen for the regulator.

If the regulator is a state and territory level regulator, each state and territory would determine its own funding arrangements. Funding could come from a mix of state and territory government contributions and cost recovery from industry and/or consumers.

If the regulator is a national-level regulator, Commonwealth, state and territory governments would agree a national funding model together. Its funding could come from a mix of government and cost recovery from industry and/or consumers.

Some national safety regulators that sit outside government departments are funded through a combination of Commonwealth, state and territory contributions, as well as income from the fees they collect from industry, for example, the National Heavy Vehicle Regulator and Office of the National Rail Safety Regulator.

The Civil Aviation Safety Authority similarly receives a mix of government and industry funding. Its government funding comes only from the Commonwealth government, and its industry funding comes from an excise on aviation fuel and fees for its services (Department of Infrastructure, Regional Development and Cities, 2018b).

Funding could come solely from contributions by government bodies. For example, the Office of the Point-to-Point Commissioner is funded by the New South Wales Government. However, the Australian Government's cost recovery guidelines state that its overarching cost recovery policy is that, 'where appropriate, non-government recipients of specific government activities should be charged some or all of the costs of those activities' (Australian Government, Department of Finance, 2014). Funding solely from government may lead to costs being recovered from industry and consumers indirectly through other taxation. Additionally, if a large proportion of funding for an independent regulator comes from government, there are risks that it might not be perceived as fully independent of political priorities.

Funding could also come solely from industry and consumers. This would be cost recovery from a mix of fees and charges by users of the system, for example, ADSEs, owners and drivers. However, this could be a disincentive for industry to bring their technology into the Australian market. It could also lead to slower uptake if costs are passed onto consumers. This could be through higher fees directed at consumers such as registration fees, or through industry charging more for the technology.

Funding that comes solely from industry or consumers could lead to an actual or perceived influence on a regulator's decisions. For example, as a result of 'regulatory capture' by large industry participants that are responsible for higher proportions of funding than smaller participants.

As well as government contributions and cost recovery, the regulator could also receive revenue from fines and penalties. The government's broader charging framework includes cost recovery from fees and levies, commercial charges, fines and penalties, and general taxation (Australian Government, Department of Finance, 2014, p. 2).

Question

16. What are your initial views on how the regulator should be funded?

9 Legislative implementation models

Key points

- A national law that regulates automated vehicles in-service could be implemented through state and territory legislation, or through Commonwealth legislation.
- The appropriate legislative implementation approach will depend on the choice of safety duties, the regulated parties, who the regulator will be, and its functions and powers.
- Whichever implementation approach is chosen, states and territories will need to review current driving, vehicles and road management legislation to ensure it remains fit for purpose.

9.1 Purpose of this chapter

The purpose of this chapter is to:

- explain why there is a need for cooperation between governments to achieve a national law for in-service safety
- explain models to implement the legislation within Australia's federal structure.

9.2 Cooperation between governments to achieve a national law

Australia's federal structure divides legislative power between state and Commonwealth levels of government. The division of legislative power means that the two levels of government need to cooperate to achieve a national approach.

The High Court has noted the challenges of achieving effective cooperative schemes in the federal system, quoting Professor Cheryl Saunders:

*Australia is a federation of a dualist kind... While some provisions in the Constitution provide for co-operation, they do not fundamentally alter its dualist character; indeed, if anything, they reinforce it. The nature of the Australian constitutional system needs to be borne in mind in designing co-operative procedures. The issues at stake essentially are questions of principle.*¹²⁶

Despite the difficulties, in order to remain internationally competitive, Australia has worked to achieve national consistency in areas which would have been considered state matters when the Australian Constitution was enacted (French, 2012, pp. 40-41). Cooperation is typically achieved through intergovernmental forums such as the Council of Australian Governments (COAG). COAG is supported by COAG Councils, one of which is the Transport and Infrastructure Council.

Cooperation between different levels of government has allowed Australia to achieve national legislation in a wide range of areas relating to the regulation of transport. These include heavy vehicles (Heavy Vehicle National Law), road rules (Australian Road Rules), rail safety (Rail Safety National Law) and commercial vessels (Marine Safety (Domestic Commercial Vessel) National Law). This record of successful intergovernmental cooperation

¹²⁶ *ASIC v Edensor Nominees Pty Limited* (2001) 204 CLR 559.

suggests that, despite the complexities of Australia's federal structure, a national law for the regulation of the in-service safety of automated vehicles is achievable.

Legislative responsibility for vehicle and road safety is split between the Commonwealth and the states and territories. The Commonwealth government has responsibility for setting requirements for vehicles at first-supply to the Australian market. State and territory governments have responsibility for the in-service elements. These include the road network, vehicle operation, driver licensing and vehicle registration.

The appropriate legislative implementation model for the in-service safety of automated vehicles will depend on the choice of safety duties (discussed in chapter 6), who the regulator is, and its functions and powers (discussed in chapter 8), and the parties to be regulated (discussed in chapters 4 and 5).

9.3 Need for a national law for the in-service safety of automated vehicles

In the absence of a coordinated, national approach, the in-service safety regulation of automated vehicles would progress in a nationally inconsistent manner. This would mean greater regulatory complexity and higher costs for regulated parties, who would need to understand and comply with varying regulatory schemes of each state and territory, rather than one nationally consistent scheme.

Inconsistent regulation would impede the deployment of automated vehicle technology in Australia, and adversely affect the affordability of these vehicles. This risk has already been realised in the vehicle industry elsewhere, for example Audi decided not to introduce its automated 'Level 3 Traffic Jam Pilot' in its A8 vehicle launch in the United States. Its reason was that inconsistent state regulations make it difficult to sell vehicles nationwide (Paukert, 2018).

Transport ministers have already made several key automated vehicle policy decisions. These decisions are significant steps towards a nationally consistent approach for automated vehicle regulation in Australia. Transport ministers have agreed to:

- the development of a new purpose-built national law to regulate the on-road operation of automated vehicles
- a self-certification approach for ADSs incorporated into existing Commonwealth legislation for the first supply of road vehicles.

In creating a national law, it is essential that jurisdictional differences of Australia's states and territories are adequately accommodated. The aim is to develop a nationally consistent approach that suits Australia's diverse road environments and climates. Without this, some jurisdictions may not adopt the national approach. For example, both the Northern Territory and Western Australia have not applied the Heavy Vehicle National Law.

Once the policy is settled, the appropriate implementation method will need to be carefully selected. It will need to be acceptable to the relevant parliaments, and constitutionally valid.

The NTC will consult with relevant experts including the Parliamentary Counsel's Committee (a national committee representing the legislative drafting offices in Australia) and governments on how to best implement any in-service regulation.

9.4 Legislative models for implementation

Existing state and territory transport laws assume a human driver is present and in control when a vehicle is in motion. States and territories will need to review their legislation to accommodate automated vehicles; for example, to ensure that any occupants of a vehicle are not unintentionally deemed the driver when the ADS is engaged. This will be the case regardless of any specific rules made for automated vehicles.

A national law that regulates automated vehicles in-service could be implemented through state and territory legislation, or through Commonwealth legislation with the assistance of the states and territories.¹²⁷ The approaches are discussed below.

9.4.1 Achieving a national law through state and territory legislation

Laws to regulate the in-service safety of automated vehicles could be made in state and territory legislation. States and territories currently regulate most in-service vehicle issues and current road users like human drivers, pedestrians and cyclists. Adding automated vehicles to those parties being regulated at state level could facilitate a holistic approach so that interactions between automated vehicles and other road users, like cyclists, are appropriately regulated. It could also help avoid potential inconsistencies or conflicts that may arise if the states and territories regulate one area of in-service safety and the Commonwealth another.

One advantage of using an entirely state-based approach for in-service automated vehicle regulation is that it would preserve the current split between Commonwealth and state and territory responsibility. The Commonwealth would regulate the first supply of all vehicles to the Australian market, both conventional and automated. The states and territories would then regulate vehicles and driving in-service for both conventional and automated vehicles. Preserving the existing division in responsibility might make it easier for government, industry and the public to understand.

A state and territory based national law could be achieved either through a 'model law' approach or an 'applied law' approach.

An applied law approach is when the law of one jurisdiction is applied in another, resulting in a single law and a single regulator operating nationally. A model law approach would involve each jurisdiction passing the same or very similar law. It would be enforced at state and territory level by different regulators for each jurisdiction. The two approaches are discussed in greater detail below.

Model law

In a model law approach, model legislation is drafted and separately enacted by participating jurisdictions. Two examples of model law are the Australian Road Rules (maintained by the NTC) and the model WHS law (maintained by Safe Work Australia).

Model law could accommodate jurisdictional differences well but would result in inconsistencies because states and territories can derogate (deviate) from the model law when they enact legislation. They will do so if they decide that parts of the model law do not meet the specific requirements of their state or territory.

Once the law is enacted, states and territories can review and amend their local version of the model law if it does not meet expectations or suit their local circumstances.

The limitations of a model law approach are illustrated by state and territory implementation of the Australian Road Rules and the model WHS law, where true harmonisation has not been achieved. The model WHS law is not applied by Victoria or Western Australia. There

¹²⁷ The Australian Constitution allows the states to refer to the Commonwealth legislative powers it does not already have under the Constitution (*Australian Constitution* s 51(xxxvii)). This has been used in relation to corporations and anti-terrorism legislation. A referral would only occur if jurisdictions agreed that they wanted the Commonwealth to regulate automated vehicles and the Commonwealth lacked the power to do so. It appears the Commonwealth does not require a referral in order to regulate ADSEs, and the matters which might fall outside the Commonwealth's power to regulate would sooner be regulated at state level, for example through the Australian Road Rules, than by a referral of state power to the Commonwealth. For this reason, the option of a referral is not explored in this consultation RIS.

are differences in application among those jurisdictions that do apply it (Boland, 2018, p. 108). Similarly, as discussed in chapter 7, road rules differ between jurisdictions.

A model law approach would require separate regulators based in each state and territory to administer in-service safety regulations; it precludes a single national regulator. Separate regulators would inevitably result in inconsistent application of the law, due to differences in each regulator's interpretation of the law and differing local enforcement priorities. This would occur even if the law itself was substantially the same in each state and territory. The regulators could be independent or government agencies, new agencies or part of an existing agency.¹²⁸

Applied law

An 'applied law' approach involves one state or territory (a 'host jurisdiction') enacting a law which is then applied by other participating jurisdictions. Applying jurisdictions would refer to the host's law in their own legislation, and state that the host jurisdiction's law applies in the applying jurisdiction.¹²⁹ This approach is suitable for establishing a national law for matters which are generally within the states' legislative powers (Parliamentary Counsel's Committee, 2018, p. 2).

One example of a state applied law is the Heavy Vehicle National Law. It is enacted by Queensland as the host jurisdiction, and Queensland's law is applied by other participating states and territories. Amendments to the Heavy Vehicle National Law are developed by the NTC in consultation with jurisdictions. The Transport and Infrastructure Council approves amendments. Amendments must be passed by the Queensland Parliament to have effect in the jurisdictions applying the law.

Applied law could achieve a nationally consistent law. This will only happen if states and territories choose to participate and are willing to adopt the legislation of another jurisdiction. State and territory parliaments are accountable only to the voters of the jurisdiction, and are expected to scrutinise, propose amendments to, and refuse to pass legislation. They may have concerns about applied law because it reduces jurisdictional sovereignty (by requiring jurisdictions to apply the law of another jurisdiction) and parliamentary supremacy (by expecting state and territory parliaments to enact laws as agreed by their minister at a ministerial council).

Technically, a state or territory could legislate to opt out of a national law which it has previously applied; for example, if it did not agree with a proposed amendment. However, in practice it may be very difficult to withdraw from a national regulatory regime once it is in place and stakeholders are accustomed to it.

An applied law approach would require a national level regulator based in a state or territory to administer in-service safety regulations. This differs from a model law approach where there are separate regulators in each state and territory.

A national law for automated vehicles could be substantially achieved by a Commonwealth law. The Commonwealth has a 'head of power' under the Australian Constitution to make laws regulating legal entities such as corporations, which means it could pass a national law

¹²⁸ Possible models for a regulator are discussed in chapter 8.

¹²⁹ In order to ensure the law accommodates future amendments to the host's law, the applying jurisdiction could specify that the host's law applies 'as in force from time to time'. If the applying jurisdiction wanted to retain control over the application of amendments to the national law in their jurisdiction, they might prescribe the process for amendments to the national law. For example, by allowing them to be disallowed by the applying jurisdiction's parliament.

which regulates ADSEs and its executive officers.¹³⁰ This law could impose safety obligations on these entities and establish a regulator to enforce those obligations.

If the Commonwealth passed a national law regulating automated vehicles, some matters would likely need to be separately addressed in state and territory legislation. For example, a law regulating human occupants of automated vehicles, such as fallback-ready users, does not appear to be supported by a Commonwealth head of power.¹³¹ This means only the states can make laws to regulate that person. It is likely that states and territories would also need to clarify that their driving law only applies to human drivers, so the field is clear for the national law to regulate automated vehicles.

The Australian Road Rules could provide model obligations for human users of automated vehicles. States and territories could implement these obligations in their legislation. As mentioned previously, the states and territories would also need to update state and territory transport law so it can continue to operate once an ADS is performing the dynamic driving task.

There are some other parties that may not be within the Commonwealth's power to regulate in a way that the national law would require. If the Commonwealth cannot legislate to regulate a relevant party, achieving a national law through Commonwealth legislation could require an applied law approach.¹³² Under an applied law approach, once the Commonwealth law is in place, each state and territory would legislate to apply the national law in their jurisdiction and fill any gaps caused by the constitutional limits on the Commonwealth's legislative power.

One benefit of implementing the law through the Commonwealth Parliament is that it would place responsibility for regulation with the national government, which speaks for Australia in international forums. This includes the United Nations Economic Commission for Europe forums, which are developing international standards for automated vehicles. It would also allow for better alignment with the rules made for automated vehicles under the Road Vehicle Standards Act.

A further advantage of relying on Commonwealth legislation is that, in contrast to the state-based applied law approach, the national regulator would be accountable to a single parliament. Having a single level of government responsible for the administration of the national law would provide the greatest accountability (French, 2012, p. 65).

However, the approach also requires ensuring that any gaps can be filled by the states, where the Commonwealth cannot legislate on the subject directly, in a way that is constitutionally valid.

Questions

17. Have we adequately and accurately captured the key legislative implementation models for in-service safety of automated vehicles?
18. Do you think there are any transitional or constitutional issues that could arise when Australia establishes a national law for automated vehicles? If so, please explain what the issues are, and if they differ depending on the legislative implementation model used.

¹³⁰ *Australian Constitution* s 51(xx) gives the Commonwealth power to make laws about certain corporations.

¹³¹ Other than in certain specific circumstances, such as fallback-ready users in one of the territories (*Australian Constitution* s 122).

¹³² Noting that states are also able to refer legislative power to the Commonwealth, which can then make legislation in relation to the subject of the referral (*Australian Constitution* s 51(xxxvii)).

10 Options to address the problem

Key points

- This consultation RIS presents four options to address the problem set out in chapter 3.
- Option 1 is the baseline option. It does not introduce any new safety duties or obligations for the in-service safety of automated vehicles. Instead, in-service safety is managed separately by each state and territory through existing regulatory frameworks.
- Option 2 introduces new in-service duties enforced by state and territory regulators under state and territory laws based on a national model law. There are two versions of this option which differ in terms of the form of obligations, one with prescriptive safety duties (option 2a) and the other with general safety duties (option 2b).
- Option 3 introduces new in-service general safety duties enforced by a single national regulator through Commonwealth law.
- Option 4 introduces new in-service general safety duties enforced by a single national regulator through state or territory applied law.
- A full independent assessment by PwC of the costs and benefits of each option has been published with the consultation RIS. Consideration of a preferred option should be informed by the cost–benefit analysis.

10.1 Purpose of this chapter

The purpose of this chapter is to:

- present the four options considered in this consultation RIS
- show how they would work in practice
- discuss the key advantages and disadvantages of each option.

10.2 Structure of the options

All reform options incorporate the key elements discussed in this consultation RIS: parties, safety duties, governance arrangements and legislative implementation.

In previous chapters we canvassed the range of alternate forms these elements could take. For example, a regulator could be independent or government, state and territory level or national level, and a new or existing body. Safety duties could be general or prescriptive. The duties could apply to only one party or a range of parties.

We have assembled the reform options by choosing the most effective and practical combinations of elements to address the problem statement.

10.3 Assumptions and considerations

10.3.1 Parties the reform options apply to

As discussed in chapter 6, we consider the following parties should be covered by general safety duties:

- ADSEs
- ADSE executive officers
- Repairers (potentially).

For the options that include general safety duties (options 2b, 3 and 4), we have assumed that these three parties are the parties that will be covered by general safety duties. For the option that includes prescriptive regulation (option 2a), we have assumed that these are the parties that will be covered by prescriptive regulation.

In chapter 6 we also discussed the parties we considered should be subject to discrete prescriptive rules. These parties are:

- ADSEs
- Remote drivers
- Fallback-ready users.

For ADSEs, this could include prescriptive dynamic driving task obligations (discussed in chapter 7). The appropriate approach to regulating the dynamic driving task will likely depend at least in part on the reform option chosen.

We have assumed that the discrete prescriptive rules applying to these parties will be a constant under each of the reform options (options 2a, 2b, 3 and 4).

10.3.2 First supply approach will be implemented

In November 2018, the Transport and Infrastructure Council agreed a safety assurance approach for the first supply of automated vehicles to the Australian market. The key feature is a set of safety criteria and obligations against which an ADSE must self-certify. This approach is outlined in chapter 1.

The safety criteria and obligations will be implemented through mechanisms under the *Road Vehicles Standards Act 2018* (Cth). Accordingly, the Department of Infrastructure, Transport, Cities and Regional Development is leading implementation of the first supply safety assurance approach. The Department is consulting as it develops the appropriate regulatory mechanisms.

We have assumed that the first supply approach agreed by the Council will be implemented.

10.3.3 First supply approach will not cover all new in-service risks of automated vehicles

As we described in chapter 5, the first supply approach only addresses safety risks known at the time of first supply to the market. It provides no mechanisms to address risks that emerge while an automated vehicle is in-service. As well, some of the safety criteria have in-service elements without corresponding regulatory tools to enforce continuing compliance. For example, the requirement to provide appropriate education and training is ongoing, and may include communicating with end users who are not the original vehicle owner, or communicating information about the impact of system upgrades.

10.3.4 Detailed compliance and enforcement mechanisms will be developed once an option is agreed

Detailed compliance and enforcement mechanisms, including sanctions and penalties, will be developed once an option for in-service safety has been agreed by the Transport and Infrastructure Council. The NTC will publicly consult on compliance and enforcement options and subsequently make recommendations to the Transport and Infrastructure Council.

10.4 Summary of the options

The four options we assess in this consultation RIS are:

Options

1. Current approach (the baseline option): This option does not introduce any new safety duties or obligations for the in-service safety of automated vehicles. Instead, in-service safety is managed separately by each state and territory through existing regulatory frameworks.
2. State and territory-based regulators enforce prescriptive safety duties (option 2a) or general safety duties (option 2b) under state and territory laws based on a national model law.
3. A single national regulator enforces a general safety duty through Commonwealth law.
4. A single national regulator enforces a general safety duty through state or territory applied law

Table 6 shows at a high level whether each option addresses the problem statement outlined in chapter 3.

Table 6. Problem statement and options for in-service safety for automated vehicles

<i>In our current regulatory environment, when automated vehicles become ready for deployment:</i>		Option 1 (baseline)	Option 2a	Option 2b	Option 3	Option 4
<ul style="list-style-type: none"> ▪ they may introduce new in-service safety risks that the market will not eliminate or mitigate 	Addresses known and anticipated safety risks	Not addressed	Largely addressed	Largely addressed	Largely addressed	Largely addressed
	Addresses unforeseen safety risks	Not addressed	Not addressed	Largely addressed	Largely addressed	Largely addressed
<ul style="list-style-type: none"> ▪ nationally inconsistent approaches to in-service safety and multiple regulators without clearly defined roles could be a regulatory barrier to market entry 	Addresses risk of national inconsistency in safety approach	Not addressed	Moderately addressed	Moderately addressed	Considerably addressed	Considerably addressed
	Addresses risk of multiple safety regulators within jurisdictions and overlapping or duplicated regulation	Not addressed	Considerably addressed	Considerably addressed	Largely addressed	Largely addressed

Key:



Risk not addressed

Risk moderately addressed



Risk considerably addressed

Risk largely addressed

In the next sections we explain the elements of each option and discuss how they would work. We then present some of the key advantages and disadvantages of each option. These qualitative arguments should be considered alongside the full cost–benefit analysis of options provided by PwC.

10.5 Option 1: Current approach (the baseline option)

10.5.1 Description of the option

Option 1 does not introduce any new safety duties or obligations for the in-service safety of automated vehicles. Instead, in-service safety is managed separately by each state and territory through existing regulatory frameworks.

Under this option, the current system for managing the in-service safety of conventional vehicles would continue to apply and would cover automated vehicles as well. States and territories would retain their control of the in-service regulation of drivers and vehicles, including ADSs, and legislation aimed at achieving road safety outcomes.

Option 1 assumes that a new uniform national law that provides the dynamic driving task obligations of the ADSE will not be created. However, state and territory government would likely need to amend their regulatory frameworks for an automated vehicle to operate on the roads under option 1. Specifically, legislation would be needed to allow an ADS to complete the dynamic driving task. These changes could include an offence for the ADSE if the ADS failed to comply with dynamic driving task obligations. This could provide state and territory implementation of transport ministers' November 2018 decision that the ADSE must certify that the ADS can comply with relevant road and traffic laws.¹³³

The safety of the automated vehicle would be managed through existing regulation, including the frameworks below. A full discussion of the existing regulatory frameworks is in chapter 5.

State and territory regulatory frameworks

- Vehicle registration by state and territory road agencies to ensure a vehicle is 'roadworthy.' Registration can be granted with conditions to further ensure safety.
- Light Vehicle Standards made at the state and territory level. These require vehicles to continue to comply with ADRs while they are in-service.
- Duties on the fallback-ready user in a Level 3 automated vehicle when the automated driving system is engaged. Under option 1, state and territory governments would likely need to legislate to place obligations on the fallback-ready user to help ensure they remain alert to system errors or requests to intervene. This could provide state and territory implementation of transport ministers' May 2018 decision to regulate the fallback-ready user.
- WHS general safety duties would be imposed on parties that were considered 'persons conducting business or undertakings' under WHS laws.¹³⁴
- General safety duties or other types of obligations on taxi, private hire and rideshare service operators implemented in state and territory legislation.
- Driver licensing for fallback-ready users.

¹³³ One of the safety criteria at first supply.

¹³⁴ The frameworks in Western Australia and Victoria are not based on model work health and safety law but their application to automated vehicles is similar.

- Regulation of motor vehicle dealers and repairers.
- Common law tort of negligence. Parties, including ADSEs, owe a duty of care to other road users for property damage or personal injury caused by an automated driving system.
- Criminal law, for example, penalties for dangerous driving causing death or injury.

National/Commonwealth regulatory frameworks

- The *Road Vehicle Standards Act (Cth)*¹³⁵ has compliance and enforcement mechanisms that can be used to enforce some in-service elements of the safety criteria and obligations an ADSE certified against at first supply.¹³⁶ As the type approval holder, an ADSE would be required to comply with any recalls concerning their vehicle or vehicle component.
- The Heavy Vehicle National Law requires that heavy vehicles continue to comply with the Australian Design Rules while they are in-service. This applies in states and territories that participate in the Heavy Vehicle National Law (all except the Northern Territory and Western Australia).
- The Heavy Vehicle National Law places general safety duties on parties in the heavy vehicle transport supply chain to ensure the safety of their transport activities. There are also prescriptive requirements for heavy vehicles (for example about mass and dimension).
- The Australian Consumer Law gives guarantees for products sold, hired or leased by businesses, including vehicles and services such as vehicle repairs. This applies if the cost of the product or service is under \$40,000, or over \$40,000 and normally bought for personal or household use.

As described in chapter 5, this framework leaves a number of gaps for in-service risks caused by automated vehicles.

10.5.2 How it would work

After an ADS is approved at first supply, the automated vehicle will have access to the entire road network, subject to any registration conditions placed on it by a state or territory government. These registration conditions may need to be more comprehensive than under other options because of the lack of automated vehicle-specific duties to manage in-service safety. Registered owners, including ADSEs where they are also the registered owner, would not have certainty about what conditions will be imposed until they register with the state or territory regulator.

Relevant parties would need to meet the duties and obligations described above in section 10.5.1. These would differ from jurisdiction to jurisdiction.

Relevant parties would not be subject to any in-service automated vehicle-specific safety duties or obligations or associated compliance and enforcement mechanisms. Compliance and enforcement mechanisms under the *Road Vehicle Standards Act* could potentially apply

¹³⁵ The first supply safety criteria and obligations are being incorporated into a range of legislative instruments under the *Road Vehicle Standards Act 2018 (Cth)*. The availability of compliance and enforcement mechanisms under the *Road Vehicle Standards Act* differs according to the legislative instrument being breached. The range of compliance and enforcement mechanisms includes, amongst others, infringement notices, enforceable undertakings, civil penalty orders and recalls for vehicles and vehicle components.

¹³⁶ The Department of Infrastructure, Transport, Cities and Regional Development is currently determining the extent to which compliance and enforcement mechanisms under the *Road Vehicle Standards Act 2018 (Cth)* can extend to safety risks that emerge while an automated vehicle is in-service.

to the ADSE for certain in-service elements of the safety criteria and obligations. Existing state and territory in-service sanctions and penalties for non-compliance with conditions of registration, such as cancellation of registration, would affect registered owners rather than the ADSE.¹³⁷

Advantages

The existing regulatory framework is well established and understood by the relevant parties who currently use it (for example, conventional vehicle manufacturers), so there will be minimal disruption for these parties if they are moving into the automated vehicle market. There would also be no new safety duties or obligations targeted at ADSEs and other relevant parties, meaning no additional regulatory burden placed on industry. The regulatory approach is likely to be ready in time for manufacturers to start commercially deploying their automated vehicles in Australia, even if this is earlier than currently expected. These factors may potentially act as an incentive for industry to bring automated vehicle technology to Australia.

There would be minimal disruption to government, keeping the same division of responsibilities amongst Commonwealth, state and territory government agencies that currently administer the existing regulatory frameworks. Using the existing regulatory framework may minimise the upfront structural, organisational and regulatory changes needed to implement a new in-service safety regulatory model.

This option could be appropriate for the initial stages of commercial deployment, when the automated vehicle market in Australia will be limited in scope.

Disadvantages

The key disadvantages of option 1 are that it precludes a national approach to the in-service regulation of automated vehicles, and that existing regulation does not place sufficient requirements on ADSEs, ADSE executive officers, fallback-ready users, remote drivers and repairers. Parties would be covered by a patchwork of legislation which could leave significant gaps in the in-service safety of automated vehicles. Some parties may have duties, but these have not yet been tested in court. Regulators may not have the technical expertise required to effectively regulate automated vehicle-specific safety issues.

Another key disadvantage is the potential for known, anticipated and unforeseen in-service safety risks of automated vehicles to go unaddressed. New safety criteria and obligations have been developed to address known and anticipated safety risks at first supply. However, some of the safety criteria have in-service elements without sufficient mechanisms to enforce continuing compliance; for example, the education and training criteria. In addition, unforeseen risks that create safety issues could emerge once the ADS is in use. Risks that might emerge and pose a risk to safety include technological failure, cybersecurity failure and failure to function appropriately within an operational design domain. It is not clear that existing regulatory frameworks or market incentives are sufficient to deliver a desirable level of safety risk management by the relevant parties.

The use of existing frameworks for compliance and enforcement could lead to adverse outcomes for some parties. For example, cancelling the registration of an automated vehicle for an ADS issue would disproportionately penalise registered owners for system issues that are beyond their control.

Another key disadvantage is the continuance of the nationally inconsistent safety approaches between jurisdictions that exist in the in-service regulation of conventional road vehicles. The lack of a nationally-led approach might lead to states and territories

¹³⁷ In some cases, the registered operator or owner and the ADSE may be the same, such as commercial operators.

implementing their own safety approaches for automated vehicles. This would require industry and consumers to comply with differing duties and obligations across the country. The costs associated with national inconsistency and the lack of a single national market is a key barrier to industry bringing automated vehicle technology to Australia. There is already inconsistency developing in regulatory approaches to automated vehicle trials across the states and territories.

The regulation of automated vehicles will occur across multiple regulators in different frameworks across WHS law, consumer law, road transport laws and other regimes. Not having a clear and consistent set of legal duties to comply with would be confusing for industry and act as a barrier to entry. This could potentially be a greater barrier for new entrants to the vehicle market, like software developers, who might be unfamiliar with the relevant existing regulatory frameworks.

Industry would be subject to differing safety requirements across states and territories leading to increased costs of compliance. The patchwork of legislation relied on in option 1 could also lead to increased costs for industry due to overlapping requirements within multiple safety regimes.

Option 1 may lead to higher costs for state and territory governments because rather than having the problem addressed holistically at a national level, they make piecemeal, interim amendments as safety issues arise. This may particularly be a challenge for smaller states and territories.

10.6 Option 2

10.6.1 Description of the option

Option 2 introduces new safety duties for the in-service safety of automated vehicles.

Governance arrangements

Regulators in each state or territory would manage the in-service safety of automated vehicles. Each state and territory would decide the governance arrangements for their regulator. The regulators may be new bodies or existing bodies given new powers. They may also be government bodies or bodies with a level of independence.

Duties

ADSEs, fallback-ready users and remote drivers will be subject to discrete prescriptive rules.

Option 2a

ADSEs, ADSE executive officers and potentially repairers will be subject to new prescriptive safety duties to manage in-service safety. For ADSEs, these would include obligations in addition to complying with dynamic driving task obligations. Appendix B provides examples of such prescriptive duties for illustrative purposes. The duties will be enforced by the regulator.

Option 2b

ADSEs, ADSE executive officers and potentially repairers will also be subject to new general safety duties. The duties will be monitored and enforced by the regulator.

These parties will need to ensure the safe operation of the automated driving system. A common standard used in general duties is for safety to be ensured 'so far as is reasonably practicable'. An illustrative general safety duty is outlined in Appendix C.

Legislative implementation (model law)

Model law would set out the model safety duties and powers for the regulators. It is likely the NTC would be responsible for developing the model law, and it would be agreed with states and territories.

The model law itself would have no legal effect. Each state and territory would need to introduce new legislation based on the content of the model law to implement the safety duties and powers in their jurisdiction. The expectation would be that state and territory governments enact legislation that is consistent with the provisions of the model law. It is possible that states and territories may include provisions (or make omissions) which derogate from the model law. States and territories may choose not to implement the model law at all and instead fall outside a national in-service safety assurance system. For the purposes of assessing this option in the cost benefit analysis, PwC has assumed that all states and territories will enact legislation that is broadly consistent with the model law with potentially some derogations (rather than choosing not to implement the model law at all).

Option 2a similar model: Conventional light vehicles while in-service

- Regulator: States and territories: government road transport agencies or corporate entities (for example, VicRoads – body corporate, NSW Roads and Maritime Services – government agency)
- Role: Administer, monitor and enforce duties
- Duties: Prescribed standards
- Enabling legislation: State and territory legislation based on model law

Option 2b similar model: Work health and safety

- Regulator: States and territories (and Commonwealth): WHS regulators (government agencies, for example ComCare)
- Role: Administer, monitor and enforce duties
- Duties: Prescribed standards and primary duties of care
- Enabling legislation: State and territory (and Commonwealth) legislation based on model law (Victoria and Western Australia have similar laws but have not implemented the model law)

10.6.2 How it would work

After an ADS is approved at first supply, the automated vehicle will have access to the entire road network, subject to any registration conditions or road access decisions made by the road manager.

Under option 2a, state and territory regulators would administer prescriptive safety duties and would therefore have a more reactive role focused on compliance and enforcement in the case of breaches of specific obligations. These reactive powers would largely consist of investigative powers to investigate suspected contraventions. Regulators under this sub-option would have a range of sanctions and penalties available to them and enforcement powers which would be used to ensure compliance with the prescriptive duties.

Under option 2b, state and territory regulators would administer a general safety duty placed on ADSEs, ADSE executive officers and potentially repairers (as well as the prescriptive obligations placed on ADSEs, fallback-ready users and remote drivers). Regulators would have proactive monitoring and investigations powers to ensure the relevant parties have proper safety management systems in place for managing safety risks before they arise.

Regulators would have an active role in information sharing and education to encourage the parties covered by general safety duties to develop appropriate safety management systems. Regulators would also have a range of sanctions and penalties available to them and enforcement powers which would be used to ensure compliance with the general safety duty.

As noted above, state and territory governments may derogate from the model law. In this case, regulated parties might have slightly different obligations across the different states and territories. The state and territory regulators might also have different powers to enforce the duties they administer.

10.6.3 Discussion

Advantages

Like all the reform options, option 2 would address the known and anticipated in-service safety risks of automated vehicles through automated vehicle-specific legislation.

Option 2b would also address the unforeseen safety risks of automated vehicles by placing general safety duties on ADSEs and ADSE executive officers. If a general safety duty was placed on repairers, option 2b would also address the unforeseen safety risks caused by repair work carried out on automated vehicles. It would incentivise these parties to proactively address these risks themselves. Regulators with proactive powers to enforce these duties will lead to safer outcomes as regulated parties would be incentivised to address safety risks before they emerge.

A general safety duty would encourage parties who are subject to it to take a proactive approach to identifying and responding to safety issues. With prescriptive duties, there is a risk that companies will focus narrowly on complying with the requirements, rather than identifying and addressing safety issues.

A general safety duty would also address the possibility of parties neglecting to address identified safety risks, based on an assessment that it makes more economic sense to risk a safety issue eventuating than to take steps to prevent the risk. While cost is a relevant factor in determining whether action to address a safety risk is 'reasonably practicable', such a test is a more objective standard than a party's own internal risk management decision-making. The term 'reasonably practicable' is a well-established legal concept, which evolves over time. In a fast-changing technology environment, something that is not reasonably practicable today may become so in a few years' time, as technology develops. With a general safety duty, the regulatory framework does not need to be updated to reflect this. Prescriptive requirements might require regular updating.

Regulators and regulatory requirements would be clearly established in legislation, providing clarity for industry and consumers. These regulators would be specialised automated vehicle regulators. This would reduce the risk of multiple regulators within jurisdictions and potential confusion for industry because it has to meet safety requirements under a number of regulatory frameworks.

The use of nationally agreed model law would achieve greater consistency in safety approaches than option 1. This would be balanced with the states and territories retaining flexibility to derogate from the model law to suit the needs of their jurisdictions.

For state and territory governments, this retention of control will allow them to develop their own governance arrangements for in-service safety. These arrangements may differ in scale according to the size of the automated vehicle market in each jurisdiction and specific local issues.

Option 2 could be more appropriate than the other options as a transition option for the initial stages of commercial deployment of automated vehicles, if existing state and territory

transport agencies were to be the regulators for in-service safety. This would need to be balanced with the duplication of resource required to move from one in-service safety model to another.

Disadvantages

Option 2a would be less effective in addressing unforeseen safety risks. Industry may not be sufficiently incentivised to create safety management systems to monitor potential emergent safety risks. Regulators would not be able to take proactive action against an industry party if an unforeseen safety risk emerges because the regulatory framework would not be flexible.

The institutional arrangements of option 2 would probably result in the most national inconsistency in safety approaches of the three reform options. This inconsistency could act as a regulatory barrier to market entry for some potential ADSEs. Regulated parties operating across states and territories would be faced with multiple approaches to compliance and enforcement. There may be a lack of clarity where automated vehicle regulation overlaps between states and territories. This would result in greater costs for industry as the costs of ensuring compliance would be multiplied across states and territories.

Regulated parties could face greater costs due to the need to comply with new automated vehicle-specific duties. Under option 2a, these costs may increase further over time when additional prescriptive duties are introduced to capture new risks as they emerge. However, this cost must be measured against potential increased cost to industry under option 1 due to the patchwork of legislation they will be subject to—particularly for parties who are already subject to duties in regulatory frameworks such as WHS and tort law.

There is the potential for inconsistent safety outcomes between states and territories where they derogate from the model law. This risk also arises because differing organisational practices may develop over time, affecting how regulators use their powers.

Upfront and ongoing costs to government would also be significant. Resourcing regulators in every state and territory would result in a duplication of effort and ongoing costs. State and territory governments would also compete for appropriately skilled regulators and staff; and attracting the appropriate expertise may be a challenge for the smaller jurisdictions especially.

10.7 Option 3

10.7.1 Description of the option

Option 3 introduces new safety duties for the in-service safety of automated vehicles.

Governance arrangements

A single, national regulator would manage the in-service safety of automated vehicles. The regulator may be a government body or an independent body. The regulator may also be a new body, or an existing body given new functions and powers.

Duties

ADSEs, fallback-ready users and remote drivers will be subject to discrete prescriptive rules.

ADSEs, ADSE executive officers and potentially repairers will be subject to new general safety duties. The duties will be monitored and enforced by the regulator. These parties will need to ensure safe operation of the automated vehicle to a standard such as 'so far as is reasonably practicable.'

Legislative implementation (Commonwealth law)

The Commonwealth government would introduce a uniform national law for the in-service safety of automated vehicles. This law would be agreed by all states and territories.

As described in chapter 9, the Commonwealth Parliament may only make laws which are supported by a head of power in the Australian Constitution. This means each state and territory law may need to cover any 'gaps' left by the Commonwealth law. The most obvious example of a potential gap is the Commonwealth's inability to create laws which regulate certain natural persons.¹³⁸ The Commonwealth may be able to regulate ADSEs and ADSE executive officers in a national law, but states and territories may need to legislate for some individuals such as fallback-ready users.

Option 3 similar model: Domestic commercial vessels

- Regulator: Australian Maritime Safety Authority
- Role: Develop standards, certification, investigation, monitoring and enforcement
- Duties: Prescribed standards and general safety duties
- Enabling legislation: Commonwealth applied law (*Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (Cth)*)

10.7.2 How it would work

After an ADS is approved at first supply, the automated vehicle will have access to the entire road network, subject to any registration conditions placed on it by a state and territory government.

The regulator would enforce a general safety duty placed on ADSEs, ADSE executive officers and potentially repairers (as well as the prescriptive rules placed on ADSEs, fallback-ready users and remote drivers). The regulator would have proactive monitoring and investigative powers to ensure the relevant parties have proper safety management systems in place for managing safety risks before they arise. The regulator would also have an active role in information sharing and education to encourage regulated parties to develop appropriate safety management systems. The regulator would also have a range of sanctions and penalties available to it and enforcement powers which would be used to ensure compliance with the general safety duty.

10.7.3 Discussion

Advantages

Like option 2, option 3 would address the known and anticipated in-service safety risks of automated vehicles through implementation of automated vehicle-specific legislation. Like option 2b, it would also enable a regulator to address the unforeseen safety risks of automated vehicles by enforcing general safety duties on ADSEs and ADSE executive officers, and incentivise these parties to proactively address emerging risks themselves. If a general safety duty was placed on repairers, option 3 would also address the unforeseen safety risks caused by repair work carried out on automated vehicles. Regulators with proactive powers to enforce these duties will lead to safer outcomes as regulated parties would be incentivised to address safety risks before they emerge.

A general safety duty would encourage parties who are subject to it to take a proactive approach to identifying and responding to safety issues. With prescriptive duties, there is a

¹³⁸ *Australian Constitution* s 51(xx).

risk that companies will focus narrowly on complying with the requirements, rather than identifying and addressing safety issues.

A general safety duty would also address the possibility of parties neglecting to address identified safety risks based on an assessment that it makes more economic sense to risk a safety issue eventuating than to take steps to prevent the risk. While cost is a relevant factor in determining whether action to address a safety risk is 'reasonably practicable', such a test is a more objective standard than a party's own internal risk management decision-making. The term 'reasonably practicable' is a well-established legal concept, which evolves over time. In a fast-changing technology environment, something that is not reasonably practicable today may become so in a few years' time, as technology develops. With a general safety duty, the regulatory framework does not need to be updated to reflect this. Prescriptive requirements might require regular updating.

This option would achieve greater national consistency in safety approaches than options 1 and 2, as it would create a single market for automated vehicles. Regulated parties in all states and territories would face the same duties and the single Commonwealth regulator would be more likely to provide consistent application of enforcement mechanisms.

These parties would face clear and consistent legal duties, simplifying their compliance obligations and reducing compliance costs. This will also potentially send a signal to industry that Australia is open to automated vehicles.

There would be one specialised automated vehicle regulator that regulates the in-service safety of automated vehicles nationally.

Government and the public might also benefit from the economies of scale of setting up a single regulatory function rather than a regulatory function in each state and territory.

This option would probably be the most efficient in managing the transition to any international in-service standards. The Commonwealth participates in international forums and has the constitutional power to implement international agreements. International standards are currently more focused on safety of vehicle and component design but in future there may be a shift towards requirements that also cover aspects of ongoing safety in-service.

The use of a single parliament would mean the uniform national law is relatively efficient to pass and maintain. As well, compared to option 4, the regulator may be considered more directly accountable, as it reports to a single parliament rather than a ministerial council, which is further removed from voters.

Disadvantages

Although there is a lower risk of overlapping regulation, some risk remains because the Commonwealth cannot regulate some in-service aspects of safety. States and territories would need to separately fill any gaps in the coverage of the national law.

As with the other reform options, if the regulator were to be a new body, the upfront costs to government to set up the regulator could be significant, as would the time needed to establish a national regulator.

Though there will only be one consistent set of national duties, as with option 2, compliance costs for parties covered by general safety duties may be higher than if there was no new automated vehicle-specific regulation. However, this cost must be measured against the potential increased cost to industry under option 1 due to the patchwork of legislation to which they will be subject.

Some states and territories may be apprehensive about losing control over an aspect of in-service road safety to a Commonwealth regulator.

10.8 Option 4

10.8.1 Description of the option

Option 4 introduces new safety duties for the in-service safety of automated vehicles.

Governance arrangements

A single, national regulator would manage the in-service safety of automated vehicles. The regulator may be a new body, or an existing body given new functions and powers. The regulator would be based in the state or territory which enacted enabling legislation (discussed below).

Duties

ADSEs, fallback-ready users and remote drivers will be subject to discrete prescriptive rules.

ADSEs, ADSE executive officers and potentially repairers will be subject to new general safety duties. The duties will be monitored and enforced by the regulator. These parties will need to ensure safe operation of the automated vehicle to a standard such as 'so far as is reasonably practicable.'

Legislative implementation (State or territory applied law scheme)

A 'host' state or territory government would introduce a uniform national law for the in-service safety of automated vehicles. This law would be agreed by all states and territories. Once the host state or territory's law was in place, participating states and territories would legislate to say that the host jurisdiction's law applied in their jurisdiction. Participating states and territories could derogate from the law in their legislation; however, derogations would need to be explicitly stated in their law. States and territories could also decide against entering the national scheme.

Option 4 similar model: Heavy vehicles over 4.5 tonnes gross vehicle mass (except in the Northern Territory and Western Australia)

- Regulator: Administered by National Heavy Vehicle Regulator (body corporate)
- Role: Administer, monitor and enforce duties
- Duties: Prescribed standards and chain of responsibility duties
- Enabling legislation: Heavy Vehicle National Law – state and territory applied law scheme

10.8.2 How it would work

After an ADS is approved at first supply, the automated vehicle will have access to the entire road network, subject to any registration conditions placed on it by a state and territory government.

The regulator would enforce a general safety duty placed on ADSEs, ADSE executive officers and potentially repairers (as well as the prescriptive obligations placed on ADSEs, fallback-ready users and remote drivers). Regulators would have proactive monitoring and investigative powers to ensure the relevant parties have proper safety management systems in place for managing safety risks before they arise. Regulators would have an active role in information sharing and education to encourage the parties covered by general safety duties to develop appropriate safety management systems. The regulator would also have a range of sanctions and penalties available to it and enforcement powers which would be used to ensure compliance with the general safety duty.

10.8.3 Discussion

Advantages

Like options 2 and 3, option 4 would address the known and anticipated in-service safety risks of automated vehicles through implementation of automated vehicle-specific legislation. Like options 2b and 3, it would enable a regulator to address the unforeseen safety risks of automated vehicles by enforcing general safety duties on ADSEs, ADSE executive officers and repairers, and incentivise these parties to proactively address emerging risks themselves. Regulators with proactive powers to enforce these duties would lead to safer outcomes as regulated parties would be incentivised to address safety risks before they emerge.

A general safety duty would encourage parties who are subject to it to take a proactive approach to identifying and responding to safety issues. With prescriptive duties, there is a risk that companies will focus narrowly on complying with the requirements, rather than identifying and addressing safety issues.

A general safety duty would also address the possibility of parties neglecting to address identified safety risks based on an assessment that it makes more economic sense to risk a safety issue eventuating than to take steps to prevent the risk. While cost is a relevant factor in determining whether action to address a safety risk is 'reasonably practicable', such a test is a more objective standard than a party's own internal risk management decision-making. The term 'reasonably practicable' is a well-established legal concept, which evolves over time. In a fast-changing technology environment, something that is not reasonably practicable today may become so in a few years' time, as technology develops. With a general safety duty, the regulatory framework does not need to be updated to reflect this. Prescriptive requirements might require regular updating.

As with option 3, this option would provide for greater national consistency given the consistent duties for parties covered by general safety duties and powers for the regulator. Like option 3, clear and consistent legal duties could simplify compliance obligations and costs for these parties, and send a signal to industry that Australia is open to automated vehicles. There would also be similar cost benefits to government and the public from the economies of scale gained by setting up a single regulator.

Disadvantages

As with option 3, if the regulator were to be a new body, the upfront costs to government to set up the regulator under option 4 could be significant, as would the time needed to establish a national regulator. Compliance costs for parties subject to general safety duties might also be higher. However, as with the other reform options, this must be measured against potential increased cost to industry under option 1.

In addition, there is a risk that the regulator will be less accountable as it reports to a ministerial council rather than a single parliament. A ministerial council is a step further removed from the voters who democratically elect their parliaments. This could be seen as a risk to the legitimacy of the law and the regulator.

Some states might also be apprehensive about applying the law of another state in their jurisdiction, again, creating a risk to successful implementation of this option.

Any legal action would need to be taken through state and territory courts, which could potentially result in inconsistency in safety outcomes in some instances across states and territories.

Questions

19. Have we accurately described how each option could work as well as the advantages and disadvantages of each option?
20. Which option most effectively addresses the problem statement? Please consider your answer in conjunction with the PwC cost–benefit analysis.
21. Is there another option or combination of options which could more effectively address the problem statement? In particular, please consider whether there is a preferable combination of the elements of each option (governance arrangements, duties, legislative implementation)

11 Preliminary conclusions and next steps

Key points

- There are gaps in Australia's regulatory framework to cover the in-service safety risks of automated vehicles.
- In-service safety risks could be addressed through a mix of regulatory approaches, incorporating a general safety duty and more prescriptive rules where appropriate.
- PwC's preliminary cost–benefit analysis assessed that the options with the highest net benefit are options 3 and 4.
- We will consider feedback and evidence provided through submissions to this consultation RIS in developing the decision RIS, which will include a final analysis of the options for the in-service safety of automated vehicles.

11.1 Purpose of this chapter

The purpose of this chapter is to:

- outline our preliminary conclusions on the gaps in Australia's regulatory framework to cover the in-service safety risks of automated vehicles and how we can regulate to ensure automated vehicles operate safely
- summarise the outcomes of the preliminary cost–benefit analysis assessing the options to address the problem statement
- outline the next steps for progressing this reform.

11.2 Preliminary conclusions

11.2.1 There are gaps in Australia's regulatory framework for the in-service safety risks of automated vehicles

Our preliminary conclusion is that there are gaps in Australia's regulatory framework for the in-service safety risks of automated vehicles. This is because the roles of several parties with a major influence on in-service safety are not sufficiently covered by existing regulation.

Parties with a major influence on the in-service safety of automated vehicles are those whose role directly affects the safe design or safe operation of an automated vehicle. We identified the following parties as having a major influence: ADSEs; ADSE executive officers; ADS manufacturers; vehicle manufacturers; remote drivers; fallback-ready users; repairers; modifiers.

We categorised the other parties with an influence on the in-service safety of automated vehicles as having either a moderate or a minor influence.

After completing a detailed analysis of the regulation that applies to all parties with an influence on the in-service safety of automated vehicles, we consider that existing regulation does not place sufficient requirements and incentives on the following parties to ensure in-service safety:

- ADSEs
- ADSE executive officers
- Fallback-ready users

- Remote drivers
- Repairers.

ADSEs, ADSE executive officers, fallback-ready users and remote drivers are new parties not currently defined in legislation, and are relevant specifically to automated vehicles. ADSEs and ADSE executive officers would be covered by a patchwork of legislation which could leave significant gaps in the in-service safety of automated vehicles. There is limited existing regulation that could apply to fallback-ready users and remote drivers.

Repairers are existing parties, and there is current regulation which applies to them. However, this regulation may not sufficiently cover their role in the in-service safety of automated vehicles. For example, regulation of vehicle repairers differs between states and territories, and current regulators may not have the level of technical understanding needed to regulate automated vehicle repairs.

Our detailed analysis of these issues is contained in chapters 4 and 5.

11.2.2 Regulating to ensure automated vehicles operate safely

Governments will need to make decisions about regulatory approaches to automated vehicles with less information than typically informs regulatory decisions for more established industries. Our preliminary conclusion is that the in-service safety risks could be addressed through a mix of regulatory approaches. In particular, the regulatory framework could incorporate a general safety duty, together with some prescriptive rules where appropriate.

We consider that a general safety duty should apply to ADSEs, ADSE executive officers and potentially repairers. A general safety duty on ADSEs may need to be supplemented with some prescriptive rules, such as those relating to the dynamic driving task.

General safety duties can be appropriate to provide flexibility, enable innovation and allow parties to adapt to changing circumstances (such as advances in technology). This is vital in the context of automated vehicles given that the technology will continue to develop over time. A general safety duty approach has been chosen by Australian governments for diverse modes of transport such as point to point passenger transport, rail and heavy vehicles.

A general safety duty would encourage parties who are subject to it to take a proactive approach to identifying and responding to safety issues. With prescriptive duties, there is a risk that companies will focus narrowly on complying with the requirements, rather than identifying and addressing safety issues.

A general safety duty would also address the possibility of parties neglecting to address identified safety risks based on an assessment that it makes more economic sense to risk a safety issue eventuating than to take steps to prevent the risk. While cost is a relevant factor in determining whether action to address a safety risk is 'reasonably practicable', such a test is a more objective standard than a party's own internal risk management decision-making. The term 'reasonably practicable' is a well-established legal concept, which evolves over time. In a fast-changing technology environment, something that is not reasonably practicable today may become so in a few years' time, as technology develops. With a general safety duty, the regulatory framework does not need to be updated to reflect this. Prescriptive requirements might require regular updating.

Remote drivers and fallback-ready users could be more effectively regulated by focused, prescriptive regulation, where flexibility is not required. Transport ministers have decided that fallback-ready users should have certain duties including that they remain sufficiently vigilant in order to respond to requests to intervene. It is likely that these duties will require implementation through prescriptive rules.

Our detailed analysis of these issues is contained in chapter 6.

11.3 Outcomes of the preliminary cost–benefit analysis

In chapter 10, we outlined four options to address the problem statement in chapter 3. PwC's independent preliminary cost–benefit analysis assessed that the options with the highest net benefit are options 3 and 4.

The cost–benefit analysis of the options was performed in an environment of significant uncertainty. This includes uncertainty about the future state of the industry (such as timing of deployment and industry structure) and uncertainty about the base case (such as business behaviour with and without regulation). Only limited quantitative evidence was available to support the analysis and several assumptions were made.

While acknowledging these uncertainties, the analysis shows that all the reform options have a higher net benefit than the base case. The options with the highest net benefit are options 3 and 4. Feedback from stakeholders on the cost–benefit analysis will assist in distinguishing between these options.

Because of the uncertainties in the current environment, it is not possible to have a significant degree of confidence in the specific net present values of the overall impacts of each option. However, the results of the cost–benefit analysis are useful in demonstrating a comparison of each option to show the relative rankings. While sensitivity analysis affected the net present values of the overall impacts, the ranking of the options remained the same.

The relative benefits and costs of the options may change in light of any new information from the consultation process as existing uncertainties become resolved. Depending on the feedback received on this consultation RIS, it may be necessary to amend the options or combine desirable elements from multiple options.

11.4 Next steps

We have prepared this consultation RIS to gather evidence and facilitate consultation with the community. We are seeking submissions on this consultation RIS by 26 August 2019.

We will consider feedback and evidence provided through submissions in developing the decision RIS, which will include a final analysis of the options for the in-service safety of automated vehicles. We will deliver our recommendations and the decision RIS for transport ministers to consider in May 2020.

Once a preferred approach is agreed, we will consider detailed compliance and enforcement options, including specific powers of the regulator to support any new obligations, and sanctions and penalties.

Appendix A Safety criteria and obligations

A.1 Safety criteria

A.1.1 Safe system design and validation process

The applicant must explain why it chose particular design, validation and verification processes, and how these ensure a safe technology is developed and maintained for the life of the ADS. The life of the ADS should be set by the applicant and represent the amount of time the applicant proposes to support the ADS, including by way of software upgrades. The applicant's design and verification processes should cover all safety-critical issues, such as unsafe maintenance, repairs, physical modifications and other system failure, as well as the ADS reaching the end of its life and no longer being supported by the applicant. For example, the applicant could design the ADS to disengage (temporarily or permanently), or for back-up systems to take over where safety-critical issues arise or the system otherwise fails.

Where the ADS is supplied as an aftermarket device (rather than a device already fitted to the vehicle), compatibility (that is, the vehicle types the ADS can be fitted to) should be specified as an element of system design.

The applicant should document decisions relating to the choice of design, validation and verification processes and include empirical evidence or research to support the safety assertions made. Such documentation could explain why particular processes were chosen. Where applicable, the applicant should use guidance, industry best practices, design principles and standards developed by established standards organisations.

A.1.2 Operational design domain

The applicant must identify the operational design domain (ODD) of the ADS and demonstrate how it will ensure the ADS is:

- able to operate safely within its defined ODD
- incapable of operating in areas outside of its defined ODD
- able to transition to a minimal risk condition when outside its defined ODD.

This could include documentation outlining the process for assessing and verifying the ADS's functionality both within and outside the defined ODD.

The applicant should also outline how it will review and manage changes to the defined ODD. Major changes to the ODD are likely to be significant modifications requiring the applicant to submit a new Statement of Compliance for approval before introducing the change into the market.

A.1.3 Human-machine interface

The applicant must outline how the human-machine interface (HMI) will facilitate interaction between the ADS and relevant parties (both internal and external to the vehicle) that allows the vehicle to operate safely.

In relation to human drivers and occupants, elements of the HMI interaction link with the education and training criterion. The information communicated by the HMI should include, but is not limited to:

- communicating to the human driver when it is safe for the driver to engage the ADS

- informing the human driver if the ADS is engaged and the level of automation engaged
- requesting the human driver or fallback-ready user take back control of the vehicle with sufficient time for the human driver or fallback-ready user to respond, including in an emerging hazard situation. In addition, the applicant should outline the safeguards to ensure a fallback-ready user is actually ready to take back control. This could include monitoring by the ADS of human readiness to take back control and alert systems where such readiness is not apparent
- drawing attention to potential safety risks related to human monitoring and readiness to re-engage with the driving task
- informing vehicle occupants of the ADS's current and intended actions to allow occupants to predict vehicle behaviour
- indicating whether the ADS is functioning properly or experiencing a malfunction.

In relation to parties external to the vehicle, information such as the ADS's state of operation should be communicated by the HMI via an external communication interface. This could, for example, take the form of an external screen.

The applicant must also outline how it designed and verified the HMI and reference any appropriate international standards or agreed guidelines for HMIs.

A.1.4 Compliance with relevant road traffic laws

The applicant must demonstrate how it will ensure the vehicle operates in compliance with relevant road traffic laws when the ADS is engaged. In particular, how the ADS will comply with:

- relevant road traffic laws, including any variations in each state and territory
- amendments to the relevant road traffic laws when they come into force.

This could include documentation outlining the process for assessing and verifying the ADS's compliance with relevant road traffic laws and the process for updating the ADS to comply with amendments to those laws.

The applicant must also demonstrate how the ADS will respond in a safe way where strict compliance with relevant road traffic laws is not possible. This requirement closely links with the on-road behavioural competency criterion.

A.1.5 Interaction with enforcement and other emergency services

The applicant must demonstrate how it will ensure that police can access accurate information about whether the ADS is engaged at a given time, the level of automation engaged and any handover of control requests. The applicant should also demonstrate how it may facilitate police access to this information in real time at the roadside.

The applicant must demonstrate how it will ensure safe interaction with emergency services (including but not limited to police, fire and ambulance services) more broadly when the ADS is engaged. This includes interactions on-road and at the roadside.

A.1.6 Minimal risk condition

The applicant must demonstrate how the ADS will detect that it cannot operate safely and the steps the ADS will take to bring the vehicle to a minimal risk condition.

This could include documentation outlining the process for verifying the ability of the ADS to detect and respond to such circumstances. The steps the ADS must take to bring the vehicle to a minimal risk condition are likely to vary depending on the reason why the ADS cannot

operate safely, other traffic and road users present, and on the level of automation engaged. Therefore, a range of approaches to bring the vehicle to a minimal risk condition may need to be considered.

A.1.7 On-road behavioural competency

The applicant must demonstrate how the ADS will appropriately respond to foreseeable and unusual conditions that may affect its safe operation and interact in a predictable and safe way with other road users. This could include documentation outlining the process for verifying the ADS's:

- object and event detection and response capabilities
- crash avoidance capabilities
- ability to respond to unusual events within its ODD
- on-road interaction with other road users, including vulnerable road users.

A.1.8 Installation of system upgrades

The applicant must demonstrate how it will manage system upgrade risks. This includes ensuring safety-critical system upgrades to the ADS are installed and do not result in the operation of an unsafe ADS.

The applicant must explain how it will notify registered owners/operators that a safety-critical upgrade has been installed or is available and needs to be installed. For such safety-critical upgrades, the applicant must also demonstrate how it will:

- detect failures to install upgrades (including failures of automatic updates, failures by registered owners/operators to take action when an upgrade is available, or failures in receipt of over-the-air software updates)
- detect system failures once upgrades are installed
- ensure the ADS is safely disengaged if such failures occur.

This could include documentation outlining the process for verifying the ADS's ability to:

- update automatically and notify the registered owner/operator of the update
- notify the registered owner/operator of available system upgrades
- detect and respond to failures to install upgrades
- detect and respond to any system failures following the installation of upgrades.

A.1.9 Verifying for the Australian road environment

The applicant must demonstrate how it has considered the Australian road environment in designing, developing and verifying the ADS, including its forward planning processes to ensure compliance with changes to the road environment (such as changes to road infrastructure).

This could include documentation outlining the process for verifying the response of the ADS to the Australian road environment such as interaction with road signs in various states and territories, and interaction with Australian flora and fauna.

A.1.10 Cybersecurity

The applicant must demonstrate:

- the capacity and competency of the ADS to minimise cybersecurity threats and vulnerabilities, including risks of cyber intrusion and other data security breaches

- the ADS's ability to detect and minimise the consequences of cyber intrusions and data security breaches that occur. Relevant consequences include those on road user safety and consequences for individual privacy following a data breach. One way to minimise negative effects on safety could be to include a manual override mechanism
- the applicant's processes for maintaining the ADS's capacity and competency to minimise cybersecurity threats, vulnerabilities and consequences of intrusions and breaches over the life of the ADS.

The applicant should refer to relevant legislation, industry standards and guidance for vehicle cybersecurity (domestic and international) and explain how it has incorporated these into its processes for designing, developing and maintaining the ADS.

A.1.11 Education and training

The applicant must outline the education and training it will provide to relevant parties about its ADS and how this will minimise the safety risks of using and operating the ADS.

Education and training should consider different types of vehicles (including light and heavy vehicles) and different types of vehicle users. Without limiting the education and training to be provided, such education and training should consider:

- training human drivers and fallback-ready users to safely disengage and re-engage the ADS and the driving task
- informing human drivers of their obligations and responsibilities, particularly any fallback-ready user obligations
- informing consumers of the ADS's capabilities by clearly describing its automated capability, its level of automation, use limitations, restrictions on modifications and any restrictions of the automated technology such as the operational design domain
- facilitating the maintenance and repair of the ADS, including post-crash before it is put back in service
- facilitating employee, dealer and distributor understanding of the technology and operation so relevant information can be accurately conveyed to consumers and purchasers
- ongoing education as required, including education and training to end users who are not the original vehicle owner and to communicate the impact of upgrades.

The development of education and training should be well documented. Such documentation could explain the reasons for the education and training chosen and how it will facilitate proper and safe use of the applicant's ADS. The ADSE should also make use of best practice or standards.

A.2 Obligations

A.2.1 Data recording and sharing

The applicant must outline the ADS data it will record and how it will provide the data to relevant parties. Without limiting the data to be recorded and shared, the applicant must explain how it will ensure:

- the vehicle has real-time monitoring of driving performance and incidents, including event data records in the lead-up to any crash that identifies which party was in control of the vehicle at the relevant time
- the vehicle can provide road agencies and insurers with crash data

- relevant parties (including police) receive information about the level of automation engaged at a point in time if required
- individuals receive data to dispute liability (for example, data showing which party was in control to defend road traffic infringements and dispute liability for crashes) when the individual makes a reasonable request
- data is provided in a standardised, readable and accessible format when relevant
- data is retained to the extent necessary to provide it to relevant parties (the amount of time data is retained for may depend on the purpose(s) the information could be used for – for example, law enforcement, insurance)
- data relevant to the enforcement of road traffic laws and the general safe operation of the ADS (including data relevant to crashes) is stored in Australia. This does not require the applicant to store the data exclusively in Australia.

In responding to this criterion, the applicant should note that the *Privacy Act 1988* (Cth) places limits on the collection, use and disclosure of personal information, which may limit the data the applicant can record and share.

A.2.2 Corporate presence in Australia

The applicant must provide evidence of its corporate presence in Australia.

A.2.3 Minimum financial requirements

The applicant must provide evidence of its current financial position, its grounds for claiming it will have a strong financial position in the future and the level of insurance held.

Appendix B Illustrative prescriptive duties

This Appendix provides, **for illustrative purposes only**, prescriptive duties that could be imposed on the ADSE, ADSE executive officers and repairers to ensure the in-service safety of automated vehicles.

The prescriptive duties outlined in Table 7 are grouped by the safety risk they are seeking to address. Table 7 focuses on a select few of the currently known safety risks that could arise when automated vehicles are in-service. The identified duties are intended to be an illustrative sample rather than an exhaustive or comprehensive list. It is likely that to address even the select safety risks, there would need to be many other prescriptive duties.

Table 7. Illustrative prescriptive duties

Safety risk	Illustrative prescriptive duties
<p>Cybersecurity failure (for example, hack or attack due to poor security maintenance)</p>	<ol style="list-style-type: none"> 1. The ADSE must test the cybersecurity capabilities of its ADS on a [daily/weekly/etc] basis by completing the following tests: <ul style="list-style-type: none"> ▪ [The specific tests will need to be determined]. 2. If the ADSE is aware, or should reasonably be aware, of cybersecurity vulnerabilities of the ADS, the ADSE must disengage the ADS. 3. The ADSE must keep the ADS disengaged until the cybersecurity vulnerability has been addressed. 4. If a cybersecurity or data security breach occurs, the ADSE must notify the user of the ADS of any unauthorised access to the ADS and any unauthorised disclosure of personal information. 5. The ADSE must disengage the ADS if unauthorised access occurs. 6. The ADSE must keep the ADS disengaged until the cybersecurity failure has been addressed.
<p>Failure to issue software updates as required (or failure to apply)</p>	<ol style="list-style-type: none"> 7. The ADSE must test the software of its ADS for errors on a [daily/weekly/etc] basis by completing the following tests: <ul style="list-style-type: none"> ▪ [The specific tests will need to be determined]. 8. The ADSE must store the data from the testing of its ADS software for at least [insert minimum data storage period]. 9. The ADSE must develop and issue a software update as soon as the ADSE is aware, or should reasonably be aware, of any errors in the ADS software. 10. If the ADSE is aware, or should reasonably be aware, of a safety-critical software error, the ADSE must disengage the ADS until it can issue and install a software update to address the error. [This duty would require a clear definition of what we mean by a safety-critical software error].

	<p>11. The ADSE must either automatically install the software update or inform the user that software updates are available and need to be installed.</p> <p>12. The ADSE must not automatically install the software update if the ADS is engaged and the update would affect the operation of the ADS.</p> <p>13. The ADSE must not allow the user to install a system update if the ADS is engaged and the update would affect the operation of the ADS.</p> <p>14. The ADSE must disengage the ADS if a safety-critical software update fails to automatically install or is not installed by the user. [<i>This duty would require a clear definition of what we mean by a safety-critical software update</i>].</p> <p>15. The ADSE must keep the ADS disengaged until the safety-critical software update is installed.</p>
<p>Software updates introducing new safety issues (poor quality control, or the update is not supported by the vehicle's operating system)</p>	<p>16. The ADSE must complete [<i>specific testing</i>] to test for system failures immediately after a software update is installed.</p> <p>17. The ADSE must disengage the ADS if it detects system failures, or should reasonably have detected these failures, following the installation of software updates.</p> <p>18. The ADSE must keep the ADS disengaged until the system failures have been rectified.</p>
<p>Vehicle repairs adversely impacting the performance of the ADS</p>	<p>19. The repairer must be suitably qualified to undertake repairs on the relevant ADS. To be suitably qualified, the repairer must complete the following:</p> <ul style="list-style-type: none"> ▪ [<i>The specific tests/requirements will need to be determined</i>]. <p>20. The repairer must complete a diagnostic test of the ADS before undertaking any repairs.</p> <p>21. The repairer must only use parts approved by [<i>relevant entities</i>] if replacing any part of the ADS.</p> <p>22. The repairer must not alter the operational design domain of an ADS.</p> <p>23. The repairer must not modify an ADS so that the ADSE no longer complies with the statements it made against the safety criteria at first supply.</p> <p>24. The repairer must not use or install third party software unless authorised by [<i>relevant entities</i>].</p> <p>25. If the repairer becomes aware of a major defect, the repairer must report the defect to the ADSE.</p>
<p>ADSE executive officer duties are relevant to a wide range of in-service safety issues, including:</p>	<p>26. ADSE executive officers must complete a minimum of [x] number of hours of training per calendar year in the following areas:</p>

<p>1. failure to adapt the system to changes in regulation over time</p> <p>2. failure by the ADSE to address safety issues that arise over time</p>	<ul style="list-style-type: none"> ▪ <i>[list key areas, with a focus on refreshing knowledge on safety issues and regulation].</i> <p>27. ADSE executive officers must keep a record of the training they complete, which must include the following information:</p> <ul style="list-style-type: none"> ▪ <i>[list the required information].</i> <p>28. ADSE executive officers must register with the relevant regulator.</p> <p>29. If the ADSE executive officer is aware, or should reasonably be aware, of one or more of the following issues <i>[list specific safety-critical issues]</i>, the ADSE executive officer must ensure the issue is rectified immediately by taking the following action:</p> <ul style="list-style-type: none"> ▪ <i>[list actions specific to each safety-critical issue].</i>
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Appendix C Illustrative general safety duty

This Appendix provides, **for illustrative purposes only**, a draft general safety duty for ADSEs, ADSE executive officers and repairers to ensure the in-service safety of automated vehicles. The draft duty draws from precedent duties of the Heavy Vehicle National Law, Rail Safety National Law and Work Health and Safety Law. Any final safety duty will be drafted by Parliamentary Counsel for the approval of the Transport and Infrastructure Council.

General Duties for the Safe Operation of Automated Vehicles

1. Duties not transferable

A duty cannot be transferred to another person

2. Person may have more than one duty

A person can have more than one duty by virtue of being in more than one class of duty holder.

3. Management of Risks

A duty imposed on a person to ensure safe operation of automated vehicles requires the person:

- i) to eliminate risks to safety so far as is reasonably practicable; and
- ii) if it is not reasonably practicable to eliminate risks to safety, to minimise those risks as far as is reasonably practicable.

4. What is reasonably practicable

Reasonably practicable means that which is, or was at a particular time, reasonably able to be done in relation to ensuring safety, taking into account and weighing up all relevant matters including:

- the likelihood of the hazard or risk occurring;
- the degree of harm that might result from the hazard or the risk;
- what the person concerned knows, or ought reasonably to know, about:
 - the hazard or the risk; and
 - ways of eliminating or minimising the risk; and
- the availability and suitability of ways to eliminate or minimise the risk; and
- after assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.

5. Duties of Automated Driving System Entities

Note: an ADSE is the type approval holder for the Automated Driving System under the Road Vehicle Standards Act 2018 (Cth)

An ADSE must ensure so far as is reasonably practicable that its automated driving system is safe when used for a purpose for which it was designed, manufactured, supplied or installed.

Without limiting the above, an ADSE must take reasonable steps to:

- remedy any safety defects in the operation of its ADS, such as through software updates;
- adapt its ADS to changes in regulation over time;
- ensure it has appropriate resources and processes to eliminate or minimise incidents and risks from the operation of its ADS;
- ensure compliance with all relevant regulatory requirements, including those required under the *Road Vehicle Standards Act 2018* (Cth).

6. Duties of ADSE executive officers to exercise due diligence

Note: an ADSE executive officer has the same meaning as officer has in relation to a corporation under section 9 of the Corporations Act 2001 (Cth).

An ADSE executive officer must exercise due diligence to ensure the ADSE complies with its general safety duty in (5).

Due diligence includes taking reasonable steps to:

- acquire, and keep up to date, knowledge about the safe performance of the ADS;
- to gain an understanding of the hazards and risks, including the public risk, associated with the ADS's operation;
- ensure the ADSE has appropriate processes for receiving and considering information regarding incidents and risks, and can respond in a timely way to that information.

7. Duties of Repairers

Note: A repairer is a person performing repairs on a vehicle or vehicle component in exchange for consideration.

A repairer must, when carrying out repair work on a vehicle or vehicle component, take reasonable care that his or her acts or omissions do not adversely affect the safety of other persons by impairing an ADS's ability to safely perform the driving task; and

A repairer must comply, so far as the repairer is able, with any reasonable instruction or other guidance given by the ADSE concerning the performance of repairs to a vehicle component.

Appendix D Legislative and policy developments in other countries

D.1 European Union

D.1.1 Policy developments

In April 2016, European Union (EU) Member States signed the *Declaration of Amsterdam – Cooperation in the field of connected and automated driving* (European Commission, 2016). The Declaration provided actions for Member States, the European Commission and industry to support connected and automated driving, including:

- Member States identifying and removing legal barriers to the testing and deployment of connected and automated vehicles
- the European Commission developing a shared European strategy on connected and automated driving
- industry identifying areas where regulation could reduce barriers to the development and take-up of new technologies.

In a communication to the European Parliament in May 2018, the European Commission proposed an approach to ‘ensure that EU legal and policy frameworks are ready to support the deployment of safe connected and automated mobility’ (European Commission, 2018, p. 2). In the communication, the European Commission stated that it would (among other matters):

- work on guidelines to ensure a consistent approach across the EU on approving (granting exemptions) for technologies not covered by EU rules
- start work on a new vehicle safety certification approach for automated vehicles
- ‘intensify coordination with Member States on traffic rules (for example, the Geneva and Vienna Conventions) so that they can be adapted to automated mobility in a harmonised way’ (European Commission, 2018, p. 10).

As part of the May 2018 communication, the European Commission also proposed revisions to the General Safety Regulation to incorporate new safety features for automated vehicles and regulate data recorders for automated vehicles. Subject to formal approval by the European Parliament, from 2022 vehicle safety features—such as driver distraction warning, advanced emergency braking and data recorder in case of an accident—will become mandatory (European Commission, 2019).

On 15 January 2019, the European Parliament adopted a resolution on autonomous driving in European transport (European Parliament, 2019). The resolution notes the significant benefits of autonomous vehicles for society but recognises that they will present new risks and calls on action in the following areas:

- road safety
- liability
- data processing, data access and cyber security
- ethics
- standardisation and cross-border interoperability
- regulation to cover all transport modes (Van Den Hende & Maly, 2019).

D.2 United Kingdom

D.2.1 Policy developments

The Law Commission of England and Wales and the Scottish Law Commission (the Law Commissions) are reviewing the legal framework for the safe deployment of automated vehicles in the United Kingdom (UK). They will deliver final recommendations by March 2021.

In November 2018, the Law Commissions published a preliminary discussion paper, which considered safety assurance at first supply and in-service, criminal and civil liability and adapting the road rules for automated vehicles. The paper proposed (among other matters) that:

- a new safety assurance scheme to authorise ADSs at first supply should be set up. The paper queried whether the agency responsible for first supply authorisations should also have responsibilities while automated vehicles are in-service
- each ADS should be backed by an ADSE which takes responsibility for the safety of the ADS, and would be subject to sanctions and penalties in the event of failures or infringements. The paper noted that this proposal was based on the NTC's recommendations (which were agreed by Australia's transport ministers).
- a 'user-in-charge' for SAE Level 4 automated vehicles (Law Commission of England and Wales and Scottish Law Commission, 2018, pp. 36-47). Their main role would be to take over driving in planned circumstances or after the vehicle has achieved a minimal risk condition and has come to a stop (Law Commission of England and Wales and Scottish Law Commission, 2018, p. 36). They would also have criminal liability for offences that do not arise from the dynamic driving task, such as reporting accidents and ensuring children wear seatbelts. The user-in-charge would need to be qualified and fit to drive but is not a driver when the ADS is engaged. During this time the user could undertake other activities. Initially at least, the user-in-charge would be the person in the driving seat (although this might change as a wider variety of controls are developed). This concept would only apply to SAE Level 4 vehicles if they have manual controls. People travelling in SAE Level 4 vehicles with no manual controls would not be able to comply with user-in-charge obligations for SAE Level 4 vehicles.

Australian transport ministers have made a decision to impose some obligations on users of automated vehicles with manual controls similar to those proposed in the user-in-charge concept. In May 2018, transport ministers decided that state and territory legislation should clarify if necessary that all drink- and drug-driving offences, including those concerning starting or being in charge of a vehicle, apply to a person who starts or turns off an automated vehicle with manual controls. This position could be considered further as technology develops and international approaches are refined. Transport ministers also decided that state and territory legislation should clarify that a person who starts, or is a passenger in, an automated vehicle without manual controls is not subject to drink- and drug-driving offences concerning starting a vehicle or being in charge of a vehicle.

D.2.2 Legislative developments

The *Automated and Electric Vehicles Act 2018* (UK) was passed by the UK Parliament in 2018. It makes the insurer under the compulsory motor vehicle insurance scheme liable for damages from an accident caused by an automated vehicle driving itself. Some exclusions or limitations on the insurer's no-fault liability include contributory negligence by the injured

party¹³⁹, and whether the accident results from unauthorised software alterations or a failure to install safety-critical software by the insured party¹⁴⁰.

D.3 Germany

D.3.1 Policy developments

In June 2017, the Federal Ministry of Transport and Digital Infrastructure's Ethics Commission for Automated Driving released a report on 'Automated and Connected Driving' (Federal Ministry of Transport and Digital Infrastructure, 2017).

The report outlines 20 ethical rules on the use of automated and connected vehicles on public roads. Some of these rules provide that:

- the guiding principle is to avoid accidents. Automated vehicles must be designed in such a way that critical situations do not arise in the first place
- the protection of individuals takes precedence over other considerations. If hazardous situations are unavoidable, protecting human life is the top priority
- automated technology must be designed to ensure efficient and reliable human-machine communication. In particular, the need for immediate handover of control from the ADS to the human driver should be avoided
- in emergencies, the vehicle must enter into a 'safe condition' without human assistance
- decisions in situations where a choice must be made between one human life and another cannot be programmed. However, general programming to reduce the number of personal injuries may be justifiable. Decisions based on attributes such as age and gender are prohibited
- accountability that was previously only placed on individuals shifts to other parties such as manufacturers and operators of automated driving systems.

D.3.2 Legislative developments

In June 2017 the German Parliament amended the German Road Traffic Act (Straßenverkehrsgesetz) to recognise the ADS in vehicles with conditional and high automation. The law:

- states that the human driver remains the driver of the vehicle even if the vehicle is controlled by the ADS
- provides the legal basis for temporary, full transfer of the driver's control to the ADS. The general liability concept under German law will not change and both the driver and the 'owner' (not the ADSE) remain liable even if the vehicle is in automated driving mode. However, drivers may avoid liability if they lawfully used the automated driving mode
- defines the requirements for automated vehicles to use public roads 'within the limits of intended use'
- clarifies the rights and duties of the driver when activating the automated driving mode (Federal Council Germany, 2017).

¹³⁹ *Automated and Electric Vehicles Act 2018* (UK) s 3(1).

¹⁴⁰ *Automated and Electric Vehicles Act 2018* (UK) s 4.

In addition, '[a]utomated vehicles must be equipped with a black box to identify whether the driver or the system had control at the time of an accident' (Burianski & Theissen, 2017).

The automated driving provisions will be reviewed at the end of 2019 (Bird & Bird, 2019).

D.4 Canada

D.4.1 Policy developments

In January 2019, the Policy and Planning Support Committee Working Group on Automated and Connected Vehicles published a Policy Framework to guide the development of automated vehicle laws (Policy and Planning Support Committee Working Group on Automated and Connected Vehicles, 2019).

The report outlines six foundational principles for governments, industry and academia to consider in preparing for the deployment of connected and automated vehicles. These principles provide as follows:

1. Safety is the number one priority.
2. Information sharing with government and law enforcement while protecting privacy is needed to ensure automated vehicles are safe and secure.
3. Policy and regulatory alignment—domestically and internationally—is vital.
4. Government and industry need to raise public awareness of the capabilities and limitations of automated vehicles.
5. Proactive preparation for the introduction of automated vehicles on public roads is needed.
6. Continuous collaboration among participants in the sector is essential.

The report also delineated the roles and responsibilities that each jurisdiction should take in governing automated vehicles. It proposed that the federal government should lead the harmonisation of regulation across the country and hold vehicle manufacturers accountable to safety standards, while the provincial governments should implement the federal vehicle safety requirements, and manage vehicle registration, insurance, rules of the road, and changes to highway infrastructure.

D.4.2 Legislative developments

From 1 January 2019, the *Pilot Project – Automated Vehicles* (Ontario Regulation 306/15) allows Level 3 automated vehicles available for public purchase in Canada to operate on Ontario's roads (Ontario Ministry of Transport, 2019). This effectively allows for public registration and use of Level 3 automated vehicles in Ontario (Love, et al., 2019).

A human driver must always be ready to take back control of the vehicle. Further, drivers are responsible for the safe operation of the vehicle and must continue to obey all existing road laws (such as those relating to distracted and impaired driving).

D.5 United States

Like Australia, the United States is a federation where much of the legislative authority for vehicles in service occurs at the state level. Despite efforts, the USA has experienced difficulties in achieving national consistency in the policy development for automated vehicles.

D.5.1 Federal policy developments

In September 2017, the House of Representatives passed the Safely Ensuring Lives Future Deployment and Research In Vehicle Evolution (SELF DRIVE) bill. The purpose of the bill was to define ‘the Federal role in ensuring the safety of highly automated vehicles as it relates to design, construction, and performance, by encouraging the testing and deployment of such vehicles’.¹⁴¹ The SELF DRIVE bill did not, however, successfully pass the Senate. On 13 March 2019, following the bill’s failure to pass the Senate, three Republican Leaders wrote to the Committee on Energy and Commerce outlining the benefits of automated vehicles and the proposed SELF DRIVE Act, and urging the Committee ‘to continue its bipartisan work on self-driving vehicle legislation’ (Walden, et al., 2019).

In October 2018, the United States Department of Transportation (U.S. DoT) released *Automated Vehicles 3.0: Preparing for the Future of Transportation*. The document ‘outlines how automation will be safely integrated across passenger vehicles, commercial vehicles, on-road transit, and the roadways on which they operate’ (U.S. Department of Transportation, 2018, p. viii). Among other matters, the document:

- supports development of voluntary technical standards
- provides state and local governments with considerations to support safe operation of automated vehicles
- focuses states on removing barriers to automated vehicle technologies.

The U.S. DoT states it will modernise or eliminate regulations that could hinder automated vehicle development. The U.S. DoT supports approaches that are flexible and adaptable over time, including focusing on performance-based rather than prescriptive rules.

The U.S. DoT also notes that the approach outlined in *Automated Driving Systems 2.0: A Vision for Safety* (AV 2.0) continues to apply, and that the current document builds on this approach. AV 2.0 provides a set of 12 safety elements as guidance for ADSEs when developing ADSs. These include operational design domain, minimal risk condition, cybersecurity and data recording. While ADSEs are encouraged to demonstrate how they have addressed the safety elements by publishing a safety self-assessment, the guidance is voluntary and is not backed by compliance and enforcement mechanisms (NHTSA and U.S. Department of Transportation, 2017).

D.5.2 State policy and legislative developments

Some automated vehicle policy and legislative developments in the US states are outlined below.

California

In April 2018, the California Department of Motor Vehicles (DMV) adopted regulations relating to the deployment of autonomous vehicles for public operation.¹⁴²

For autonomous vehicles to be deployed on public roads, manufacturers are required (among other matters) to:

- conduct testing and validation, and be satisfied that the vehicles are safe for deployment on public roads in California
- certify that the technology is designed to detect and respond to roadway situations in compliance with relevant laws (including changes to those laws)

¹⁴¹ SELF DRIVE Bill s 2.

¹⁴² Modified Express Terms, Article 3.8 – Deployment of Autonomous Vehicles.

- notify the registered owner that updates are available and explain how to access the updates
- certify that autonomous vehicles meet current industry standards to help defend against, detect and respond to cyber attacks.

Alabama

A bill currently before the Alabama Legislature relates to the authorisation of autonomous vehicles operated by an automated driving system.¹⁴³

The bill provides for an autonomous vehicle to operate without a conventional human driver if it is equipped with a teleoperation system and meets several criteria. A teleoperation system is hardware and software that allows a remote human operator to supervise or perform the dynamic driving task.

The criteria the autonomous vehicle must meet include that it is:

- capable of operating in compliance with road and traffic laws
- capable of achieving a minimal risk condition
- equipped with a recording device.

Utah

In March 2019, Utah's Legislature passed House Bill 101. The bill has now been signed into law and allows autonomous vehicles to operate on public roads in Utah (Ropek, 2019).

The bill amends the state's driving and road rules to allow automated vehicles equipped with an ADS to operate within the state under certain conditions (State of Utah, 2019). These conditions include that a minimal risk condition can be achieved in the case of a system failure rendering a level 5 ADS unable to perform the entire dynamic driving task relevant to the operational design domain of the ADS (State of Utah, 2019).

Further, the amendments allow a vehicle to operate without a driver (including a remote driver) and provide that when an ADS is in operation, the ADS is responsible for the compliant operation of the vehicle (State of Utah, 2019).

Under the amendments, the 'registration and privilege' of a vehicle equipped with an ADS to operate on a highway of the state can be revoked if (State of Utah, 2019):

- a) the ADS is operating in an unsafe manner; or
- b) the vehicle's ADS is being engaged in an unsafe manner.

Nevada

In June 2017, the Nevada Legislature passed Assembly Bill 69, which allows manufacturers and developers to register their autonomous vehicles for operations (public use) by self-certifying that it meets the requirements in Nevada Revised Statutes Chapter 482A – Autonomous Vehicles (State of Nevada Department of Motor Vehicles, 2019).

Some of the requirements in Chapter 428A include that:¹⁴⁴

- the autonomous vehicle must be capable of operating in compliance with applicable vehicle and traffic laws
- if the vehicle is not fully autonomous, it must be equipped with: means for a human operator to engage and disengage the ADS; an indicator to indicate when the ADS is

¹⁴³ Alabama Senate Bill 47 (2019).

¹⁴⁴ Nevada Revised Statutes 482A.070 and 482A.080.

operating; means to alert the human operator to take back control of the vehicle. The human operator must be seated in a position that allows them to immediately take back control, and must be capable of immediately taking over

- if the vehicle is fully autonomous, it must be capable of achieving a minimal risk condition. A human operator does not need to be present.

Arizona

State of Arizona Executive Order 2018-04 provides that vehicles can only be operated on public roads without a person present if they are fully autonomous. The person wanting to operate a fully autonomous vehicle must submit a written statement to the Arizona Department of Transportation acknowledging that:

- the ADS complies with federal motor vehicle safety standards
- the fully autonomous vehicle can achieve a minimal risk condition and comply with all applicable traffic and vehicle safety laws.

D.6 Singapore

D.6.1 Policy developments

In February 2017, the Second Minister for Transport (Ng Chee Mengh) stated that Singapore plans to adopt a 'light-touch' regulatory stance that caters to various innovations in the land transport sector while continuing to ensure the safety of the public (Mengh, 2017).

In January 2019, Singapore released guidelines for the deployment of autonomous vehicles covering vehicle behaviour, safety, cybersecurity and data formats (TR 68). The purpose of TR 68 is to 'promote the safe deployment of fully autonomous vehicles in Singapore' (Land Transport Authority, 2019).

D.6.2 Legislative developments

In February 2017, amendments to Singapore's *Road Traffic Act* (RTA) were passed by the Singapore Government to accommodate automated vehicles. The law empowers the Minister for Transport to make rules concerning the use of automated vehicles.¹⁴⁵

The *Road Traffic (Autonomous Motor Vehicles) Rules 2017*, which are made under the RTA, provide a mechanism for a person to apply to use an autonomous motor vehicle on a public road, outside of a trial. The application to use an autonomous vehicle on public roads must outline:¹⁴⁶

- (i) *how any autonomous motor vehicle is intended to be used;*
- (ii) *the type or types of autonomous motor vehicles to be used and details concerning the autonomous system to be employed in each vehicle;*
- (iii) *if an autonomous motor vehicle is to be modified, the nature of the modifications; and*
- (iv) *any supporting documents concerning any autonomous motor vehicle to be used and the autonomous system to be employed, stating that the vehicle and autonomous system are safe for use in the intended manner.*

¹⁴⁵ *Road Traffic Act* (Singapore) s 6C.

¹⁴⁶ *Road Traffic (Autonomous Motor Vehicles) Rules 2017* (Singapore) r 6.

If authorisation is granted to use an autonomous motor vehicle on a road¹⁴⁷, conditions can be imposed¹⁴⁸. Such conditions may include: limiting the geographical area in which the autonomous vehicle may be used; prohibiting it from carrying passengers; requiring a qualified driver to monitor and take over operation of the vehicle if necessary.¹⁴⁹

The rules also impose duties on certain persons around autonomous vehicle maintenance, data collection, record keeping, vehicle testing and notification of incidents.¹⁵⁰

D.7 Japan

D.7.1 Policy developments

In December 2018, Japan's National Police Agency released a draft bill to allow level 3 automated vehicles to operate on public roads. The Japanese government sought public comment on the bill and will submit it to its national parliament in 2020 (The Japan Times, 2018).

The bill proposes to amend Japan's Road Traffic Act to recognise an 'Autonomous Driving Device' and provides that the Autonomous Driving Device would be the driver when it is performing the driving task (Allsop & Baldwin, 2019).

Provided they can take back control of the vehicle, the draft bill allows drivers of level 3 vehicles to watch TV or talk on their mobile phones when the automated driving system is engaged. Initially, 'the government may only allow the use of level 3 self-driving technology during highway traffic jams' (The Japan Times, 2018). The bill also requires level 3 vehicles to be fitted with a data recorder and for drivers 'to save and store all driving data captured by the recorder' (Allsop & Baldwin, 2019).

¹⁴⁷ Under the *Road Traffic (Autonomous Motor Vehicles) Rules 2017* (Singapore) r 7.

¹⁴⁸ *Road Traffic (Autonomous Motor Vehicles) Rules 2017* (Singapore) r 9(1).

¹⁴⁹ *Road Traffic (Autonomous Motor Vehicles) Rules 2017* (Singapore) r 9(2).

¹⁵⁰ *Road Traffic (Autonomous Motor Vehicles) Rules 2017* (Singapore) pt 3.

Appendix E Repairer access to data

This Appendix provides an overview of the work completed and currently underway by the Commonwealth government relating to repairer access to data.

E.1 New Car Retailing Industry: A market study by the ACCC (December 2017)

In December 2017, the Australian Competition and Consumer Commission (ACCC) released a market study considering the new car retailing industry (Australian Competition and Consumer Commission, 2017). Among other matters, the ACCC's study considered repairer access to technical information to repair or service new cars.

The ACCC found that the repairers of new cars increasingly rely on access to electronic information and data from manufacturers. Independent repairers (repairers not affiliated with manufacturers) rely on manufacturers voluntarily sharing this information and data. The ACCC's concern was that manufacturers do not provide the same access to data to independent repairers as they do to their dealer-preferred repairer networks. This is despite voluntary commitments by manufacturers to provide independent repairers with the same access to data.

The ACCC recommended that regulation is necessary to 'mandate the sharing of technical information with independent repairers on 'commercially fair and reasonable terms', subject to appropriate safeguards to enable the sharing of environmental, safety and security-related technical information' (Australian Competition and Consumer Commission, 2017, p. 3).

The ACCC suggested that the regulation could be implemented in one of three ways:

- Changing the Motor Vehicle Standards Act or Australian Design Rules.
- A mandatory industry code administered by the ACCC.
- New stand-alone legislation (Sims, 2018).

E.2 Mandatory scheme for the sharing of motor vehicle service and repair information: Consultation paper (February 2019)

In February 2019, the Commonwealth Treasury released a consultation paper on establishing a mandatory code of conduct to 'specify minimum standards of conduct for parties sharing and accessing vehicle service and repair information' (The Australian Government the Treasury, 2019, p. 3).

One objective of the mandatory code would be to 'mandate access to service and repair information on fair and reasonable commercial terms to allow all repairers to compete on a fair playing field' (The Australian Government the Treasury, 2019, p. 3). This would generally require manufacturers to share information necessary or useful to complete repairs, but with appropriate safeguards.

The Commonwealth Treasury proposed that manufacturers would need to set up systems to ensure the same data can be accessed at the same time by all parties who purchase it or are provided it (including repairers). Where manufacturers charge fees for providing the data, they would need to justify how these fees are fair and reasonable.

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