National guidelines for automated vehicle trials

Policy paper

May 2017

NTC AUSTRALIA

National Transport Commission

Report outline

Title	National guidelines for automated vehicle trials
Type of report	Policy paper
Purpose	For approval by the Transport and Infrastructure council May 2017.
Abstract	This policy paper sets out Transport and Infrastructure recommendations for national guidelines for automated vehicle trials in Australia.
Key words	Automated vehicle, regulation, trials, vehicle standards, Australian Design Rules, Australian Road Rules, liability, insurance, privacy, security, safety assurance.
Contact	National Transport Commission Level 15/628 Bourke Street Melbourne VIC 3000 Ph: (03) 9236 5000 Email: enquiries@ntc.gov.au www.ntc.gov.au
ISBN	978-0-6480156-3-5

Contents

Executive summary

Automated vehicles offer potential long-term road safety benefits. On-road trials are necessary to ensure that automated driving systems can operate safely and efficiently in Australian conditions. However, the lack of a common approach from state and territory road transport agencies on how they will regulate and support trials of automated vehicles is creating uncertainty for industry and the risk of inconsistency between states and territories.

The development of national guidelines seeks to promote Australia as a test bed for automated vehicles, while ensuring public safety. National guidelines provide a more flexible mechanism than legislation to encourage innovation and help ensure that trialling organisations face similar trial conditions across Australia.

Why guidelines are needed

Highly or fully automated vehicles cannot legally operate on public roads due to existing legal barriers.[1] Organisations seeking to run automated vehicle trials will require state road agencies to provide exemptions or permits from these legislative obligations. This could include an exemption or permit from operate outside of obligations in the Australian Road Rules or other state road transport legislation.

Road transport agencies also have a responsibility to ensure road safety. Agencies will seek to impose conditions on these exemptions or permits to ensure safety, for example by limiting the roads on which the trial can be run or requiring a safety management plan to be developed.

There is a risk that different road agencies will set different conditions on the exemptions or permits they provide for automated vehicle trials. Different conditions could add unnecessary cost for industry or potentially make cross-border trials impractical.

In November 2016, transport and infrastructure ministers asked the NTC to develop guidelines on automated vehicle trials. If adopted and applied by state road transport agencies, the guidelines will ensure a level of consistency in trial conditions across the country, whilst maintaining flexibility.

National guidelines are intended to:

- provide certainty and clarity to industry regarding expectations when trialling in Australia
- help agencies manage trials in their own jurisdictions as well as across states borders
- establish minimum standards of safety
- help assure the public that roads are being used safely
- help raise awareness and acceptance of automated vehicles in the community.

What aspects of the trials will the guidelines cover

In supporting trials of automated vehicles, governments must ensure:

- that trials are safe, including ensuring that they are only run in appropriate conditions
- that trialling organisations are managing safety risks appropriately
- that trialling organisations can manage liability
- that any crashes can be appropriately investigated
- that trials may move across borders where appropriate.

In order to address these requirements, this policy paper recommends that the guidelines cover:

- management of trials
- safety management plans
- insurance
- data and information
- cross-border issues
- heavy vehicles

[1] The National Transport Commission (NTC) identified 716 legislative provisions that could be regulatory barriers to the use of more automated vehicles in Australia.

Below is a summary of the NTC's recommendations.

Summary of recommendations:

Chapter 1: Application of guidelines

1. The guidelines will be applied as the basis of conditions for any regulatory exemption or permit needed to operate the vehicle on public roads.

2. All matters within the guidelines will need to be addressed by the applicant and an assessment of whether or not each one constitutes a risk in the context of the trial that is proposed must be completed.

3. A safety management approach to trials will be adopted, where the guidelines form the framework for a safety management plan and applicants demonstrate performance and compliance against the criteria specified in the guidelines.

Chapter 2: Management of trials

4. The guidelines will require trialling organisations to:
   - propose trial locations as part of their application
   - provide a traffic management plan as part of the development of a safety management plan
   - notify road transport agencies of infrastructure requirements
   - provide a description of the technology being trialled
   - outline any community consultation and public engagement as part of the development of a safety management plan

5. The guidelines will state that trials must comply with existing:
   - road rules and traffic laws, except where an exemption or permit has been granted
   - vehicle standard requirements, except where an exemption or permit has been granted
   - privacy laws and other legislation

Chapter 3: Safety management plan

6. The guidelines will allow testing without a human driver or operator, but will require safety issues to be addressed as part of the development of a safety management plan.

7. The guidelines will require trialling organisations to address the following criterion as part of the development of a safety management plan:
   - system security
   - the pre-trial testing of vehicles,
   - driver or operator duties and training requirements,
   - driver and operator fitness for duty,
   - consideration of a process for driving mode transition,
   - consideration of system failure warnings; and
   - consideration of visual identifiers.

Chapter 4: Insurance

8. The guidelines will require trialling organisations to demonstrate to the road transport agency that they have appropriate insurance cover to protect against the risks associated with testing automated vehicles.
9. Jurisdictions will aim to ensure that any road user injured by an automated vehicle trial is no worse off than if they were injured by a human operated vehicle.

Chapter 5: Data and Information

10. The guidelines will require trialling organisations to:
    - report any serious incident to the relevant road transport agency within 24 hours.
    - provide a full report on any incident to the road transport agency within 7 days.
    - provide an end of trial report on research outcomes.

11. The guidelines will encourage trialling organisations to collect and share data with road transport agencies on the condition of the network on a case by case basis.

Chapter 6: Cross-border trials

12. States and territories commit to consulting with each other on any cross-border trial applications, to ensure consistent outcomes of applications and to minimise duplication.

Chapter 7: Heavy vehicle trials

13. Particular matters and criteria relevant to the trials of heavy vehicles will be included in the national guidelines

Summary of stakeholder feedback

In November 2016, the NTC published the 'National guidelines for automated vehicle trials' discussion paper for public consultation. The discussion paper was informed by preliminary consultation with key stakeholders and reflects the key issues raised by stakeholders through that process. The NTC has received 45 submissions in response to the discussion paper. In addition, informal consultation has been conducted with principle stakeholders.

All stakeholders support the aim of the national guidelines and consider that a standardised approach will encourage innovation and help expedite the safe delivery of automated vehicle systems within Australia. Stakeholders consider relevant criteria within the guidelines will provide a balance between providing flexibility and enforcing necessary measures for safety and practicality. All stakeholders support the adoption of a safety management approach within the guidelines and consider that this approach will provide appropriate flexibility for applicants to demonstrate performance while maintaining safety assurance for the community.

There is also general support amongst stakeholders for the NTC's proposed options. In particular, stakeholders support requiring trialling organisations to address relevant criteria including:

- Compliance with existing Australian laws
- Traffic management plan
- Community engagement
- Appropriate insurance
- Training for the driver or operator
- Vehicle identifiers ; and
- Provision of data/information for serious incidents.

While there is general support for the use of 'essential' and 'optional' criteria within the guidelines, some road transport agencies raised concerns that this approach will cause confusion within the application process. These stakeholders maintain that the guidelines should set out the criteria that trialling organisations will be required to address and trialling organisations will then need to address the criteria or explain why it is not relevant in their circumstances. These stakeholders are of the opinion that this approach is more consistent with the adoption of a safety management approach.

Who we are

The NTC is an inter-governmental agency charged with improving the productivity, safety and environmental performance of Australia's road, rail and intermodal transport systems. As an independent statutory body, the NTC develops and submits reform recommendations for approval

to the Transport and Infrastructure Council, which comprises Commonwealth, state and territory transport, infrastructure and planning ministers.

Automated vehicles are an important part of our work program because they are expected to have a significant impact on transport networks. Our work in this area began in 2015 after the Transport and Infrastructure Council asked us to identify regulatory barriers to safely introducing more automated road and rail vehicles in Australia.

1 Context

Key points

- On-road trials are necessary both to ensure that automated systems can operate safely in Australia and to build public understanding and confidence.
- National guidelines endorsed by all Australian governments provide an opportunity to ensure trial conditions and expectations are harmonised across jurisdictions.

Automated vehicles offer the possibility of fundamentally changing the transport task and society. Industry evaluation of automated vehicles through on-road field testing and trials is already happening in Australia. Governments are actively encouraging and supporting trials. On-road trials of automated vehicles are necessary to ensure that automated systems can operate safely and efficiently in Australian conditions, and for building public understanding and confidence. Nationally-agreed trial conditions would provide certainty regarding the expectations of trials and simplify the application process.

In November 2016, the NTC published the 'National guidelines for automated vehicle trials' discussion paper for public consultation. The discussion paper was informed by preliminary consultation with key stakeholders and reflects the key issues raised by stakeholders through that process. The NTC has received 45 submissions in response to the discussion paper. In addition, informal consultation has been conducted with principle stakeholders.

1.1 Project objectives

Automotive manufacturers and technology developers are using trials to evaluate the safety and technology performance of automated vehicles in Australia. National guidelines provide an opportunity to ensure minimum standards of safety and infrastructure protection are agreed by state and territory road transport agencies.

This project aims to develop a single, nationally-agreed set of guidelines to support automated vehicle trials. This will support the implementation of standardised trial conditions by state and territory road transport agencies.

This paper details policy recommendations for Australia's transport ministers to ensure that automated driving systems can operate safely and efficiently in Australian. These recommendations focus on addressing potential issues to implementing safe trials and propose options to resolve these issues.

The National Transport Commission (NTC) has collaborated with Austroads to develop the national guidelines, in close consultation with government and industry.

What is the problem?

Different approaches from state and territory road transport agencies to regulating trials of transport technology create uncertainty and cost for industry. Inconsistent or unclear trial requirements could deter industry from trialling in Australia and reduce the potential economic, environmental and safety benefits of the technology.

As part of allowing trials of automated vehicles, governments must ensure:

- that trials are safe, including ensuring that they are only run in appropriate conditions
- that trialling organisations are managing safety risks appropriately
- that trialling organisations can manage liability
- that any crashes can be appropriately investigated
- that trials may move across borders where appropriate.

To address these requirements, the policy paper sets out areas that guidelines should cover:

- management of trials
- safety management plans
- insurance

- data and information
- cross-border issues
- heavy vehicles

Benefits of supporting automated vehicle trials

National guidelines would be an effective means by which to promote Australia as a test-bed for automated vehicles.

Guidelines would provide a more flexible mechanism than legislation to encourage innovation, whilst maintaining safety. Guidelines can accommodate a range of different automated vehicle technologies and applications. The risks for a trial of a single, low-speed, driverless shuttle on a set route, will be different from those for a trial of a fleet of heavy vehicles on high-speed motorways. The legal regime for trials needs to allow for these differences.

National guidelines could also facilitate collaborative research, support Australian competiveness and reduce administrative costs.

If national guidelines are adopted and applied by all jurisdictions, trialling organisations will have similar trial conditions, regardless of which state or territory the trial is conducted in. This also facilitates cross-border trials. National guidelines could also allow greater information sharing, where appropriate, about trial and research outcomes between jurisdictions.

Project mandate

Following the discussion paper '*Regulatory options for automated vehicles*' (May 2016), the NTC developed a number of recommendations for the Transport and Infrastructure Council. Recommendation 1 was that the NTC and Austroads develop national guidelines for on-road field testing and trials of automated vehicles in Australia. In November 2016 the council approved this recommendation:

> ***Recommended actions:*** *That the NTC and Austroads develop national guidelines for on-road field testing and trials of automated vehicles in Australia.*
>
> ***Lead agency:*** *The NTC, in partnership with Austroads*
>
> ***Timeframes:*** *Early 2017 to May 2017*

Scope

We propose that the national guidelines focus on the substance of the trial conditions, rather than the form in which applicants would seek an approval for an on-road trial of an automated vehicle.

The Commonwealth Government can exempt new and imported vehicles from Australian Design Rules (ADRs), while the states and territories have exemption powers in relation to the road rules, traffic laws and in-service vehicle standards. At this stage, we do not propose that the national guidelines would impact on these exemption powers or that the process to develop national guidelines for automated vehicle trials would result in harmonised application or approvals processes. **Table 1** sets out the scope of national guidelines.

Table 1: scope of the national guidelines for automated vehicle trials.

Scope of national guidelines
Conditions set by road transport agencies for an exemption or permit, including: • management • safety • data and information sharing • insurance.
Out of scope for national guidelines
The legal or administrative framework to support trials in each jurisdiction, including: • exemption powers • legislation to mutually recognise trials in other states or territories

- administrative processes to approve a trial
- application fees
- additional matters based on local needs or the risk profile of the application.

2 Application and use of guidelines

Key points

- National guidelines form the conditions of an exemption or permit provided by a road agency in order of a trial to place on a public road.
- Trialling organisations must consider all criteria in the guidelines and explicitly indicate their view on its applicability. If a criterion is not applicable, this can simply be stated. Where a criterion is applicable organisation must explain how any risks associated with this have been addressed.
- All criteria must be addressed through a safety management approach.

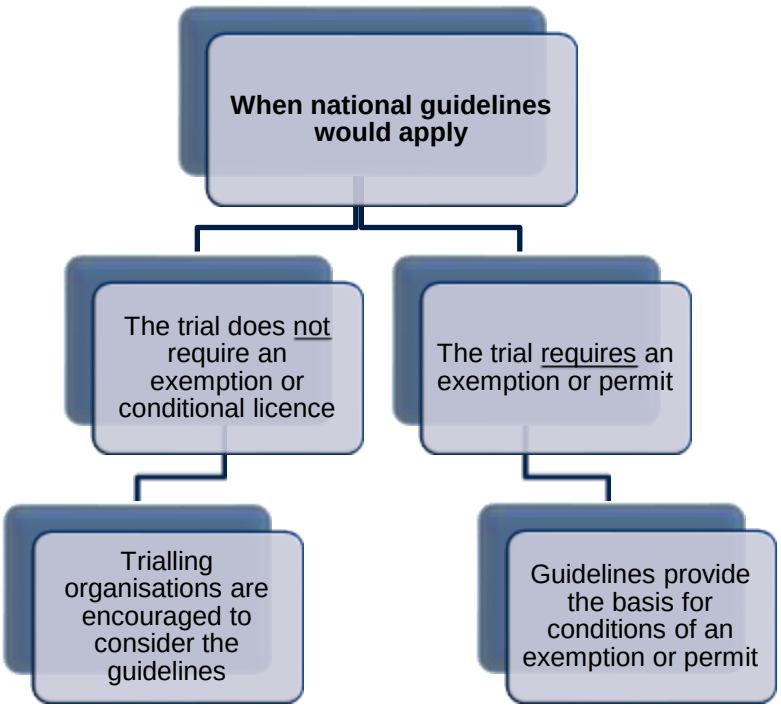
Prior to commencing an automated vehicle trial, a trialling organisation should contact the relevant road transport agency to determine if an exemption or permit to test on Australian roads are required. It is the trialling organisation's responsibility to ensure that required exemptions or permits are obtained prior to the commencement of a trial.

2.1 When would national guidelines apply?

Where a trialling organisation requires an exemption or permit to trial an automated vehicle on Australian roads, the road transport agency will apply the guidelines as part of the conditions of the exemption or permit. To satisfy the conditions of the exemption or permit, trialling organisations are required to demonstrate to the road transport agency that they have addressed each criterion or explain why it is not relevant. Not all trials will be the same and some of the criteria will not be applicable to all trials. For example, a fully autonomous vehicle will not transition between the human driver and the automated system because there is no human driver. In this case a trialling organisation can simply state that on the application form. If any condition of the exemption or permit is not complied with the exemption or permit may be suspended or revoked.

Where a trialling organisation does not require an exemption or permit, the organisation is still encouraged to follow the guidelines to help ensure their vehicles are operating safely and in compliance with Australian laws. In the event of an incident or breach involving the automated vehicle, consideration of the guidelines could be relevant in demonstrating that the trialling organisation took appropriate steps to minimise the incident or breach occurring (see Figure 1).

Figure 1: Application of the guidelines.



Discussion paper question

As part of the discussion paper, the NTC sought feedback on whether national guidelines should provide the basis for conditions of an exemption or permit. The discussion paper posed the following question for stakeholder consideration.

Question 1: Do you agree that national guidelines should provide the basis for conditions of an exemption or permit? If not, why?

Feedback from the discussion paper

All stakeholders agree that the national guidelines should provide the basis for conditions of an exemption or permit.

SA DPTI agrees that the:

> *granting of exemptions and any conditions attached should be based on national consistent guidelines.*

Likewise, WA agrees that:

> *Australian transport agencies would benefit from guidelines that outline criteria that can be applied to automated vehicle trials, with some flexibility to cater for the potential variety of trials and their anticipated outcomes.*

VicRoads intends to apply the trial guidelines in the following scenarios:

- *As a voluntary code of practice when a vehicle capable of operating at SAE levels 3,4 or 5 (herein referred to as level 3, 4 or 5) is used in accordance with Victoria's road law, such as a level 4 vehicle being operated in a partially automated mode, thus not operating as a level 4 vehicle.*
- *As the basis of conditions applied as part of any regulatory exemption or permit needed to operate the vehicle as a highly automated vehicle. Prior to any exemption or permit being issued to enable a trial, VicRoads expects to receive evidence from an applicant demonstrating how the applicant intends to meet the guidelines. The evidence provided by applicants and the guidelines would form the basis of conditions attached to any permit or exemption.*

Clayton Utz agree that:

> *National Guidelines are a sensible basis for endeavouring to harmonise the conditions that States and Territories attach to exemptions to allow trials that require an exemption. We consider the proposed scope of the National Guidelines to be appropriate.*

Although agreeing that national guidelines would be beneficial, NSW do caution that:

> *particular care is required to ensure the guidelines are not limiting given the rate that technology is moving.*

TMR supports in principal the proposal that national guidelines should provide the basis for conditions of an exemption. However:

> *note that jurisdictions may also reserve the right to grant exemptions outside of agreed guidelines based on a variety of factors. TMR also has some concerns with the ability of the proposed guidelines to manage automated vehicle trials without a vehicle occupant.*

Some stakeholders do however raise concern that having the guidelines as a compulsory precursor to any exemption would be contrary to the common application of guidelines.

For example, the NSW Taxi Council considers that the:

> *term 'guidelines' may not be appropriate if applicants have to consider a mandated set of criteria given that mandatory criteria needs to be supported by regulation or another appropriate binding instrument.*

Nova states that:

> *the inference that the guidelines should provide the basis for conditions of an exemption suggests that the guidelines would be a mandatory precursor. That is, the exemption will*

only be issued subject to the condition that the national guidelines are followed. This is contrary to the common understanding that guidelines, by their very nature, are never mandated. To ensure that national guidelines provide the basis for conditions of an exemption, each applicable exemption process would need to mandate that the applicant must demonstrate that they have addressed each issue set out in the national guidelines prior to and as a prerequisite for issuance of the exemption.

On a similar note, although NatRoad supports the NTC proposal that the national guidelines be used by road transport agencies as the basis for conditions of an exemption, they consider that the fact that:

the national guidelines would serve two purposes with two target audiences: to be used by road transport agencies as the basis for conditions of an exemption and as guidance for trialling organisations to ensure the safety of their trial, could result in some confusion.

Policy finding:

Given the level of stakeholder support, the NTC considers that the national guidelines should provide the basis for conditions of an exemption or permit. The NTC is of the opinion that a national approach to exemption or permit conditions will reduce regulatory challenges, assist cross-border trials and promote national best practice.

2.2 How would national guidelines be used as part of an exemption or permit process?

The discussion paper proposed three ways that the guidelines could be used by road transport agencies:

1. All criteria discussed here form a catalogue that road transport agencies can select from and require trialling organisations to address.
2. All criteria discussed here are divided into agreed lists of 'essential' and 'optional'.
3. All criteria must be addressed, and an assessment of whether or not each one constitutes a risk in the context of the trial that is proposed must be completed by trialling organisations. This would be the most consistent and thorough of the three options.

Discussion paper question

As part of the discussion paper, the NTC sought feedback on how the national guidelines could be used as part of an exemption or permit process. The discussion paper posed the following question for stakeholder consideration.

Question 2: How should road transport agencies use the guidelines in relation to exemptions or permits?

Feedback from the discussion paper

While the majority of submissions support the use of 'essential' and 'optional' criteria within the guidelines, some road transport agencies raise concerns that this approach would cause confusion as applicants would be unable to submit an application until they were aware of the optional criteria required for consideration and likewise, road transport agencies would be unable to access the proposal and invoke the optional criteria until they receive the application.

NT agrees that the proposal:

provides a certain level of common safety based criteria which are agreed to nationally, with the option for jurisdictions to require additional criteria to be addressed, appropriate to the specifics of the proposed trial and the operating environment.

TIC consider that the approach of 'essential; and 'optional' criteria will:

allow flexibility for varied technologies and vehicles.

This was supported by HVIA who consider that:

> *the list of optional and essential conditions needs to be able to be extended and modified based on experience obtained as the trials progress.*

In contrast, SA DPTI argues that:

> *there is actually little difference between the second and third models from the perspective of a trial applicant as an organisation intending to submit a trial application would need to consider both the essential and optional criteria given that a receiving road transport agency may or may not include one or more of the optional criteria for assessment of the application.*

SA DPTI considers that:

> *the default position should be that applicants should demonstrate that a requirement has been considered and explicitly indicate their view on its applicability. It is considered more transparent with greater certainty if the third model is adopted for the guidelines, recognising that for some trials one or more criteria will not be applicable.*

Likewise, although Bosch agrees that:

> *those seeking exemption should supplement 'essential' requirements with 'optional' requirements.* Which reflects an option 2 approach. They consider that:
>
> *the onus should be on the applicant to specify what they cannot meet the trial guidelines and what 'optional' requirements can be supplemented.* Which reflects an option 3 approach.

This position is supported by the NT Police who consider that the matters dealt with by the guidelines should form the 'minimum requirements that should be addressed by applicants.

Policy finding:

Although stakeholders' views on how the guidelines should be used diverge, the NTC is persuaded by the responses of stakeholders in favour of the third option, that 'all matters must be addressed and an assessment of whether or not each one constitutes a risk in the context of the trial that is proposed must be completed by trialling organisations'.

The NTC considers that this option better aligns with the safety management systems approach proposed under 1.4 and will result in greater flexibility for trialling organisations and better consistency in exemption or permit conditions for cross-border trials. In addition, if a particular matter is not relevant to the trial, for example the requirement for driver training in relation to a trial that does not include a driver, than this can be highlight by the applicant.

The NTC considers that the second option of having agreed lists of 'essential' and 'optional' issues will cause confusion for both applicants, who would be unable to submit an application until they were aware of the optional criteria required to be considered, and road transport agencies who would be unable to access the proposal and invoke the optional criteria until they receive application from the trialling organisation.

2.3 A safety management system approach

The NTC is proposing a safety management approach to trials, where the guidelines form the framework for a safety management plan. A safety management system approach is a co-regulatory, risk-based approach to identifying and managing safety risks.

Adopting a safety management system approach, trialling organisations would demonstrate to the relevant road transport agencies that they have identified safety risks and how those risks are to be managed. Under Australian rail safety and workplace health and safety law, operators, employers and other parties must ensure 'so far as is reasonably practicable' (SFAIRP) the safety of their operations. But other thresholds have been applied internationally that potentially result in a different threshold, the most common in work health and safety regimes being 'as low as reasonably practicable' (ALARP).

A safety management system approach enables road transport agencies to provide a clear pathway for the technology while ensuring the community is both protected and reassured of the safety of approved trials. A safety management system approach also supports innovation by allowing industry to determine the best way to manage risk. The disadvantages of a safety management system approach are that:

- without agreed standards for automated vehicles, the road transport agencies may not be able to test or validate the safety management system
- they can make applications more complex and expensive to prepare;
- they may require more follow-up and audits by the road transport agencies.

Ensuring the safe operation of vehicles involved in on-road trials will be a primary objective of trial participants, and road transport agencies. Trialling organisations would need to demonstrate to road transport agencies how their vehicle can be safely used on the road and how the safety of other road users and the general public will be assured against the conditions of the exemption or permit. In addition, trialling organisations will need to demonstrate how they will manage any potential impact on road infrastructure and public amenity.

Discussion paper question

As part of the discussion paper, the NTC sought feedback on whether the guidelines should adopt a safety management approach. The discussion paper posed the following question for stakeholder consideration.

Question 3: Should national guidelines take a safety management approach? If not, what other approach do you suggest?

Feedback from the discussion paper

All submissions supported adopting a safety management approach within the proposed guidelines.

For example, WA supports taking a safety management approach as this would:

> *provide an appropriate balance of flexibility for approving authorities with a reliable trial approval process for trial proponents.*

Similarly, NSW supports the safety management approach, noting that:

> *it may require follow up from agencies and ongoing iteration as safety risks continue to be identified, understood and managed.*

SAPOL supports a safety management approach, which would:

> *require validation of the particular technology to be tested.*

Although supporting the safety management approach, SA suggests that the guidelines:

> *outline expectations on the completeness and detail required from trial applicants, particularly for safety management plans and associated risk assessments. This could include reference to appropriate standards.*

Toyota considers that a safety management approach:

> *supports innovation and allows industry to determine the best way to manage risk. Toyota deems these resources necessary as safety is paramount and any incident involving automated vehicle trials would negatively impact the public's perception of the technology.*

ATIA supports Toyota's position and states that:
safety is likely to be a critical and determining factor in the Australian public's acceptance of AV technology. Accordingly, the safety management approach should wherever reasonably possible aim to minimise incidents involving death, injury or property damage, and eliminate foreseeably avoidable incidents.

Verless agrees that the guidelines:

should form the framework for a safety management plan as this will give road transport agencies a scaling model for the safety of the vehicle to be tested against, and also help trialling organisations to know what is expected of them.

Clayton Utz consider the:

proposed safety management system approach to be appropriate and sensible and is also consistent with the approach being taken in other countries.

Policy finding:

Given the level of stakeholder support, the NTC considers that the national guidelines should take a safety management approach to trials. The NTC is of the opinion that this approach provides appropriate flexibility for applicants to demonstrate performance while maintaining safety assurance for the community.

2.4 Recommendations

Application of guidelines

1. The guidelines will be applied as the basis of conditions for any regulatory exemption or permit needed to operate the vehicle on public roads.
2. All matters within the guidelines will need to be addressed by the applicant and an assessment of whether or not each one constitutes a risk in the context of the trial that is proposed must be completed.
3. A safety management approach to trials will be adopted, where the guidelines form the framework for a safety management plan and applicants demonstrate performance and compliance against the criteria specified in the guidelines.

3 Management of trials

Key points

The following issues will need to be addressed as part of the trialling organisation's application to run an automated vehicle trial.

- Description of the technology being trialled
- Traffic management plan
- Infrastructure or network requirements
- Engagement with the public and other stakeholders
- Managing change

Not all trials will be the same and some of the criteria will not be applicable to all trials. In this case a trialling organisation will need to explain why the particular criteria is not relevant. This approach will ensure the consistency of conditions imposed upon exemptions and permits, whilst maintaining flexibility for applicants.

The safe management of automated vehicle trials by trialling organisations and by road transport agencies will play a key role in ensuring the safe on-road testing of automated systems. This chapter discusses what aspects of managing automated vehicle trials will be included in national guidelines.

3.1 Should trials be allowed anywhere on the road network?

One of the most significant restrictions road transport agencies could impose on automated vehicle trials is limiting network access. Restricting automated vehicles' access to the road network is unlikely to be warranted where vehicles do not require an exemption or permit. It will likely to be an issue for vehicles requiring an exemption or permit as these vehicles may only be capable of driving on certain roads.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether trials should be allowed anywhere on the road network. The following three options were canvassed:

- **Option 1:** Guidelines do not include reference to trial location.
- **Option 2:** Guidelines include providing the trial locations as an option for road transport agencies to add.
- **Option 3:** Guidelines require trialling organisations to propose trial locations as part of their application.

The NTC supported option 3 and considered that the location of trials should be known to road transport agencies when granting an exemption or permit in order to ensure the safety of the road network.

Feedback from the discussion paper

The majority of submissions support requiring trialling organisations to propose trial locations as part of their application. Stakeholders consider that this information will be crucial in order in order for road transport agencies to properly assess the safety risks of the trial

NSW supports the proposal and also considers that:

> *access to the network could include spatial and route restrictions and timing of trial activity on the road network (e.g. day/night, peak/off peak times and seasonal conditions).*

NT agrees and considers that there are:

> *different risks present in different environments and that these must be addressed for a road agency to properly consider the types of conditions and restrictions appropriate to the situation.*

This position is also supported by the NT Police, SA Police and ACT Police

SA considers that:

> *it is expected that a trial applicant's nomination of trial locations would be based largely on the safety management plan and associated risk assessments.*

QBE supports the NTC proposal and considers that:

> *it is a key element of a safety-focussed approach, as it will allow trial criteria to be set in the context of specific trial conditions. Further, it will allow members of the public and government traffic and safety authorities in the area to be informed of the occurrence of the trial.*

In contrast, the ATIA supports providing the trial locations as an option for road transport agencies to add and considers that the NTC preferred option of requiring applicants to provide this information:

> *appears unreasonably burdensome and inappropriate in the case of trials of less radical technology that may be capable of operating extensively across a jurisdiction's road network.*

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should require trialling organisations to propose trial locations as part of their application. The NTC is of the opinion that this approach will allow any potential hazards to other road users and implications for infrastructure to be assessed prior to any trial taking place. In addition, it will provide appropriate flexibility for applicants to demonstrate this requirement is not necessary in their particular case or that the associated risks can be managed appropriately.

3.2 Should trials require a traffic management plan?

Preparation of a detailed traffic management plan and implementation of controlling measures could help ensure the safety of all road users and the general public and minimise disruption to other road users.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether trials should require the development of a traffic management plan. The following three options were canvassed:

- **Option 1:** Guidelines do not include a traffic management plan.
- **Option 2:** Guidelines include a traffic management plan as an option for road transport agencies to add.
- **Option 3:** Guidelines include a traffic management plan as an essential criterion for any trial.

The NTC supported option 2 and considered that a traffic management plan would be an effective tool for managing trials and would complement the safety management approach.

Feedback from the discussion paper

There is general support for the NTC proposal to include a traffic management plan as an option for road transport agencies to add. These stakeholders consider that a traffic management plan should be required on a case-by-case basis as this would provide flexibility to applicants.

For example, WA considers that:

while a traffic management plan may not always be required, depending on the nature of the trial the inclusion of a traffic management plan may allow the proponent to look at trial elements they might not otherwise consider.

FCAI supports include a traffic management plan as an option and states that the:

need for a traffic management plan, and the details in the plan, will depend on the trial location, time of operation, traffic conditions and objectives of the trial.

VicRoads agrees with the proposal:

Some trials may need to have a traffic management plan. The risk assessment /safety management plan should assist to decide whether a traffic management plan is needed. Some testing bodies may trial automated vehicles that share road related areas with vulnerable road users such as pedestrians and cyclists. Depending on the evidence provided in any application and attached safety management plan, VicRoads may seek to add additional protections for vulnerable road users such as reduced speeds, flashing lights or sound warnings for shuttles.

However, there was also support for including a traffic management plan as essential criteria within the guidelines.

For example, in keeping with SA DPTI's overall position that applicants should consider all issues and demonstrate that a requirement has been considered and explicitly indicate their view on its applicability, SA DPTI:

agrees that a traffic management plan may not always be necessary but where it is necessary, the plan should meet set requirements and road transport agency policies for approval of on-road events.

QBE supports requiring a traffic management plan as an essential criterion for any trial and considers that a traffic management plan:

is critical for the safe testing of automated vehicles on Australian roads, and therefore should be mandatory.

NT supports this position and states that while a traffic management plan:

may not be required, trialling organisations should identify potential issues and show they have properly assessed their potential impacts on traffic. They could either then provide a traffic management plan as part of their application, or the road agency could require it.

This position is supported by the ACT and NT Police.

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should require trialling organisations to consider the development of a traffic management plan as part of their application. The NTC is of the opinion that this approach will allow any potential hazards to other road users and implications for infrastructure to be assessed prior to any trial taking place. In addition, it will provide appropriate flexibility for applicants to demonstrate this requirement is not necessary in their particular case or that the associated risks can be managed appropriately.

3.3 How should trials manage infrastructure and network requirements?

Understanding infrastructure and network requirements to support on-road trials is important in order to allow road transport agencies to prepare for and support the trial appropriately. Agencies are likely to have limited capacity and budget to provide major infrastructure support. But it is possible that through engagement with trialling organisations, some assistance could be provided or an agreement reached as to how changes to infrastructure will be managed.

There are also benefits in a road agency understanding a vehicle's Operational Design Domain (ODD) and the infrastructure requirements to operate in an automated driving mode. This would

not require road or transport agencies to manage infrastructure differently but it would be important to understand when assessing safety.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on how trials should infrastructure and network requirements. The following three options were canvassed:

- **Option 1:** Guidelines do not reference infrastructure requirements.
- **Option 2:** Guidelines include notification of infrastructure requirements as an option for road transport agencies to add.
- **Option 3:** Guidelines require trial applicants to notify road transport agencies of infrastructure requirements.

The NTC supported option 2 and considered that knowledge of infrastructure and network requirements would be useful in assessing safety.

Feedback from the discussion paper

There is general support for including notification of infrastructure requirements as an option for road transport agencies to add. These stakeholders consider that this approach recognises that this criterion may be highly relevant for some trials, and less relevant for others.

For example, VITRONIC considers that the proposal:

> *strikes a delicate balance between offering flexibility for optional criteria and enforcing necessary measures for safety and practicality.*

TIC supports this position and states that

> *being mindful that it may not be practical to provide the necessary infrastructure requirements on a specific road for a limited trial. Road transport agencies should not be obligated to provide specific infrastructure requirements.*

Toyota maintains that:

> *the infrastructure and network requirements may evolve over time, this option allows for the road transport agencies to perform changes as necessary.*

Clayton Utz supports the NTC proposal and considers that:

> *road agencies should not be obliged to provide any specific support or infrastructure. As a general rule, we consider any additional costs incurred by road agencies in providing specific support or infrastructure to support a trial should be paid by the trialling organisation.*

However, there is also support for require trial applicants to notify road transport agencies of infrastructure requirements.

For example, SA DPTI states that:

> *it is considered crucial that there be an explicit indication of infrastructure requirements from the outset. Along the lines discussed above, this notification can be that there are no infrastructure requirements applicable for a particular trial.*

NT supports the SA's position and considers that:

> *as well as assisting in the road agency's assessment of the application and consider contributing to upgrades, it will help inform a course of action for any programmed or ad-hoc road maintenance, or other activities within the road network that could affect the safety of the trial.*

Nova acknowledges that:

> *road transport agencies will have very limited resources, and be under no obligation to support trials. However, knowledge of requirements will be required to enable an assessment of risk.*

WA agrees on the basis that road transport agencies:

need to be informed of any infrastructure requirements before the trial commences to enable those agencies to assess the practicability of the request.

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should require trial applicants to notify road transport agencies of infrastructure requirements. The NTC is of the opinion that this approach will allow any potential implications for infrastructure to be assessed prior to any trial taking place. If there are no specific requirements, this can be stated.

3.4 Should trialling organisations document what is being trialled?

Understanding the automated vehicle technology being trialled is likely to support coordinated and cooperative research, minimise potential safety and network risks and inform future policy decisions.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether trialling organisations should document what is being trialled. The following three options were canvassed:

- **Option 1:** Guidelines do not require trialling organisations to provide a description of the technology being trialled.
- **Option 2:** Guidelines include a description of the technology being trialled as an option for road transport agencies to add.
- **Option 3:** Guidelines require trialling organisations to provide a description of the technology being trialled.

The NTC supported option 3 and considered that road agencies would require some understanding of the technology being trialled in order to make an assessment on the safety of the trial.

Feedback from the discussion paper

There is majority support for requiring trialling organisations to provide a description of the technology being trialled. Stakeholders consider that it will be necessary for road agencies to understand the technology being trialled in order to assess the potential safety risk. These stakeholders consider that any intellectual property and commercial competition concerns can be addressed by the road agency only disclosing information to the extent necessary for safety reasons.

For example, WA considers that:

without a description of the technology it may prove problematic to approve a permit/provide an exemption where required.

This position is supported by NT who states that:

the description should not be required to go into a high level of technical detail, however it should be enough for road agencies to understand the intent of the trial, and for emergency services to understand any particular risks if they need to get involved.

MCCofNSW maintains that:

it is fundamental that trialling organisations provide details of what is being trialled to road authorities. This is essential for building a database of incidents and reports of on-road trials.

Natroad considers that:

it will be important to understand the test vehicle, the nature of the testing and which roads the trial intends to use in order to properly assess the safety risks of the trial.

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should require trialling organisations to provide a high-level description of the technology being trialled. This would not need to infringe on IP. The NTC is of the opinion that this approach will allow road agencies to understand the intent of the trial, and for emergency services to understand any particular risks.

3.5 Should guidelines include compliance with existing road rules and traffic laws?

To ensure public safety, it is crucial that automated vehicles being tested on public roads comply with all relevant road traffic laws, unless an exemption or permit is obtained. Trialling organisations will need to demonstrate that all tests undertaken comply with all relevant existing laws and that the vehicles involved are roadworthy, meet all relevant vehicle requirements, and can be used in a way that is compatible with existing road traffic law.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include compliance with existing road rules and traffic laws. The following two options were canvassed:

- **Option 1:** Guidelines do not include compliance with existing road rules and traffic laws.
- **Option 2:** Guidelines include compliance with existing road rules and traffic laws as essential (except where an exemption or permit has been granted).

The NTC supported option 2 and considered that subject to an exemption or permit, all trials will be required to comply with existing road rules and traffic laws and that stating this explicitly in the guidelines will help to establish legal compliance as a fundamental part of any trial.

Feedback from the discussion paper

There is majority support for including compliance with existing road rules and traffic laws as essential (except where an exemption or permit has been granted). Many stakeholders consider that stating this explicitly in the guidelines will help to establish compliance as a fundamental part of the trial.

SA DPTI supports the proposal and considers that this:

be included in the national guidelines as a simple statement along the lines that applicants will need to apply to road transport agencies for any proposed exemptions from existing road rules and traffic laws with appropriate justification.

QBE considers that:

it will also give members of the public confidence that they can continue to safely use road networks during vehicle trials.

Natroads notes that:

a majority of our survey respondents believe a mix of new and existing vehicle standards would be needed for automated heavy vehicles.

Nova maintains that:

more effective use of existing regulatory tools (i.e. road rules, traffic laws, in-service vehicle standards) will help to expedite the safe introduction and regulation of automated vehicles. Any exemptions from current rules and regulations add a degree of extra risk.

Verless supports the proposal and states that:

> *autonomous vehicles will expose us all to new technologies and new ways of ensuring safety. This could include situations where present traffic or road rules might not be followed. For example, side mirrors and back mirror won't have prominent roles in autonomous vehicles.*

Verless proposes that the:

> *NTC could introduce options where trial autonomous vehicle would be allowed to comply with the intent of existing laws using alternate technologies.*

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should state that trials must comply with existing road rules and traffic laws except where an exemption or permit has been granted. Stating this explicitly in the guidelines will help to establish legal compliance as a fundamental part of any trial and avoid any doubt over compliance requirements.

3.6 Should guidelines include compliance with existing vehicle standards?

Linked to the issue of compliance with road rules and traffic laws is whether an explicit statement is required in the guidelines that provides that the trial vehicles must meet existing vehicle standards, including the ADRs and in-service vehicle standards, unless an exemption or permit has been provided. Meeting the existing vehicle standards is unlikely to be an issue for trials of partially or conditionally automated vehicles but will be of primary importance to fully automated vehicles and some highly automated vehicles.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include compliance with existing vehicle standards. The following two options were canvassed:

- **Option 1:** Guidelines do not include compliance with existing vehicle standards.
- **Option 2:** Guidelines include compliance with existing vehicle standards as essential (except where an exemption or permit has been granted).

The NTC supported option 2 and considered that subject to an exemption or permit, all trials will be required to comply with vehicle standard requirements and that stating this explicitly in the guidelines will help to ensure the safe design and maintenance of vehicles operating on Australian roads.

Feedback from the discussion paper

There is unanimous support for including compliance with existing with existing vehicle standards as an essential criterion. Similar to road rules and traffic laws, stakeholders consider that stating this explicitly in the guidelines will help to establish compliance as a fundamental part of the trial.

For example, QBE supports compliance with existing vehicle standards being an essential criterion and considers that:

> *where a testing organisation believes that a certain standard is not relevant, an exemption can be applied for and considered.*

Nova agrees with the proposal and states that it will:

> *ensure that the technical integrity of the automated vehicles satisfies an established and well understood expectation of safety throughout Australia and thereby provide the public with a suitable level of confidence.*

The port of Brisbane considers that:

> *it is highly likely that trials of [automated heavy vehicles] will require exemptions from existing vehicle standards, so this needs to be provided for in the guidelines.*

FCAI states that:

> *any exemption to vehicle regulatory standards will need to be assessed against how the trialling organisation will ensure the vehicle operates safely on the road.*

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should state that trials must comply with existing vehicle standard requirements except where an exemption or permit has been granted. The NTC is of the opinion that stating this explicitly in the guidelines will help to establish legal compliance as a fundamental part of any trial and avoid any doubt over compliance requirements.

3.7 Should guidelines include compliance with existing privacy laws and principles?

Australia has existing privacy protections that will very likely apply to automated vehicle trials. In the event that automated vehicle trials generate personal information, the entities responsible for collecting and handling that information will be subject to privacy laws. Automated vehicles will also be regulated by Commonwealth, state and territory surveillance device laws that prohibit covert surveillance of individuals through the use of surveillance tracking devices. Surveillance laws provide that a person shall not use a tracking device to determine the geographical location of a person without the express or implied consent of that person.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include compliance with existing privacy laws and principles. The following two options were canvassed:

- **Option 1:** Guidelines do not include compliance with existing privacy laws and principles.
- **Option 2:** Guidelines include compliance with existing privacy laws and principles as an essential criterion

The NTC supported option 2 and considered that as all trials will be required to comply with existing privacy laws and principles, stating this explicitly in the guidelines will help to establish privacy as a fundamental part of any trial.

Feedback from the discussion paper

There is majority support for including compliance with existing privacy laws and principles as essential criterion. Similar to road rules and traffic laws, stakeholders consider that stating this explicitly in the guidelines will help to establish compliance as a fundamental part of the trial.

VCPDP considers that:

> *explicitly stating this in the guidelines will ensure that trialling organisations hold a common understanding of expected practices, and will cement privacy as a critical element of the trials. This is consistent with Privacy by Design.*

They also suggested that:

> *for simplicity, the guidelines should outline the relevant Privacy laws and Principles that will apply to automated vehicle trials and which parties will be required to comply. For example, the federal Privacy Act 1988 will apply to different parties than the Victorian [Personal Data Protection Act]. Surveillance devices laws may also apply to some trials but not others. Particular consideration should be given to those jurisdictions that do not have their own*

privacy laws. Trials in these states should be conducted consistently with the highest standard of privacy protections afforded by Australia's privacy laws.

NT supported the proposal and states that

while it is a given that trialling organisations will have to comply with existing privacy laws and principles, it would not hurt to explicitly state it in the guidelines. There are instances (such as in NT) where specific privacy laws may not automatically apply to some trialling organisations, and as such individual jurisdictions may need to specifically require compliance with a law.

WA considers that:

it is important that privacy is seen as a fundamental consideration of any trial.

TIC agrees with WA's position and adds that:

the use, access and privacy of data collected during the trial should also be determined by the trialling organisation before the trial begins.

VITRONIC considers that his approach would

strike a delicate balance between offering flexibility for optional criteria and enforcing necessary measures for safety and practicality.

OAIC is of the opinion that:

as part of the safety management system approach, and to facilitate public engagement, the benefits of a [privacy impact assessment] should be outlined in the National Guidelines. A PIA is a written assessment, to assist in identifying the privacy impacts of a proposal and provides an opportunity to set out any recommendations for managing, minimising or eliminating those impacts. A PIA is an effective way to satisfy the requirements under APP 1.2, which requires entities to take reasonable steps to implement practices, procedures and systems that will ensure an entity's compliance with the APPs The NTC could consider promoting the benefits of a PIA in the National Guidelines' system security criteria, or as part of the general design of the National Guidelines more broadly, and encourage entities participating in automated vehicle trials to conduct a PIA where it will benefit the project.

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should state that trials must comply with existing privacy laws and principles. The NTC is of the opinion that stating this explicitly in the guidelines will help to establish legal compliance as a fundamental part of any trial and avoid any doubt over compliance requirements.

3.8 Should trialling organisations be required to engage with the public?

Public acceptance, and public engagement in the testing of automated vehicles, is likely to be essential in terms of raising community awareness and education about how automated vehicles operate. Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether trialling organisations should be required to engage with the public. The following three options were canvassed:

- **Option 1:** Guidelines do not include community consultation and public engagement requirements.
- **Option 2:** Guidelines include community consultation and public engagement as optional criteria for road transport agencies to add.
- **Option 3:** Guidelines include community consultation and public engagement as essential criteria of any trial.

The NTC supported option 2 and considered that engaging with the public and providing information about trials can help educate and assure the public about the safety of new technology.

Feedback from the discussion paper

There is mixed support for including community consultation and public engagement as optional criteria. Some stakeholders consider that notifying the public of the occurrence of a trial may reduce the safety risk.

For example, NT agrees with the proposal and considers that:

> *public engagement may not always be necessary, however road agencies must be able to add this as a criteria when it is required. In addition to engagement related to safety or amenity, trialling organisations should also be required to liaise with road agencies before carrying out any promotional activities in relation to the trial.*

QBE considers that this:

> *would allow road agencies to add community consultation and public engagement as a trial criterion.*

Clayton Utz supports the proposal and states that:

> *it should be a matter for the trialling organisation whether or not it engages with public or specific stakeholders in relation to a proposed trial. We consider that there may be some (limited) circumstances in which a road agency might consider a minimum level of community consultation and public engagement to be essential to appropriately manage safety risks in relation to a specific trial. Perhaps this is a matter which each applicant should address in its safety management plan, which would then become a condition of any exemption.*

The OAIC is of the opinion that:

> *it is important that entities involved in automated vehicle trials who are required to collect and disclose personal information are transparent about their practices. Good privacy practice, together with effective communication and community engagement strategies, can help to ensure that the handling of personal information is consistent with the community's expectations. The NTC may wish to consider including guidance material to assist entities determine when community consultation and public engagement may be necessary.*

In contrast, some stakeholders support including community consultation and public engagement as essential criteria of any trial.

SA DPTI supports this option and considers that the:

> *need for and extent of public engagement will vary widely depending on the nature of the trial. It is suggested that there is an explicit indication of the scope and extent of any proposed public engagement provided by trial applicants. This could be that public engagement is not considered necessary for a particular trial.*

SA's position is supported by NT Police, SA Police and ACT Police.

Likewise, TIC firmly believes that:

> *effective and "two-way" public engagement must form the basis of any C-ITS heavy vehicle trial. The potential "hysteria" surrounding an autonomous truck trial will very likely surpass that of similar light vehicle trials and as such effective communication with the public should form part of the trialling organisations heavy vehicle trial plan.*

MCCofNSW also supports including community consultation and public engagement as essential criteria and considers that:

> *engagement with the public is essential, to ensure full disclosure of what information is being collected and transmitted by the vehicle.*

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should require trialling organisations to address the scope and extent of any community consultation and public engagement as part of the safety management plan. The NTC is of the opinion that this approach will help ensure that local governments, the community and other relevant parties are consulted

before any trial takes place. In addition, it will provide appropriate flexibility for applicants to demonstrate this requirement is not necessary in their particular case or that public engagement with particular parties will occur before trials commence.

3.9 Recommendations

Management of trials

4. The guidelines will require trialling organisations to:
   - propose trial locations as part of their application.
   - provide a traffic management plan as part of the development of a safety management plan.
   - notify road transport agencies of infrastructure requirements.
   - provide a description of the technology being trialed.
   - address the scope and extent of any community consultation and public engagement as part of the development of a safety management plan.

5. The guidelines will state that trials must comply with existing:
   - road rules and traffic laws except where an exemption or permit has been granted.
   - vehicle standard requirements except where an exemption or permit has been granted.
   - privacy laws and principles.

4 Safety management plan

Key points

- Safety management will be critical for successful trials.
- In order to meet the requirements to receive an exemption or permit, a trialling organisation will be expected to address all safety risks and:
    - provide key information on the proposed trial
    - provide a safety management plan
    - have appropriate insurance in place
    - agree to provide certain data.

Ensuring the safe operation of test vehicles involved in on-road trials will be a primary objective of trial participants and road transport agencies. As discussed in 1.4, trialling organisations applying for an exemption or permit will be required to develop a safety management plan. As stated above, a safety management plan will be required for all trials.

This chapter discusses safety specific conditions that will need to be addressed by applicants as part of the development of a safety management plan.

4.1 Should guidelines include system security?

Security is critical for ensuring both the safety of trials and the protection of personal information generated by trials. Automated vehicles have the potential to generate significant amounts of location information that could be personal information. They are also potentially vulnerable to external security threats and hacking with associated safety implications.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include system security. The following three options were canvassed:

- **Option 1:** Guidelines do not include system security.
- **Option 2:** Guidelines include system security as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines include the system security as an essential criterion of all trials, to be addressed as part of the safety management plan.

The NTC supported option 3 and considered that given the possibility of cyber security attacks and interventions of malicious intent, minimum standards for trusted access to data and protection from cybersecurity attacks may be warranted.

Feedback from the discussion paper

There is general support for including the system security as an essential criterion of all trials, to be addressed as part of the safety management plan.

VCPDP supports the proposal and considers that:

> *where personal information is generated by automated vehicles there is a risk that on-road trials may result in a privacy breach where the security of personal information is compromised. To minimise the likelihood of an attack on systems, trialling organisation should ensure that security is built in to the design of vehicles and measures are in place to protect any personal information generated throughout the trials.*

SA DPTI supports the proposal and states that:

reference could be made to standards such as ISO/IEC 27001 – Information Security management.

NT agrees and considers that the
wording should be broad, and not prescriptive as there is likely no capacity for road agencies to verify the stated methods to ensure system security.

WA considers system security considered to be essential to automated vehicle trials and maintains that:
given the nature of the technology being trialled and the risk posed through a lack of cyber security, it is reasonable to expect this to be an essential criterion in the guidelines.

The FCAI agrees with the proposal and believes that:
possibility of cyber security attacks and interventions of malicious intent, minimum standards for trusted access to data and cyber security are required.

Toyota states that:
any data obtained from trials should be securely stored and its security can be tested against any hacking activities.

In contrast, Alain Kornhauser, NT Police and Port of Brisbane supported including system security as an optional criterion for road transport agencies to add.

Alain Kornhauser considers that:
there is no need to overdo it. These are not going to operate in a centrally controlled 'Marxist' system with all kinds of connectivity. Certainly not in the beginning, and not for a long while.

Policy finding:

Given the level of stakeholder support, the NTC considers that the guidelines should require trialling organisations to consider the system security as part of the development of a safety management plan. The NTC is of the opinion that this approach will ensure that trialling organisations have taken appropriate steps to minimise the risks posed by a lack of cyber security. In addition, it will provide appropriate flexibility for applicants to demonstrate this requirement is not necessary in their particular case.

4.2 Should guidelines ensure a vehicle has been trialled at a test facility before being allowed on public roads?

Trialling at a testing facility, such as a closed track, could provide additional assurance that the automated vehicle technology can be safely deployed on public roads.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should require a vehicle to be trialled at a test facility before being allowed on public roads. The following three options were canvassed:

- **Option1:** Guidelines do not include any requirement for pre-trial testing of vehicles.
- **Option 2:** Guidelines include the pre-trial testing of vehicles as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines include the pre-trial testing of vehicles as an essential criterion for all trials, to be addressed as part of the safety management plan.

The NTC supported option 2 and considered that the pre-trial testing may not always be needed and that trialling organisations could develop other measures that specifically suit their mode of operation.

Feedback from the discussion paper

There is mixed support for including the pre-trial testing of vehicles as an optional criterion for road transport agencies to add. Stakeholders who support the proposal refer to the flexibility benefits for trialling organisation.

For example, the FCAI supports Option 2 noting that pre-trial testing may not always be needed.

> *the requirement and level of any pre-trial testing will depend on the trial conditions including the type of technology being tested, location of the trial and local traffic conditions.*

NSW considers that:

> *this could be amended to require all systems to have been tested, either separately in a vehicle, prior to a vehicle being allowed onto the road.*

VITRONIC supports the proposal on the basis that it provides:

> *flexibility for optional criteria and enforcing necessary measures for safety and practicality.*

In contrast, some stakeholders consider that including the pre-trial testing of vehicles as an essential criterion would help ensure safety and minimise risk to other road users.

For example, SA DPTI notes that the:

> *nature of the technology, trial environment, etc. could vary quite widely between trials and the use of an off-road testing facility prior to on-road trials may not always be necessary, and supports this aspect being incorporated by trialling organisations into safety management plans where necessary. There could be a requirement for trialling organisations to provide rationale on the proposed use or non-use of pre-trial testing. The South Australian Driverless Vehicles website covers pre-trial testing by seeking information from trial applicants on staging of anticipated tests.*

NT supports SA's position and states that:

> *the guidelines should require pre-trial testing of vehicles is addressed, however with the ability for trialling organisations to demonstrate that it is not necessary in their particular case and how they propose to manage the associated risks. It should be mandatory that it is addressed even if it may not be required given suitable mitigation of the risks.*

WA considers that:

> *off-road testing prior to the vehicle being allowed on public roads as essential unless exempted. For example, vehicles coming from Europe may not be used to Australian conditions and so pre-trial testing would be an opportunity to identify any issues prior to on-road testing. It also provides the opportunity to assess new automated vehicle technology in a controlled environment where it may not have had such extensive testing elsewhere.*

QBE supports including the pre-trial of all vehicles in test facilities as essential criterion and maintains that:

> *to minimise the risk to other road users, vehicles should only be able to use public roads when they have been thoroughly trialled and proven in a test environment.*

MCC of NSW states that:

> *pre-trial testing needs to be essential criteria with a proviso that trialling organisation are able to apply for exemptions if the trialling is of a minor change of a system which has been previously subjected to pre-trial testing. Essential testing would include testing of systems to ensure they can detect motorcycles, bicycles and other vulnerable road users.*

VicRoads supports including the pre-trial testing of vehicles as an essential criterion for all trials and is of the option that:

> *guidelines should ensure a vehicle and the test driver has successfully completed training before being allowed on public roads to demonstrate capability. Where vehicles are production ready, evidence could include on-road trials or deployments from other jurisdictions. VicRoads also considers it to be an advantage if trial applicants are required to demonstrate their pre-trial testing, as opposed to road agencies having to making an internal assessment as to whether it should be included if it was an optional guideline.*

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to consider all criteria and, if necessary, outline why it was not required. the pre-trial testing of vehicles as part of the development of a safety management plan. The NTC is of the opinion that this approach will assist road transport agencies in assessing whether safety risks have been addressed and whether an exemption or permit should be granted. In addition, it will provide appropriate flexibility for applicants to demonstrate that this matter is not required if it is not applicable in their particular case.

4.3 Should guidelines require a human in a trial vehicle?

It is likely that vehicle manufacturers and technology providers will seek to trial vehicles across the full spectrum of automated driving levels. Under a safety management system approach, risks would be identified and addressed on a case-by-case basis. Capturing any human driver considerations in a safety management system will provide flexibility, recognising that having a human in the physical vehicle may not always be a relevant issue or necessary.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should require a human in a trial vehicle. The following two options were canvassed:

- **Option 1:** Guidelines do not allow trials without a human driver or operator present.
- **Option 2**: Guidelines allow testing without a human driver or operator, but require safety issues to be addressed as part of a safety management plan as an essential criterion.

The NTC supported option 2 and considered that a human driver in the vehicle provides the safest testing environment and should be required unless an exemption or permit has been granted.

Feedback from the discussion paper

There is general support for allowing testing without a human driver or operator, but requiring safety issues to be addressed as part of a safety management plan as an essential criterion. Many stakeholders note that the objective of automated vehicles will be the removal of drivers but that applicants should consider measures to ensure the safety of other road users.

NatRoad notes that a:

> *human driver in the vehicle provides the safest testing environment and will be required unless a specific exemption has been granted. Where a human driver is required, the safety management plan should also address driver competency and fitness for duty. It is expected that removing the human driver will be a part of testing higher levels of automation. This will require careful consideration of the safety risks and how they can be controlled and a question which should be the subject of ongoing consultation with industry.*

WA considers that:

> *for safety reasons, particularly in testing in the early phase of the technology, the default position for road transport agencies should be that the presence of a trained human driver or operator is essential; however, it is agreed that there may be situations where prescribing human involvement may restrict innovation or be counter to achieving trial objectives. In those circumstances operating the vehicle without a human driver or operator presence should be by exemption, and subject to potential safety issues being addressed as part of a safety management plan as an essential criterion.*

TIC supports the proposal on the basis that:

> *the level of human intervention and/or presence in a given trial should be determined by trialling organisation, based on the trial conditions and the safety management plan.*

The FCAI supports this position and notes that:

> *the ultimate aim of an automated vehicle is to not have a human driver or operator and a safety management plan is appropriate to address safety issues in this instance.*

Port of Brisbane states that:

> *initial testing of [automated heavy vehicles] will require a human in the trial vehicle as technology and systems are developed to allow the driver to be replaced by a 'driver system'. To allow flexibility in this area it is suggested that this issue is addressed as part of the [safety management plan], rather than being mandated in the guidelines.*

Policy finding:

Based on stakeholder feedback received, the NTC proposes that the guidelines allow testing without a human driver or operator, but require safety issues to be addressed as part of the development of a safety management plan. This approach will assist road transport agencies in assessing whether the safety risks posed by vehicles without a human driver or operator have been addressed.

4.4 Should guidelines include driver or operator duties and training?

Depending on the application being trialled, it may be critical for the safe operation of the trial that the human driver or operator is sufficiently trained to operate the vehicle, respond to any safety incidents and take back control of the vehicle if required. The human driver or operator may have to be highly skilled, undertaking a specialist role.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include driver or operator duties and training. The following three options were canvassed:

- **Option 1:** Guidelines do not include driver or operator duties or training requirements.
- **Option 2:** Guidelines include driver or operator duties and training requirements as optional criteria for road transport agencies to add.
- **Option 3:** Guidelines include driver or operator duties and training requirements as essential criteria to be considered as part of a safety management plan.

The NTC supported option 2 and considered that capturing driver or operator duties and training requirements should be addressed by trialling organisations in a manner to suit their mode of operation.

Feedback from the discussion paper

There is mixed support for including driver or operator duties and training requirements as optional criteria for road transport agencies to add. Supporters of this proposal noted that duties and training will depend upon the circumstances of the trial and of the trialling organisation.

For example, the FCAI considers that:

> *the need for and level of driver/operator duties and training will depend on a range of circumstances include the technology being trialled, trial location and level of interaction with other traffic. Each company's Workplace Health and Safety requirements (and any legislative requirements) will be a major factor in determining the relevant operator training and fitness to drive requirements.*

This is supported by WA who states that:

it would be problematic to prescribe specific operator duties or training requirements within guidelines as it may not be congruous with the intent of the trial. Therefore the Transport Portfolio supports option 2 for the reason proposed by NTC that "capturing driver or operator duties and training requirements may not always be necessary, but when they are this is best addressed by trialling organisations developing measures that specifically suit their mode of operation

TIC is of the opinion that:

the need for and level of, driver/operator duties and training will depend on a range of circumstances including the type and maturity of the technology being used, the vehicle types, trial location, company's OH&S regulations, etc. The trialling organisation along with the road transport agency/s should make this determination.

In contrast, stakeholders who support including it as essential criteria noted that operator/driver duties and training will need to be considered in order to comply with workplace health and safety duties and obligations to ensure the safety of workers and other road users.

Clayton Utz believe that this:

is a matter which should be addressed in every safety management plan, noting that the safety management plan may conclude that there is no need for any specific driver training or duty. The level of training which a human driver of a test vehicle should have, or whether there are specific duties which the human driver should perform, are matters best determined by the trialling organisation, having regard to the nature of the trial. This is a matter which trialling organisations will wish to consider, in order to discharge their duty of care in negligence to other road users.

MCCofNSW consider that:

specifying the duties and training of a driver or operator needs to be essential criteria with the trialling organisation being able to apply for an exemption if it considers these are not applicable to the proposed mode of operation.

SA DPTI suggests that the:

national guidelines address this aspect in a similar manner to the South Australian requirement for trial applicants to provide information on proposed safe work methods to be used, including associated training, test driver / operator workload and shift management, etc. This would also include supervision of trials. Information on safe work methods could be supporting information to safety management plans prepared by trialling organisations.

NT agrees that the:

trialling organisations are best placed to define the actual requirements so the guideline's requirements should be broad – similar to Japan's approach.

Nova believes that:

driver or operator duties and training requirements pertain not just to their competency in controlling the vehicle but importantly their accountability. Additionally, the test driver/operator needs competencies and training to understand the systems under test, their capabilities and limitations and have the knowledge and skill to rapidly assess and anticipate the need to intervene and resume manual control if necessary.

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to consider driver or operator duties and training requirements as part of the development of a safety management plan. This approach will ensure that trialling organisations have considered driver and operator duties and training as part of meeting their legal obligations in particular under workplace health and safety laws. In addition, it will provide appropriate flexibility for applicants to demonstrate that this matter is not required if it is not applicable in their particular case.

4.5 Should guidelines include fitness to drive requirements?

Identifying appropriate measures to ensure the driver or operator of a trial vehicle is fit to drive or operate the vehicle at the relevant time within a safety management system would be consistent with the health and safety requirements of trialling organisations. As an employer, a trialling organisation must manage identified risks to employees so far as is reasonably practicable. Again, if a human is not required then fitness for duty requirements would not be relevant.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include fitness to drive requirements. The following three options were canvassed:

- **Option 1:** Guidelines do not include driver and operator fitness for duty requirements.
- **Option 2:** Guidelines include driver and operator fitness for duty as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines include driver and operator fitness for duty as an essential criterion, to be considered as part of a safety management plan.

The NTC supported option 2 and considered that while consideration of driver and operator fitness for duty may not be required in all instances, trialling organisations should have flexibility to develop measures that specifically suit their mode of operation.

Feedback from the discussion paper

There is mixed support for including driver and operator fitness for duty as an optional criterion for road transport agencies to add. Supporters of this proposal noted that driver and operator fitness for duty will depend upon the circumstances of the trial and of the trialling organisation and consideration should therefore be optional.

For example, WA considers that:

> *unless there was an identified need it is not clear the guidelines should include fitness to drive requirements over and above that currently in place for drivers (as per Assessing Fitness to Drive – a joint Austroads/NTC publication).*

This position is also supported by NSW Taxi Council, Toyota, Verless, ATIA, FCAI, TIC and NSW.

In contrast, some stakeholders consider that the guidelines should include driver and operator fitness for duty as an essential criterion, to be considered as part of a safety management plan.

These stakeholders maintain that fitness to drive requirements are crucial to ensuring safety on the road. If there is no need for a test driver or test operator, these criteria can be addressed by the applicant as not relevant.

For example, Nova considers that:

> *this will ensure that when there are test drivers and/operators involved in the test their duties and training is always captured.*

Likewise, Clayton Utz maintains that:

> *we think this is a matter which every trialling organisation will wish to consider in order to discharge its duty of care in negligence. Agencies also have an interest in ensuring that organisations have appropriately considered this matter for the proposed trial. We agree that fitness for duty requirements may not be required for some trials. However, we think that where this is the case, the trialling organisation should state this in its safety management plan for the trial.*

Bosch states that:

> *fitness to drive requirements are important for any trial and should be considered essential criteria as part of a safety management plan.*

This position is also supported by SA DPTI, NT and the ACT, NT and SA Police.

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to consider driver and operator fitness for duty as part of the development of a safety management plan. The NTC is of the opinion that this approach will ensure that trialling organisations have considered the obligations to their drivers and operators as part of meeting their obligations under workplace health and safety laws. In addition, it will provide appropriate flexibility for applicants to demonstrate that this matter is not required if it is not applicable in their particular case.

4.6 Should guidelines include requirements for transitioning between driving modes?

Linked to driver's and operator's duties to drive or operate a vehicle safely is the issue of whether the national guidelines should explicitly address how vehicles safely transition between human and automated driving modes.

There is ongoing discussion among human factors experts, safety advocates and insurers that managing the transition of the driving task between the human and the automated driving system will be one of the most significant safety challenges associated with conditional automation. The safe transition between driving modes is also likely to be a critical issue for those highly automated vehicles that will be fully automated only some of the time.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include requirements for transitioning between driving modes. The following three options were canvassed:

- **Option 1:** Guidelines do not include requirements for a process for driving mode transition.
- **Option 2:** Guidelines include requirements for a process for driving mode transition as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines required a process for driving mode transition as an essential criterion, to be considered as part of a safety management plan.

The NTC supported option 2 and considered that while driving mode transition may not be required in all instances, trialling organisations should have flexibility to develop measures that specifically suit their mode of operation.

Feedback from the discussion paper

This is mixed support for including requirements for a process for driving mode transition as an optional criterion for road transport agencies to add. Supporters of this proposal noted that the process for driving mode transition will depend upon the circumstances of the trial and of the trialling organisation and consideration should therefore be optional.

For example, WA considers that:

> *the ability to transition between driving modes would depend on the level of automation being tested (i.e. full AV (level 5) may not have controls to cater for a transition). This would need to be part of the trial risk management framework. The process for establishing transition requirements should be flexible, driven by the technology being trialled and where required by the road authority established in consultation with the trial proponent.*

This position is supported by FCAI, Bosch, NSW, ATIA, Toyota, Verless, VITRONIC and the NSW Taxi Council.

In contrast, some stakeholders maintain that driving mode transition is crucial to ensuring safety on the road. If this is not relevant for a particular trial, then this can be addressed as such by the applicant in the safety management plan.

For example, while SA DPTI agrees that the:

> *national guidelines should provide flexibility to trialling organisations to develop driving mode transition measures that suit their mode of operation, technologies, etc., it is considered that information on driving mode transition needs to be provided by trialling organisations as part of the safety management plan and safe work methods, particularly for methods to bring test vehicles into a safe low risk mode in the event of malfunction, overload, etc., be that a controlled emergency stop or reversion to a human driver.*

Nova also states that:

> *a driver mode transition between human and automated driving modes is a consideration of vehicle control handover. The control of the vehicle must be clearly understood at all times, even when the vehicle is idle. This information must be described as part of a SMP as human machine interface (HMI) factors are critical for system safety.*

QBE considers that:

> *trial operators should be able to demonstrate how they will safely transition trial vehicles between human and automated driving modes. Where a vehicle does not have a human driving mode, this should be explicitly stated.*

This position is supported by the ACT, NT and SA Police, TIC, Natroad and MCCofNSW.

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to consider a process for driving mode transition as part of the development of a safety management plan. The NTC is of the opinion that this approach will ensure that trialling organisations can demonstrate how they will safely transition trial vehicles between human and automated driving modes. In addition, it will provide appropriate flexibility for applicants to demonstrate that this matter is not required if it is not applicable in their particular trial.

4.7 Should guidelines include system failure warnings?

In the context of testing new technologies in different road environments and weather conditions, it may be particularly important that any human driver or operator of the trial vehicle is made aware of any system failures. At issue, therefore, is the extent to which national guidelines should specify system failure warnings to support the safe operation of the on-road trial.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include requirements regarding system failure warnings. The following three options were canvassed:

- **Option 1:** Guidelines do not include a requirement for system failure warnings.
- **Option 2:** Guidelines include a requirement for system failure warnings as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines require system failure warnings as an essential criterion, to be considered as part of a safety management plan.

The NTC supported option 3 and considered that system failures pose a serious road safety risk and therefore should be considered as part of any trial.

Feedback from the discussion paper

There is majority support for requiring system failure warnings as an essential criterion, to be considered as part of a safety management plan. Supporters of this proposal consider failure warnings are critical for ensuring safe work methods as they greatly impact the safety of all parties involved in the trials.

For example, QBE believes that:

> *system fail warnings should be an essential criterion as humans operating vehicles in an automated mode may otherwise miss system failures that would be self-evident in a human driving mode.*

NT considers that this proposal will:

> *align with Florida's approach, however should include additional wording to ensure the vehicle is brought to a stop safely in a suitable position, in case a failsafe stop results in a vehicle stopping and becoming an additional hazard.*

WA maintains that:

> *system failure warnings are an essential component of the safety framework for any automated vehicle trial, not only in this early development phase of the technology but also as it matures. It is agreed that trial proponents should be encouraged to develop measures appropriate to their "mode of operation.*

TIC believes that:

> *system failure warnings must be addressed as part of the safety management plan and should form an essential requirement in the guidelines.*

The FCAI agrees that the:

> *need for and type of system failure warnings must be addressed as part of the safety management plan. On the basis that the technology being trialled requires an exemption from the road rules or traffic laws the FCAI has no objection to the guidelines requiring system failure warning as essential criteria to be considered as part of a safety management plan.*

Nova considers that:

> *system failures can pose a serious road safety risk that should be considered a vital part of any system risk assessment. As such, a demonstration of this functionality should be conducted as the first part of any trial as a verification activity.*

In contrast, the ATIA supports:

> *the guidelines including a requirement for system failure warnings as an optional criterion for road transport agencies to add on the basis that the preferred option appears unreasonably burdensome and inappropriate.*

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to consider system failure warnings as part of the development of a safety management plan. The NTC is of the opinion that this will ensure trialling organisations have considered appropriate mitigation measures to minimise potential road safety risks. In addition, it will provide appropriate flexibility for applicants to demonstrate that this matter is not required if it is not applicable in their particular case.

4.8 Should guidelines include visual or other identifiers?

Visual or other identifiers can increase the profile of automated vehicle trials and thereby increase awareness levels, education and public trust in the safety of emerging technologies. The safety case for visual identifiers will depend on the automated functionality. For example, testing minor changes to a vehicle with conditional automation where a human driver remains in control of the vehicle will have a different risk profile from a driverless passenger shuttle. The importance of communicating with other road users that a vehicle is automated could also depend on the trial

objectives. For example, an objective of the trial may be to evaluate how human driving behaviours change when other road users are aware that a vehicle is automated.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include requirements regarding visual or other identifiers. The following three options were canvassed:

- **Option 1:** Guidelines do not include consideration of visual identifiers.
- **Option 2:** Guidelines include consideration of visual identifiers as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines require visual identifiers as essential criterion of trials.

The NTC supported option 2 and considered that trialling organisations should be provided flexibility to develop specific measures regarding vehicle identifiers.

The discussion paper posed the following question for stakeholder consideration.

Question 4: Are there additional criteria that should be included in the guidelines?

Feedback from the discussion paper

There is mixed support for including consideration of visual identifiers as an optional criterion for road transport agencies to add. Stakeholders in support note that this approach appropriately recognises that visual identifiers may not be necessary in all circumstances.

For example, WA considers that:

> *aside from alerting drivers and other travellers that a vehicle may behave differently than expected, there may be value in having standardised visual identifiers for automated vehicles nationally at an early stage (both for public awareness and to ensure national consistency).*

The Port of Brisbane agrees and states that:

> *visual identifiers will be important for trials of AHVs to ensure other drivers are aware of their presence.*

FCAI believes that the:

> *need for visual identifiers is likely to be determined on a case-by-case basis, taking into consideration the automated driving application, the risk profile of the trial and the research objectives.*

In contrast, some stakeholders maintain that the guidelines should require visual identifiers as essential criterion of trials.

For example, VITRONIC is of the opinion that:

> *making vehicle identification an essential criterion increases visibility, which in turn increases public awareness. A similar system is already in place throughout Australia, in the form of plates for less experienced graduate drivers. Vehicle identification would serve not only to alert drivers to exercise due care surrounding trials, but would also help normalise and improve public perception surrounding automated vehicles.*

This position is supported by Natroad who consider that:

> *alerting other road users that a vehicle is automated may help manage risks in relation to their interaction with the vehicle and increase public awareness.*

MCC of NSW supports:

> *prominent signage at the roof line of the vehicle as drivers or vulnerable road users are unlikely to inspect a numberplate, despite the ability of [optical character recognition] enforcement systems to do so. As an automated vehicle in a trial mode, the vehicle is likely to behave differently to other traffic, causing traffic flow disruption.*

VicRoads does not agree with the NTC and prefers Option 2: Guidelines may require visual identifiers as essential criterion of trials.

> *police enforcement of automated vehicles in trials would be aided by ensuring that electronic records of automated vehicles are kept. VicRoads and Victoria Police believe a record of vehicle registrations should be collected to aid enforcement. A special series of number plates (registration plates), could help notify members of the public that a vehicle is involved in a trial, and would also serve as an electronic record of the vehicle's registration.*
> *To minimise complaints and phone calls to Police and road agencies relating to highly automated vehicles (where the driver may be exempt from certain road rules relating to control) or where no driver is in the vehicle, a small identifier on the vehicle noting that it is involved in a trial would be worthwhile. A similar identifier has previously been required for left-hand drive registered vehicles. However, where the purpose of a test is to judge human responses to automated vehicles (potentially other drivers); there is benefit in leaving flexibility to leave the vehicle unmarked.*

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to consider visual identifiers as part of the development of a safety management plan. The NTC is of the opinion that this will provide a visual cue to non-automated vehicle drivers and enforcement officers.

Additional issues not addressed in the discussion paper

The discussion paper also asked stakeholders whether any further issues should be covered by the guidelines.

WA proposes that the following matters be addressed within the guidelines:

- *a definition of 'road transport agency' reflecting the fact that the powers for granting exemption may rest with a single agency.*
- *notification of software updates or other modifications during the trial period which may alter the operational characteristics of the trial vehicle.*
- *notification of previous crashes involving the test vehicle or another vehicle of the same make and model operating under test conditions on public roads elsewhere, regardless of who was at fault*
- *notification to the Police or other emergency services of the trial.*

Bosch suggests that:

> *consideration be given to the duration and complexity of a trial where the technology trialled can evolve. For example, a Level 3 vehicle trial may be approved and over the course of the trial, the technology evolves to include elements of Level 4 automation.*

NSW recommends that the guidelines:

> *include outcomes of any assessment by the Commonwealth Department of Infrastructure & Regional Development. Particular emphasis should be placed on compliance with the vehicle standards (Australian Design Rules (ADRs)), especially the ADRs that the vehicle is identified as not meeting.*

SAPOL proposes that that the following be addressed within the guidelines:

- *any operational design limitations e.g. terrain, road type, surface type, road conditions / marking, weather or light (day/night), which may adversely affect the vehicle or equipment being trialled.*
- *issues relating to post collision 'return to serviceability' requirements may need addressing.*

NSW Taxi Council considers that consideration should be given to:

> *additional criteria for public passenger automated vehicles. The principles of higher standards in safety that currently exist for public passenger vehicles in today's environment apply in this regard.*

VicRoads suggests that further consideration be given to:

> *Impacts on over-all network performance*

- *A section relating to larger trials should be considered where there may be impacts on mobility. For example, where a trial may compete with an existing public transport service. An additional guideline stating that each road authority may need to consider impacts against their obligations should be included.*

Limitations on trial sizes or scope

- *Road agencies should have the ability to limit the scope or size of trials through an optional guideline which could form part of any permit condition or exemption. In many cases the vehicles being developed in overseas markets are not intended for sale to the public. 'Supply to market' cannot therefore be used as a reasonable test of when a vehicle is being trialled, or when it is deployed. Therefore, care needs to be taken to ensure that trial, testing and development guidelines are not used in lieu of the forthcoming safety assurance system for broader deployment. VicRoads recommends additional criteria to limit trials of a significant size.*

Route monitoring

- *Where a vehicle is only capable of operating safely on a limited network, such as a vehicle without occupant protection features (a shuttle or mobility pod), operating in a prescribed low speed area, or a heavy vehicle platoon that can only be configured in a narrow headway on limited parts of the network, VicRoads may seek to make monitoring of route access a condition of a permit or exemption.*

Policy finding:

Some of the additional issues raised can be addressed through the existing processes laid out in the guidelines. For example limitations on trial sizes and route monitoring can both be address through a traffic management plan. Where a road agency is not content with the proposed traffic management plan or any of the strategies to address safety risks, then an exemption or permit may not be granted.

Other additional issues have been incorporated into the guidelines. For example, ongoing software updates, which must now be addressed through the safety management plan.

4.9 Recommendations

Safety management plan

6. The guidelines will allow testing without a human driver or operator, but will require safety issues to be addressed as part of the development of a safety management plan.

7. The guidelines will require trialling organisations to address the following criterion as part of the development of a safety management plan:
   - system security
   - the pre-trial testing of vehicles,
   - driver or operator duties and training requirements,
   - driver and operator fitness for duty,
   - consideration of a process for driving mode transition,
   - consideration of system failure warnings; and
   - consideration of visual identifiers.

5 Insurance

Key points

- Ensuring automated vehicle trials have appropriate insurance is critical to public acceptance.
- The extent to which insurance products and the level of insurance is specified in the national guidelines.

Automated vehicles are expected to result in improved safety outcomes. However, crashes involving automated vehicles will still be possible. For example, by mid-2016, Google had test driven their fleet of vehicles, in automated mode, for2.7 million kilometres (Google, 2016), and its test vehicles had been involved in 14 collisions, of which other drivers were at fault 13 times. In February 2016, a Google self-driving car collided with a bus in automated mode while attempting to avoid sandbags blocking its path (DMV, 2016).

5.1 Level and type of insurance

There is a clear ongoing need for automated vehicles involved in on-road trials to have insurance to cover injury, property damage and theft. In Australia, a number of insurance products could be available to cover an on-road trial of an automated vehicle. These include:

- compulsory third party insurance
- comprehensive vehicle insurance
- public liability insurance
- product liability insurance
- self-insurance.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include requirements regarding insurance. The following three options were canvassed:

- **Option 1:** Guidelines do not include insurance.
- **Option 2:** Guidelines include:
  a) "appropriate" insurance as an option for road transport agencies to add.
  b) prescribed insurance as an option for road transport agencies to add.
- **Option 3:** Guidelines include:
  a) "appropriate" insurance as an essential criterion for any trial.
  b) prescribed insurance as an essential criterion for any trial.

The NTC supported option 3a and considered that it would provide the most flexible approach and allow trialling organisations to tailor insurance policies depending on the trial and the statutory variations in different states and territories.

The discussion paper posed the following question for stakeholder consideration.

Question 5: Do you support the guidelines including prescribed insurance? If so, what kind of insurance should be prescribed?

Feedback from the discussion paper

There is majority support for including "appropriate" insurance as an essential criterion for any trial within the guidelines. Stakeholders maintain that this would allow trialling organisations to tailor

insurance policies to suit the trial. In addition, many stakeholders raised concern that existing prescribed CTP insurance may not provide cover for automated vehicles being trialled on Australian roads.

For example, ICA considers that:

> *existing prescribed CTP insurance may not provide cover for automated vehicles being trialled on Australian roads. Existing CTP schemes require a driver to be 'operating' a vehicle in order to ascertain fault (liability) in the event of a collision.*

In addition, ICA maintains that:

> *trialling organisations must be required to hold appropriate public liability insurance to cover the risk of damage to third party property and injury to third parties. As a minimum, the ICA recommends trialling organisations hold at least $20 million in public liability insurance, which is a standard liability product for business organisations and sufficiently covers the potential liabilities for all but the more remote risks associated with automated vehicle trials. That said, larger scale trials, involving multiple vehicles on open roads may require higher cover.*

MAIC supports the proposal and states that:

> *ensuring that all vehicles operating on Queensland roads have appropriate liability insurance is a key concern for MAIC. MAIC is uncertain as to whether the current CTP scheme and the National Insurance Injury Scheme (NIIS) for catastrophic injuries will apply to automated vehicles if a driver cannot be identified. MAIC and other jurisdictions may need to ensure the right kind of insurance products are available to the consumers when they purchase a Level 4 or Level 5 automated vehicles.*

This position is supported by NT who states that:

> *a common level of prescribed insurance in the guidelines may not be appropriate as different trials will present different risks. Mandating an "appropriate" level of insurance to be approved by the appropriate jurisdictional authority therefore seems the best approach. This approach would obviously require jurisdictions to develop internal processes for how this would be assessed and approved case by case.*

Insurance Commission of WA supports the proposal and considers that the:

> *required insurance should be appropriate and sufficiently broad to cover a number of risk areas including public and product liability. Compulsory third party and other statutory insurance schemes should not bear the financial costs of compensation for persons injured as a result of product failures in automated technology.*

In contrast SA DPTI supports prescribing an insurance level for public liability insurance and considers that:

> *public liability insurance for death, bodily injury and damage to property arising from the conduct of trials should be prescribed. In SA such insurance is a requirement set by the Motor Vehicles (Trial of Automotive Technologies) Amendment Act 2016. Other types of insurance can be required where appropriate.*

Similarly, IAG also supports this option and considers that

> *the National guidelines must include insurance as an essential requirement for any automated vehicle trial. The required insurance, at a minimum, should be no less than what is currently available for vehicles on the road (e.g. CTP, Workers Comp, Third Party Property Damage) as well as an appropriate level of public liability cover for the trial itself. It is important to note that despite the widely accepted assumption that technology and AVs will significantly improve road safety and reduce collisions, we must approach these assumptions with caution. Whilst people are in charge or required to supervise a vehicle in any capacity, even in semi-AVs, the issues of human error including poor judgment, slow reaction time, lack of visibility, inattention, sleepiness and fatigue; influences of alcohol or drugs and driver distraction will remain.*

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to demonstrate to the road transport agency that they have appropriate insurances and insurance cover to protect against the risks associated with testing automated vehicles.
In addition, the NTC is of the opinion that jurisdictions should aim to ensure that any road user injured by an automated vehicle trial is no worse off than if they were injured by a human operated vehicle. As such, the NTC recommends that jurisdictions ensure trials are covered by their state based insurance schemes or by appropriate private insurance. Where private insurance is used, governments should aim to ensure that claimants receive equivalent treatment to the treatment that they would have received if they had been injured by a human operated vehicle. Features of private insurance that ensure equivalent treatment may include:

- timely resolution of claims
- interim economic assistance for loss of wages
- appropriate medical care.
- that such insurance should be claimable within Australia

5.2 Recommendations

Insurance

8. The guidelines will require trialling organisations to demonstrate to the road transport agency that they have appropriate insurances and insurance cover to protect against the risks associated with testing automated vehicles.

9. Jurisdictions will aim to ensure that any road user injured by an automated vehicle trial is no worse off than if they were injured by a human operated vehicle.

6 Data and information

Key points

- Ensuring that data generated is held securely and made available to relevant agencies in the event of a crash is one of the key issues.
- Some jurisdictions request that updates and feedback is provided from trialling organisations.

Vehicle data is a key component for increasingly automated vehicles. Third-party access to data could help solve operational challenges, such as identifying who is in control of an automated vehicle at a point in time to determine responsibility and civil liability. In the context of on-road trials and testing, collecting and sharing data can leverage research opportunities, raise community awareness and acceptance, and provide greater certainty for road transport agencies that the safety risks are being adequately identified and managed.

6.1 Should guidelines include crash data?

On-road trials provide a research platform to test and validate the safety of different automated vehicles operating in real-life road environments. Road transport agencies have therefore taken a clear position that providing crash data should be a criterion of an exemption or permit for trial vehicles**.** This will also assure public trials are being run safely.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include requirements regarding crash data. The following three options were canvassed:

- **Option 1:** Guidelines do not require the collection and sharing of crash data.
- **Option 2:** Guidelines include the collection and sharing of crash data as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines require collection and sharing of crash data as an essential criterion for all automated vehicle trials.

The NTC supported option 3 and considered that providing requirements regarding crash data will help road agencies understand the nature of any crash involving a trial vehicle.

The discussion paper posed the following question for stakeholder consideration.

Question 6: If trialling organisations are required to collect crash data and share it with road transport agencies, what data should be required?

Feedback from the discussion paper

There is majority support for requiring the collection and sharing of crash data as an essential criterion for all automated vehicle trials. Stakeholders consider that the collection and analysis of this information will allow stakeholders to consider the causes of and learnings from any incidents and improve public safety outcomes. However there are different views on the type of data that should be collected.

For example, SA DPTI supports the proposal and agrees that a single national approach to crash data involving trial vehicles is highly desirable.

> *While the data available in the event of a crash will be dependent on the nature of the trial and the technology employed; at a minimum data on the vehicle speed profile leading up to the crash should be provided along with status of control (automated system, human driver or transitioning).*

WA considers that an:

> *enhanced Option 3 would be appropriate, with the guidelines requiring mandatory data recording and provision of depersonalised crash data as an essential criterion. All data relevant to the crash and the performance of the system should be included so that re-creation of the event is possible if needed, including details of damage/personal injury.*

Bosch supports the proposal and states that the:

> *amount and complexity of data collection in trials is significant and will most likely increase with the evolution of technology. As a result, a minimum set of criteria should be agreed with the road transport agencies in regards to trials. For example; speed of travel, automation status, GPS location, stability status etc. Road crash investigators should be consulted as to what criteria is required and appropriate in determining crash cause and analysis.*

NSW supports:

> *the requirement to collect and share crash data, as well as the suggested data package provided by the NTC noting the need for de-identification of personal information collected from the crash. The availability of crash data, including narrative of the crash, location and crash outcomes for analysis by road transport agencies is fundamental to the success of any trial.*

Toyota considers that the type of data required to be collected should be divided into 3 categories:

- *Vehicle data including: acceleration, braking, automation level, actions such as steering and indicating.*
- *Driver data including; driver's condition or action during the incident, driver response time*
- *Traffic data including: number of vehicles, pedestrians or infrastructure involved in the crash, status of the pedestrian at the time of the crash, status of the infrastructure at the time of the crash, road & weather condition.*

In contrast, Clayton Utz does not support the guidelines requiring the collection and sharing of crash data and state that:

> *we are not convinced that the guidelines should specify the data that should be collected. Rather, we think this is a matter probably best left to the organisations that decided to collect the data. If government determines that the data collected by an organisation should be made available to government or other organisations, the collecting organisation should only be required to make available the data that it has collected. It should also be required to provide any assistance that government or other organisations require to decipher the data.*

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to report any serious incident to the relevant road transport agency. A serious incident would include a crash involving a trial vehicle or a contravention of any law such as exceeding the speed limit or a red light violation. Trialling organisations should be required to collect and provide all information relevant to the event and the performance of the system.

While the data available in the event of a crash will be dependent on the nature of the trial and the technology employed, information expected could include time, date, location, automation status (e.g. automated system, human driver, transitioning), traffic (e.g. empty road, in heavy traffic) and road & weather condition. Noting the existing crash reporting obligations in the relevant state or territory, a trialling organisation should be required to report the incident to the road transport agency as soon as possible.

The NTC considers that this will ensure that road agencies have the appropriate information to understand the nature of any crash involving a trial vehicle.

6.2 Should guidelines include providing ongoing data updates?

Throughout a trial, data updates could be collected and sent in real time to road transport agencies reporting on incidents or non-compliance. Notifications could provide helpful information to ensure the terms of a trial are being met and providing updates to agencies on how the trial is progressing. Equally, excessive or inaccurate data could be an administrative burden for an agency.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include requirements on providing ongoing data updates. The following three options were canvassed:

- **Option 1:** Guidelines do not include collecting and providing incident and event data.
- **Option 2:** Guidelines include collecting and providing incident data as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines require collection and provision of defined incident and event data as an essential criterion for any trial.

The NTC supported option 2 and considered that the purposes and requirements for incident and event data are still to be defined and as such it is not clear that such data would be needed for all trials.

The discussion paper posed the following question for stakeholder consideration.

Question 7: How should an automated vehicle 'incident' be defined? What data should be required for such incidents?

Feedback from the discussion paper

There is mixed support for including collecting and providing incident data as an optional criterion for road transport agencies to add. Supporters consider that this approach reaches an appropriate balance between safety and efficiency.

For example, Nova supports the proposal and suggests that:

> *an "incident" be defined as an event which causes, or has the potential to affect the safety of vehicle, other public road users and/or test personnel.*

The FCAI agrees with the above proposal and notes that:

> *data should only be required where there is a defined policy purpose and this will be based on the objectives and circumstances of the trial. The types of data that should be required for such incidents include number of incidents, reaction of technology under trial and result of event.*

Bosch supports the proposal and considers that:

> *for insurance and public safety purposes, an incident should be defined to include any incident which causes injury or damage to persons or property, as well as any 'near-misses', including those requiring human intervention, or where personal injury or property damage was likely or possible.*

NSW agrees and suggests that:

> *an automated vehicle incident should be defined to include the unplanned intervention by the person in control of the vehicle; or where the vehicle fails to travel in accordance with the specified controls; or any failure of any of the automated systems; or any information on the circumstances of a near-crash.*

Option 2 was also supported by NSW Taxi Council, QBE, VITRONIC, NT, Verless, ATIA, TCA, Bosch, NSW and SA Police.

In contrast, some stakeholders support requiring collection and provision of defined incident and event data as an essential criterion for any trial. These stakeholders consider that mandatory reporting of serious incidents will be crucial to public confidence in automated vehicle trials.

For example, WA believes:

> *all incidents and events as defined should be reported to the road transport agency. The point made in the paper that the definitions of data requirements needs to be clear is acknowledged and work will be required to establish the reportable incidents and events to clarify for all stakeholders to a trial (i.e. trial proponent, road agency, enforcement authorities).*

WA proposes that:

> *an incident can be defined as any 'near miss', sudden braking, taking over control by the operator due to an unexpected unsafe situation, automatic stop by the vehicle for unknown reason, malfunction, degradation or failure of any equipment critical for safe operation of the vehicle, or any other incident on or because of the vehicle causing injury or potential injury to an occupant of the vehicle or a road user, or damage to another vehicle or property. Careful analysis of trial data and trials conducted elsewhere may help identify potential 'incident' descriptions that could be included.*

SA suggests two classes of incidents:

- *Serious incidents requiring mandatory reporting within a specified timeframe: a crash involving a trial vehicle and contravention of a road rule such as exceeding the speed limit or red light violation should be defined as a serious incident.*
- *Other incidents that must be recoded and data held for potential enquires and reporting at trial completion: a near miss event, incidents where a human driver takes back control, through to an event that leads to receipt of a public complaint about the trial vehicle's operation, performance or perceived safety risks.*

ACT Police consider that:

> *an automated vehicle incident should be defined that same as a motor vehicle incident with all information regarding the software operating systems included.*

In comparison, Uber considers that:

> *there is no need for road transport agencies to collect "incident" data in addition to any crash or accident data reported in accordance with local generally-applicable requirements. Any additional reporting risks compromising highly sensitive commercial business information and would impose significant burdens on the organisations involved. Moreover, this information is not necessary for road transport agencies to effectively oversee self-driving vehicle operations and ensure the safety of the public. It should be sufficient for the road transport agency to have access to the same types of information that it collects from other motorists.*

Policy finding:

Consistent with the finding under 6.1, which requires trialling organisations to report any serious incident to the relevant road transport agency within 24 hours, the NTC considers that the guidelines should also require trialling organisations to provide a full report on a serious incident to the road transport agency within 7 days.

A serious incident is defined here as a crash involving a trial vehicle or a contravention of any law such as exceeding the speed limit or a red light violation. Other incidents to be reported on monthly include:

- near misses
- when a human takes back control of the vehicle
- a public complaint regarding the performance of the vehicle.

The NTC considers that this will ensure that road agencies have the appropriate information to understand the nature of any crash involving a trial vehicle.

6.3 Should guidelines require updates on research outcomes?

On-road trials of automated vehicles are expected to have clear objectives. Unlike demonstrations or niche deployments, technology trials should have clearly defined research protocols and metrics that can be measured during, or at the conclusion of, the trial. Road transport agencies may wish to receive information on research outcomes to learn from the trials in order to inform future policy.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should require updates on research outcomes. The following three options were canvassed:

- **Option 1:** Guidelines do not require trialling organisations to provide research outcomes.
- **Option 2:** Guidelines include providing research outcomes as an optional criterion for road transport agencies to add.
- **Option 3:** Guidelines require trialling organisations to provide research outcomes as an essential criterion for any trial.

The NTC supported option 3 and considered that reports on trial outcomes will be vital information for road agencies to assess the ongoing safety of different technologies and assess policy issues such as how automated vehicles interact with other users

Feedback from the discussion paper

There is mixed support for requiring trialling organisations to provide research outcomes as an essential criterion for any trial. Supporters consider that this information will help jurisdictions in their assessment and evaluation of subsequent trials.

For example, SA DPTI supports the proposal as this is:

> *consistent with section 134M of the Motor Vehicles (Trials of Automotive Technologies) Amendment Act 2016 which requires a report to the South Australian Parliament. To reassure trialling organisations the national guidelines could state that commercially sensitive information does not need to be reported in detail.*

NT considers that:

> *governments will want this information if required to justify/validate any approvals for trials and some more thought may be required on the format of these reports and how they are stored to maximise their usefulness nationally.*

MCCofNSW supports this approach and considers that:

> *reports must be easy to understand and not used to obfuscate, so it is essential to require certain information and outcomes to be defined by the guidelines.*

In contrast, some stakeholders support including providing research outcomes as an optional criterion for road transport agencies to add.

WA consider that:

> *policy makers will need to be fully informed about the performance of specific technologies in public settings before allowing general access. Standardised national reporting would improve the quality of information available to policy makers in the future.*

ATIA states that the NTC preferred option:

> *appears unreasonably burdensome and inappropriate in the case of trials where Trialling Organisations are seeking to create or preserve commercial competitive advantage from their trial experiences.*

In addition, some stakeholders also support not requiring trialling organisations to provide research outcomes. For example, the NSW Taxi Council considers that:

> *the commercial implications of this requirement are significant and trial proponents may be reluctant to undertake trials if they are forced to provide data that is commercially sensitive.*

Bosch agrees and maintains that:

> *publishing or sharing of trial results that include IP should be left to the discretion of the trialling organisations.*

Policy finding:

Based on stakeholder feedback received, the NTC considers that the guidelines should require trialling organisations to provide an end of trial report on research outcomes. This would be a high level summary and would not need to include any commercially sensitive information.
The NTC is of the opinion that this will support transparent and cooperative research and provide a mean to which road agencies can assess the ongoing safety of different technologies.

6.4 Should guidelines include providing updates on network operation and road conditions?

As trial vehicles move around on the network some will collect a lot of information about the state of the network and the condition of individual roads. Traffic data, potholes, the condition of line markings or road signs and even hazards could all potentially be reported back to the relevant agency. This will depend entirely on the trial and the trial vehicle.

Discussion paper proposals

As part of the discussion paper, the NTC sought feedback on whether the guidelines should include providing updates on network operation and road conditions. The following three options were canvassed:

- **Option 1**: Guidelines do not include collecting and sharing of data on network operation and road conditions.
- **Option 2:** Guidelines include collecting and sharing of data on the condition of the network as an optional criterion for road transport agencies to add.
- **Option3:** Guidelines require collecting and sharing of data on the condition of the network as an essential criterion.

The NTC supported option 2 and considered that trial data could provide useful information to agencies in areas where data may be difficult to gather.

Feedback from the discussion paper

There is general support for including collecting and sharing of data on the condition of the network as an optional criterion for road transport agencies to add. These stakeholders maintain that this information could benefit road transport agencies and other road managers in preparing for and attracting automated vehicle trials.

For example, NT supports the proposal and considers that:

> *trialling organisations and road agencies may like to agree on a particular issue that they'd like to report on/receive reports on specific to the objectives of the trial. For example, there may be road markings that an automated driving system does not recognise due to a maintenance/design issue that may not have been identified otherwise.*

FCAI agrees and states that the:

collection and sharing of data on network condition should be part of the guidelines and as such trialling organisations should be requested to provide this information if it is within the scope of the technology being trialled.

Verless is of the opinion that:

this is a novel idea and will help road transport agencies and also help develop V2V communication technology- which seems to play a big role in the autonomous vehicle technology.

MCC of NSW supports the proposal as:

this is not specifically a safety item, but an item of network surveillance for road authorities.

In contrast, SA DPTI suggest that a:

a case-by-case approach to updates on road network operation and conditions is appropriate. Rather than setting this aspect as a criterion (either essential or optional), DPTI suggests that the national guidelines encourage trialling organisations to consider the potential benefits of providing road network operation and condition information to road transport agencies and discuss this with agencies.

Policy finding:

NTC is of the opinion that trial data could provide useful information to agencies that previously may have not been so readily available. Based on stakeholder feedback received, the NTC considers that where is it possible and easy to do so a road agency and trialling organisation may agree to share information that is useful for the purpose of improving the network.

6.5 Recommendations

Data and Information

10. The guidelines will require trialling organisations to:
    - report any serious incident to the relevant road transport agency within 24 hours.
    - provide a full report on any incident to the road transport agency within 7 days.
    - provide an end of trial report on research outcomes.

11. The guidelines will encourage trialling organisations to collect and share data with road transport agencies on the condition of the network on a case by case basis.

7 Cross-border trials

Key points

- National guidelines can support cross-border cooperation and national consistency, but are not intended to amend state and territory laws.

7.1 National guidelines can support cross-border cooperation

National guidelines provide an opportunity for states and territories to support on-road trials through setting nationally consistent conditions.

The national guidelines are intended to support existing regulatory mechanisms to conduct trials on public roads through exemptions or permits. The NTC recognises that states and territories may have different trial processes and procedures within which national guidelines can be referenced and used. It is not the intention that national guidelines necessarily result in amendments to current regulatory mechanisms or policies and procedures to establish on-road trials.

However, trialling organisations may wish to operate an automated vehicle trial on roads that cross jurisdictional boundaries. The automotive and technology industries see Australia as a single market for investment and innovation. To ensure trialling organisations can conduct cross-border trials, states and territories could consider ways they can facilitate such trials.

7.2 Cross-border opportunities to consider for future reforms

Currently no state or territory has statutory authority to recognise an exemption or permit from road rules or traffic laws authorised by another state or territory. If trialling organisations sought to undertake a cross-border trial of an automated vehicle that required an exemption or permit, it would be necessary to obtain a permit form each relevant jurisdiction. The risk is that these additional administrative processes make the cost and compliance burden of conducting a trial in Australia too expensive or resource-intensive. This could be a barrier to investment in automated vehicle trials in Australia.

Discussion paper question

As part of the discussion paper, the NTC sought feedback on mechanisms to better enable cross-border trials. The discussion paper posed the following question for stakeholder consideration.

Question 8: How important is it that state and territory road transport agencies facilitate cross-border trials of automated vehicles? How could governments enable cross-border trials?

Feedback from the discussion paper

The majority of stakeholders agree as to the importance of cross-border consistency to trials of automated vehicles.

For example, the NSW Taxi council considers this:

> *to be an important part of the Guidelines and consistent with the objective of a national approach to the conduct of trials of automated vehicles.*

QBE is:

> *conscious that one benefit of national guidelines is that cross-border trials will be more easily facilitated, and notes that there could be benefit in trialling vehicles across state borders given terrain differences.*

Natroad is of the option that:

> *mechanisms to enable cross-border trials are essential, either by establishing a mutual recognition scheme or, ideally, by adopting a single, national automated vehicle trial exemption and application process.*

SA DPTI considers that the:

> *establishment of guidelines will significantly help establishing cross border trials. DPTI considers that there is no need for either a mutual recognition framework or a single automated vehicle trial application framework and approval process. Rather by applying national guidelines, and if involving heavy vehicles subject to national law, road transport agencies can work cooperatively to progress parallel trial applications for a cross border trial.*

Toyota supports cross-border cooperation:

> *within state and territory road transport agencies primarily because most automotive and technology industries see Australia as a single market for investment and innovation and the collaboration would mean savings in resources. The sharing of trial results and data would also be very beneficial for state and territory transport agencies, especially with the various weather and terrain conditions. Therefore, it is imperative the roads and signage between jurisdictions are consistent and aligns to international standards where applicable (i.e.: Vienna Convention).*

WA states that:

> *the ability to facilitate trials is important generally, with cross-border trials the key would be to engage with the proponent early in the process and have a nationally agreed process by which to engage with other jurisdiction/s to give effect to the trial. It may be appropriate for a third party, for example the NTC, to be a single point of contact for cross border trial applications, working with jurisdictions to coordinate trial access and conditions.*

TMR is of the opinion that:

> *cross-border trials are likely to become of increasing importance as automated vehicle technology matures and gets closer to larger scale deployment. Eventual use cases of automated vehicle technology will invariably involve cross-border applications. This is particularly true for the freight industry, which is expected to be an early adopter of automated vehicle technologies*
>
> *To facilitate cross-border trials TMR suggests an escalating approach be adopted:*
>
> 1. *In the first instance, the results of any exemption applications should be shared via an inter-jurisdictional group, for example, the Austroads Registration and Licensing Taskforce.*
> 2. *In the medium term, jurisdictions should consider introducing legislation that enables the mutual recognition of exemptions, just as is currently the case for driver licence conditions.*
> 3. *Longer term, a coordinated national approach should be considered. The deployment of a safety assurance framework, administered at a national level could resolve this issue.*

VicRoads agrees that:

> *currently no state or territory has statutory authority to recognise an exemption from road rules or traffic laws authorised by another state or territory. If the current arrangements remain, VicRoads agrees it could be a barrier to investment in automated vehicle trials in Australia.*

Policy finding:

The overwhelming view from feedback received to the discussion paper supported cooperation and common recognition between states and territories when it came to trials. This would support Australia's vision of being one market and therefore attracting more innovation and technological developments.

Creating a simple process of common recognition will mean that states can reduce their own administration, where appropriate, while assuring the safety of the trial.

7.3 Recommendations

Cross-border trials

12. States and territories will work together to ensure that automated vehicle trials approved in other states and territories are recognized, as appropriate, within their jurisdiction.

8 Heavy vehicle trials

Key points

- Despite increased size and mass, the safety risks of trialling of automated heavy vehicles can be addressed through a safety management system in the same way as for automated light vehicles.
- A different regulatory regime applies for heavy vehicles in Australia and this will need to be considered by trialling organisations.

The introduction of automated heavy vehicles is both an opportunity to improve transport services and a challenge for transport agencies, infrastructure operators and regulators. Despite the enormous potential to improve outcomes in heavy vehicle freight movement, the challenges and risks posed by automated heavy vehicles will need to be managed effectively if benefits are to be optimised.

8.1 How are trials of automated heavy vehicle trials different from light vehicle trials?

Heavy vehicles are a critical part of the freight network, delivering essential goods, services and jobs for our communities across at times vast distances. Automated heavy vehicles have the potential to fundamentally change the heavy vehicle freight industry and deliver improvements in safety, productivity, customer service, congestion management and environmental performance.

Discussion paper question

As part of the discussion paper, the NTC sought feedback on whether different guidelines were required for heavy vehicles or whether the guidelines should clarify issues that may be relevant to automated heavy vehicle trials. The following two options were canvassed:

- **Option 1:** Develop separate guidelines for trialling heavy vehicles and light vehicles.
- **Option 2:** Include heavy vehicles in the guidelines and clarify any specific matters relevant to the trialling of automated heavy vehicles, including the role of the NHVR.

The NTC supported option 2 as heavy vehicles would have to comply with existing laws and an exemption or permit could be administered through existing exemption powers, supplemented by the guidelines.

The discussion paper posed the following question for stakeholder consideration.

Question 9: Are there any unique issues for heavy vehicles that require special consideration in guidelines for automated vehicle trials?

Feedback from the discussion paper

There is majority support for including heavy vehicles in the guidelines and clarifying any specific matters relevant to the trialling of automated heavy vehicles.

For example, WA supports the proposal noting that:

> *safety risks increase for heavy vehicles that are of greater dimensions and mass than a standard passenger vehicle. There are likely similarities between light and heavy vehicle trials and there may be applications of the technology for each type from the other the guidelines for heavy vehicle specific trials are not needed provided that specific heavy vehicle risks are considered by approving authorities.*

TCA believes that:

public perception of automated heavy vehicles will be a sensitive issue, and any guidelines that clarify specific matters relevant to automated heavy vehicles reflect the inherent differences and risks associated with the vehicles themselves, and are also designed to address these public perception sensitivities.

Nova does not consider that:

heavy vehicles require special consideration in guidelines for automated vehicle trials. Nova Systems acknowledges that heavy vehicles are physically imposing both in the forces they exert on the road infrastructure below them and in the volume of space required for safe manoeuvring around them. However, in a functional sense they are equivalent to other road vehicles, as they provide mobility where it is required.

In contrast, some stakeholders support the development of separate guidelines for trialling heavy vehicles and light vehicles. For example, Natroad supports separate guidelines and considers that there are:

a number of unique issues for heavy vehicles that require special consideration in guidelines for automated vehicle trials.

Similarly, Verless considers that:

automated heavy vehicles can do more damage to the public and property than light vehicles. Also, heavy vehicles come in much more varied shapes and sizes than light vehicles: buses, farm equipment, oversized carriers, freight carriers, hazardous-material carriers, liquid carriers, live-stock carriers etc. Some of these will form convoys, and therefore the trialling will also be as convoys. Bundling trials of heavy vehicles along with light vehicles would be impractical and dangerous.

NSW is of the opinion that:

there may also be different thresholds in the operation of technology that must cater for the unique nature of heavy vehicles (e.g. the need for greater stopping distance compared to light vehicles). NSW recommends they are not grouped with light vehicles under generic strategies and controls, but that their particular characteristics are specifically investigated in every instance. There may also be a different level of road safety risk where heavy vehicle platooning is being trialled, particularly with respect to other road users (e.g. how other vehicles will merge from a slip lane onto another road where a group of heavy vehicles are platooning). As a result, additional mitigation factors may need to be included in the safety assurance framework to satisfactorily address these risks. Additional network access limitations may be appropriate in the case of heavy vehicle trials and there may be greater public concern to address in potential community consultation and engagement.

Stakeholders were also asked whether there any unique issues for heavy vehicles that require special consideration in guidelines.

SA considers that:

the acceptance of non-standard HVs must be managed by the NHVR rather than individual jurisdictions. Infrastructure issues, route selection and possibly traffic management will be more important for trials involving automated HVs depending on the size of the vehicles or combinations.

Toyota is of the opinion that the guidelines for heavy vehicles will:

have to be more stringent compared to light vehicles. This is because of their larger size and mass and will in turn impose a higher risk towards road users in the event of an incident. It is important for such category of vehicles to include:-

- *Location of the trials (public awareness)*
- *The nature of the technology being trialled (e.g.: speed, what detection, safety management)*
- *Types of trial involved i.e., AV, CV or CAV*

WA states that:

trials involving truck platooning are likely to require a higher degree of public awareness and caution. Therefore, the need for a community engagement plan as an essential criterion in the

guidelines is highly desirable. The requirement for escort/pilot vehicles should be included as an optional criterion.

SA Police considers that:

whilst harmonisation and mutual recognition in the light vehicle fleet can apply across state borders, heavy vehicles have substantially different infrastructure and operator requirements. SAPOL supports the NHV Regulator having administrative control over all heavy vehicle trials.

Toll Group believes that:

The NHVR should administer the exemption process for heavy vehicles rather than for this function to be acquitted by the various states and territories. The existing model whereby the NHVR consults with state-based road managers on access conditions could be replicated for traffic and road law enforcement. This will promote consistency and minimise duplication.

Policy finding:

Heavy vehicles have unique risks in terms of automation and trials. The most obvious being the size and weight of heavy vehicles increasing risks. Other potential factors such as carrying dangerous goods, having unsecured loads and speed and distance that many heavy vehicle travel compound the risks posed by heavy vehicles.

Currently these risks are managed and regulated in different ways – mostly through the NHVR and HVNL along with existing road rules. The existing regulation through the NHVR and HVNL would still allow for appropriate management of heavy vehicles.

The safety management approach in the guidelines is sufficiently comprehensive, non-prescriptive and performance based to allow for safety risks to be managed appropriately for heavy vehicle trials.

8.2 Recommendations

Heavy vehicle trials

13. Particular matters and criteria relevant to the trials of heavy vehicles will be included in the national guidelines.

9 Glossary

Term or title	Acronym	Description
Australian Design Rules	ADRs	National standards for safety, anti-theft and emissions in vehicle design.
Automated driving system	ADS	The hardware and software that are collectively capable of performing the entire Dynamic Driving Task (DDT) on a sustained basis, regardless of whether it is limited to a specific Operational Design Domain (ODD).
Australian Privacy Principles	APPs	Standards for how Commonwealth agencies, private sector and not-for-profit organisations must handle, use and manage personal information.
Australian Road Rules	-	Model road rules developed by the NTC and applied in state and territory legislation.
Austroads	-	The association of Australasian road transport and traffic agencies.
Automated highway driving	-	A system that takes control of driving and monitoring road environment on specific roads, but the driver monitors the automated driving system.
Conditionally automated	-	The system drives the vehicle for sustained periods of time. The human driver does not have to monitor the driving environment or the automated driving system, but must be receptive to any system failures and intervene if requested and be the fall back for the dynamic driving task.
Cooperative intelligent transport systems	C-ITS	The use of wireless communications to exchange data between vehicles, and with roadside infrastructure, including data on vehicle movements, traffic signs and road conditions.
Dynamic driving task	DDT	All of the real-time operational and tactical functions required to operate a vehicle in on-road traffic, excluding the strategic functions such as trip scheduling and selection of destinations and waypoints.
Fully automated	-	All aspects of the driving task and monitoring of the driving environment and the dynamic driving task are to be undertaken by the vehicle system. The vehicle can operate on all roads at all times.
Highly automated	-	The system drives the vehicle for sustained periods of time in some situations, or all of the time in defined places, and no human driver is required to monitor the driving environment and the driving task, or to intervene, when the system is driving the vehicle.
Human–machine interface	HMI	Interface between a human operator and a machine. Includes functional and ergonomic design of the interface (human factors).
Information Privacy Principles	IPPs	State privacy principles regulating public sector accesses to and handling of personal information.
National Transport Commission	NTC	Independent statutory body that contributes to the achievement of national transport policy objectives by developing regulatory and operational reform of road, rail and intermodal transport.
Operational Design Domain	ODD	The specific conditions under which a given driving automation system or feature thereof is designed to function, including, but not limited to, driving modes.
Partially automated	-	The automated driving system may take control of steering, acceleration and braking in defined circumstances but the human driver must continue to monitor the driving environment and the driving task, and intervene if required.
Society of Automotive Engineers	SAE	International association for automotive engineers.
Transport and Infrastructure Council	-	Council of Commonwealth, State, Territory and New Zealand ministers with responsibility for transport and infrastructure issues, as well as the Australian Local Government Association.

References

Google. (2016, June). *Google Self-Driving Car Project.* Retrieved August 2016, from https://static.googleusercontent.com/media/www.google.com/en//selfdrivingcar/files/reports/report-0616.pdf

Government of South Australia, Department of Planning, Transport and Infrastructure. (2016). *Driveless Vehicles*. Retrieved August 2016, from http://www.driverlessvehicles.sa.gov.au/

Government of Western Australia: Department of Mines and Petroleum. (2015). *Safe mobile autonomous mining in Western Australia – code of practice.* Retrieved August 2016, from http://www.dmp.wa.gov.au/Documents/Safety/MSH_COP_SafeMobileAutonomousMiningWA.pdf

Japan, National Police Agency. (2016, May). *Guidelines for Public Road Testing of Automated Driving Systems.* Retrieved August 2016, from http://www.npa.go.jp/koutsuu/kikaku/gaideline.pdf

NHVR. (2016). *Heavy Vehicle National Law and Regulations*. Retrieved August 2016, from https://www.nhvr.gov.au/law-policies/heavy-vehicle-national-law-and-regulations

NTC. (2016). *Current projects / Preparing for more automated road and rail vehicles.* Retrieved 2016, from http://www.ntc.gov.au/current-projects/preparing-for-more-automated-road-and-rail-vehicles/

NZ Transport Agency. (2016). *Testing Autonomous Vehicles in New Zealand.* Retrieved August 2016, from http://www.transport.govt.nz/assets/Uploads/Our-Work/Images/T-Technology/Testing-Autonomous-Vehicles-in-New-Zealand.pdf

PC Mag. (2015, October 6). *Daimler Tests Autonomous Truck on Germany's Autobahn*. Retrieved August 2016, from http://au.pcmag.com/cars-products/37671/news/daimler-tests-autonomous-truck-on-germanys-autobahn

Rio Tinto. (2016). *Mine of the Future*. Retrieved August 2016, from Rio Tinto: http://www.riotinto.com/australia/pilbara/mine-of-the-future-9603.aspx

Royal Automobile Club of WA. (2016, August 2016). *Australia's first driverless bus is on the open road*. Retrieved September 2016, from https://rac.com.au/about-rac/media/media-releases/august-2016/australias-first-driverless-bus-is-on-the-open-road

SAE International. (2016a). *Automated Driving: Levels of driving automation are defined in new SAE International standard J3016.* Retrieved August 2016, from http://www.sae.org/misc/pdfs/automated_driving.pdf

SAE International. (2016b). *Guidelines for Safe On-Road Testing of SAE Level 3, 4, and 5 Prototype Automated Driving Systems (ADS)*. Retrieved August 2016, from http://standards.sae.org/j3018_201503/

State of Florida, Department of State. (2016). *State Library and Archives of Florida*. Retrieved August 2016, from http://laws.flrules.org/search/google?cx=011660464153745793162%3Aorhh8qrepy0&cof=FORID%3A11&query=autonomous+vehicles&op=Search&form_build_id=form-6cee4872b279df8b9d664fcf0af43c7b&form_id=google_cse_searchbox_form

State of Nevada: Department of Motor Vehicles. (2016). *Autonomous Vehicles*. Retrieved August 2016, from http://www.dmvnv.com/autonomous.htm

UK Department of Transport. (2015). *The Pathway to Driverless Cars: A code of practice for testing.* Retrieved August 2016, from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/446316/pathway-driverless-cars.pdf

VicRoads. (2016, October). *Testing of automated vehicles*. Retrieved August 2016, from https://www.vicroads.vic.gov.au/safety-and-road-rules/vehicle-safety/automated-and-connected-vehicles/testing-of-automated-vehicles

Wired. (2016, February 29). *Googles self-driving car caused its first crash*. Retrieved August 2016, from https://www.wired.com/2016/02/googles-self-driving-car-may-caused-first-crash/

Submissions to the NTC discussion paper

Name of organisation	Abbreviation	Description
ACT Policing		
Australian Automobile Association	AAA	National peak body for Australia's motoring clubs
Australian Driverless Vehicle Initiative	ADVI	Initiative led by ARRB to support deployment of automated vehicles in Australia (members include vehicle insurers)
Australian Taxi Industry Association	ATIA	The Australian Taxi Industry Association is the national peak representative body for the taxi services industry and the personalised transport sector in Australia.
CARRS-Q		The Centre for Accident Research and Road Safety - Queensland is a research centre established in 1996.
Clayton Utz		Global law firm.
Cohda Wireless		Technology development company.
Commissioner for Privacy and Data Protection	CPDP	Victorian state government commission for information, privacy and data protection.
Department of Infrastructure, Planning and Logistics		Department of the Government of the Northern Territory
Department of Planning, Transport and Infrastructure	DPTI	Department of the Government of South Australia
Department of Transport		Department of the Government of Western Australia
Department of Transport and Main Roads	TMR	Department of the Government of Queensland
Federal Chamber of Automotive Industries	FCAI	National peak body for manufacturers and importers of light vehicles sand motorcycles
Heavy Vehicle Industry Association	HVIA	Peak body for the heavy vehicle industry
Insurance Australia Group	IAG	General insurance group
Insurance Commission of Western Australia	ICWA	Insurance commission
Insurance Council of Australia	ICA	National peak body for the general insurance industry
John Smith		Citizen of Australia

Law Institute Victoria	LIV	Professional association for Victorian solicitors and lawyers
Maurice Blackburn Lawyers		Compensation and social justice law firm
Professor Robert Sparrow		Professor – Monash University
Motorcycle Council of NSW		Council for New South Wales motorcycle clubs, associations and ride groups
National Road Transport Association	NatRoad	Road transport industry association
Northern Territory Police		Police agency of the Northern Territory
Nova Systems		Professional service provider, specialising in the provision of engineering and management services to industry and government.
NSW Taxi Council		The peak body for the NSW Taxi Industry
Office of the Australian Information Commissioner	OAIC	Independent statutory agency within the Australian government.
Optalert		Technology developer
Port of Brisbane		Port operator
Alain L. Kornhauser		Professor Princeton University
QBE	QBE	Insurance provider
Robert Bosch Australia	Bosch	A global supplier of technology and services
Royal Automobile Club of WA (Inc.)	RAC WA	Motoring club and mutual organisation
South Australia Police		Police agency of South Australia
The Law Society of New South Wales		Professional association for NSW solicitors and lawyers
The Motor Accident Insurance Commission	MAIC	Regulatory authority responsible for the ongoing management of the Compulsory Third Party (CTP) scheme in Queensland.
Toll Group		Freight and logistics operator
Toyota Australia	Toyota	Vehicle manufacturer
Transport Certification Australia	TCA	National government body which provides assurance for services for public purposes
Transport for NSW	TFNSW	Department of the New South

		Wales Government
Transurban		Manager and developer of urban toll road networks in Australia and the United States
Truck Industry Council	TIC	Peak body for heavy vehicle manufacturers and distributors
Uber		Mobility provider
Verless		Franklin Regal Pty Ltd, trading as Verless
VicRoads		Road management agency, Victoria
Vitronic Machine Vision Australia	Vitronic	Industrial machine vision manufacturer and provider