



TRUSTED AUTONOMOUS SYSTEMS

Submission to Independent Review of Domestic Commercial Vessel Safety Legislation

30 March 2022

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About Trusted Autonomous Systems (TAS)

Trusted Autonomous Systems Defence Cooperative Research Centre (TAS) is Australia's first Defence cooperative research centre and is uniquely equipped to deliver world-leading autonomous and robotic technologies to enable trusted and effective cooperation between humans and machines. Our aim is to improve the competitiveness, productivity, and sustainability of Australian industry.

Supporting Australia's defence capability

TAS, together with its participants and the Department of Defence, is focused on developing the capacity of Australia's defence industry to acquire, deploy and sustain the most advanced autonomous and robotic technology through:

- delivering world-leading autonomous and robotic defence technologies
- building innovative IP through targeted research and technology programs
- assisting Australian industry to develop new, improved and competitive autonomy technologies
- evaluating the utility of autonomous systems through capability demonstrations.

Supporting assurance and accreditation of autonomous systems

In addition to specific industry-led projects, TAS is undertaking two 'common-good' activities that have broader, non-defence applications. Through these activities TAS will:

- foster ethical and legal research including value-sensitive design
- develop policy pathways for projects and participants
- support development of Queensland air, land and marine ranges for trusted trials, test and evaluation
- establish independent, world-class certification pathways for global industry.

How we work

Trusted Autonomous Systems fosters collaboration between Australia's defence industry and research organisations and aims to increase small and medium enterprise (SME) participation in its collaborative research to improve capabilities of Australia's defence industry. Established under the Next Generation Technologies Fund, with \$50 million invested over seven years, and a \$15 million co-investment from the Queensland State government, TAS aims to deliver trustworthy smart-machine technologies for new defence capabilities based on advanced human-machine teaming.

For additional information on TAS, [click here](#).

VIA ONLINE SUBMISSION

<https://www.infrastructure.gov.au/have-your-say/review-domestic-commercial-vessel-safety-legislation>

Submission in response to the Independent Review of Domestic Commercial Vessel Safety Legislation

To whom it may concern,

Trusted Autonomous Systems (TAS) welcomes the opportunity to make this submission in response to the Independent Review of Domestic Commercial Vessel Safety Legislation.

Through our common good activities, specifically [Activity 2: Assurance of Autonomy](#), TAS is working to enhance Australian capacity for building and employing ethical and trusted autonomous systems across the land, air and maritime domains.

The use of maritime autonomous technology in Australia is growing, with an increasing number of surface and subsurface vessels in use for a range of scientific, commercial and defence purposes such as hydrographic surveying, reef monitoring, hull inspection, surveillance, and mine countermeasures.

Around the world, autonomous vessels of increasing size and complexity are being developed, tested and deployed in a variety of diverse operations. However, progress on the development of an appropriate international standards framework has been slow. For autonomous vessels to be used safely and ethically, and for investment and research to continue, the Australian regulatory framework must be fit for purpose. This means that it must be capable of addressing and anticipating changes to the maritime ecosystem in Australia.

Our submission will focus on the suitability of the National Law in relation to maritime autonomous technology. Accordingly, we make several recommendations in relation to enhancing the flexibility available in the National Law for autonomous vessels to provide suitable test, approval and assurance arrangements; updating key definitions; and amending the 'defence vessel' carve-out.

We also respectfully suggest that the Panel consider whether – in order to adequately address the different risks and requirements of autonomous vessels more broadly - autonomous vessels may be more effectively regulated through a separate regulatory framework.

Addressing these issues will likely encourage the development of, and allow application of, appropriate technical standards, which are currently lacking both in Australia and internationally. To this end, the final part of this submission provides an overview of some of the regulatory tools and initiatives that TAS has led to bridge this gap, and forge greater certainty and clarity for autonomous vessel owners and operators.

TAS would like to remain engaged with AMSA and the Panel during this review process both with respect to this initial submission and any further matters connected with the review concerning autonomous technology. I am TAS' Assurance of Autonomy Activity Lead (Rachel.Horne@tasdcrc.com.au), and am the primary contact for this submission.

Yours sincerely,

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Submission to the Independent Review of Domestic Commercial Vessel Safety Legislation (National Law)

Summary

This submission sets out the key issues with the National Law in relation to autonomous maritime technology, and TAS' recommendations:

Issue 1: The National Law is not equipped to regulate systems

Recommendation: The Panel consider whether a separate regulatory framework – including a separate regulator – is required to effectively regulate autonomous systems.

Issue 2: The National Law lacks the flexibility to accommodate autonomous vessels and other emerging technologies

Recommendations: The Panel consider

- amending the National Law to enable marine orders to determine when a vessel requires a certificate, and which standards apply to the vessel (regardless of whether it requires a certificate)
- amending the National Law to enable marine orders to determine how vessel owners can demonstrate compliance with requirements, and
- amending the National Law Regulations to create greater flexibility in who can be accredited as a marine surveyor, and expanding categories of accreditation in which a surveyor may be accredited to undertake surveys and inspections.

Issue 3: Key National Law definitions are outdated

Recommendations: The Panel consider

- amending the National Law to update the definition of crew and master to more clearly allow for remote operation and supervision of vessels
- amending the definition of 'vessel' in the National Law, and/or
- amending the National Law Regulations to 'carve out' very small vessels

Issue 4: The National Law defence vessel carve-out is not fit for purpose

Recommendation: The Panel consider:

- directly engaging with Warfare Innovation Navy to better understand the issues associated with the National Law approach to 'defence vessel', and the impact on Australia's Defence capability
- alternative approaches to the existing 'carve-out' which would ensure vessels being constructed and tested for defence purposes are captured, and
- seeking advice from AMSA and Office of International Law.

Autonomous vessels – both surface and subsurface - are being used in a range of defence, commercial and research settings. This will continue, likely at an enhanced pace. Where vessels are being operated within Australia's Exclusive Economic Zone, the National Law applies and autonomous vessels will generally be domestic commercial vessels. However, the consequence of the four issues outlined in our submission is that all autonomous vessel owners must seek an exemption to operate. This process is inefficient, opaque, and uncertain, and leads to increased financial and opportunity costs for both vessel owners and for AMSA. It does not recognise or allow

for the importance of appropriate mechanisms for conducting testing, nor does it reflect or support the strategic, regulatory and operational agility that modern defence forces – working closely with diverse industry stakeholders - require. TAS has sought to work in a collaborative manner with government and industry alike to overcome these challenges, including developing regulatory initiatives and tools such as the [Australian Code of Practice for Autonomous and Remotely Operated Vessels](#) and the [COLREGS Operator Guidance Framework](#). However, change is needed at a legislative level to recognise the benefits of autonomous technology, and ensure that it is deployed safely, now and in the future.

Note:

- *This submission is focussed on the National Law. It does not address issues with AMSA marine orders, the National Standards for Domestic Vessels (NSCV) or AMSA policies and guidelines, other than to highlight that changes to the National Law may allow AMSA to more effectively use those mechanisms to regulate autonomous vessels and other emerging technology.*
- *The primary author worked on the legislative reform package of work with the Department in 2020, which outlined the substantive issues related to the National Law and how it treats emerging technology—where possible this submission avoids replicating that work which should be available to the Investigation Panel.*

Issue 1: The National Law is not equipped to regulate systems

The National Law, as with other existing transport safety legislation, does not adequately provide for – and is not necessarily well-suited to – the regulation of systems and the different risks associated with autonomous vessels.

The focus of the National Law is on vessels, operators, and masters and crew, rather than on systems comprised of algorithms, software and data, leaving a significant ‘gap’ in AMSA’s ability to effectively regulate autonomous vessels. There are no standards within the National Standard for Commercial Vessels (NSCV) that deal with these matters. Accredited marine surveyors, who are required to undertake assurance functions under the National Law, including surveys and inspections of vessels, generally do not have the skills, qualification or experience needed to check the safety of software or the performance of algorithms.

Despite this, in regulating autonomous vessels that are domestic commercial vessels, AMSA is and will continue to be required to assess the safety of transport technologies that are fully or partly reliant on algorithms to operate. This poses a range of challenges. For example, automation relies on algorithms, which can be designed to constantly update based on new data through machine learning. If a regulatory agency such as AMSA approves the use of a particular autonomous technology, the underlying code may evolve over time and become entirely different to the initially approved code. It may be difficult to predict – and thus effectively regulate - how a machine learning algorithm will respond to a new environment, or to data in a form it did not encounter during development or testing.

Currently, AMSA is using exemptions to ‘replace’ requirements available under the National Law with more appropriate permissioning and assurance arrangements. However, consideration needs to be given to the futureproofing question of whether, and how, autonomous systems used in the maritime context will be regulated in the medium to longer term. In the land domain, Transport Ministers have agreed that a new ‘Automated Vehicle Safety Law’ (AVSL) – separate from existing legislation - will come into force in 2026 that will regulate the entities responsible for automated driving systems (ADSEs) through a new national regulator. There will also be a new self-certification approach for safety at first supply that is intended to be sufficiently flexible to ensure that design rules are updated expeditiously to include new international standards for automated vehicles as they are made.

Broadly, a separate regulatory framework, including a separate regulator, for ‘automated’ or ‘autonomous’ systems may provide the opportunity to address corollary issues – such as data collection and use, and privacy – in a consistent manner. Further consideration of this issue is available in the Resources section of this submission, specifically the paper “Autonomous and Remotely Operated Vessels: 2021 to 2040”.

Recommendation: That the Panel consider whether a separate regulatory framework – including a separate regulator – is required to effectively regulate autonomous systems.

Issue 2: The National Law lacks flexibility to accommodate autonomous vessels and other emerging technologies

The lack of flexibility available in the current regulatory approach causes a reliance on exemptions, which is not a suitable way to regulate beyond providing short term relief, facilitating temporary operations, or for very novel vessels.

Autonomous vessels are designed, constructed and equipped on the basis that they typically operate with no crew or passengers on board, or with 'optional crewing'; the vessel may be operated or supervised by a human operator; and sometimes work in 'swarms' where multiple vessels work together. As a result of iterative development, where a platform may only exist for six months before the next iteration supersedes it, some vessels may only operate for a short period so that they can be tested. People and organisations with a range of different expertise may be needed to design, build, equip and inspect or review autonomous vessels and systems.

Vessel owners wishing to invest in autonomous technology, or expand the size of their fleet, require a level of regulatory certainty in terms of the time and cost associated with compliance. Accordingly, for the growing maritime autonomous technology sector, it is problematic that the starting position for all vessels is that, under the National Law, an autonomous vessel must have a certificate of survey, certificate of operation, and be crewed by persons holding the required certificate of competency.

These certification requirements impose obligations on operators to meet technical standards that are not suited to autonomous systems or operations, and demonstrate compliance with those standards through the use of accredited marine surveyors or recognised organisations. For example, physical sea trials are conducted under the supervision of an accredited marine surveyor as part of an initial survey process as part of obtaining a certificate of survey.

This approach, and the survey process it entails, was fit for purpose when most vessels were 'traditional' or 'conventional' vessels, built to be 'in-service' for years or decades, with human operators, able to meet contemporary design, construction, survey and equipment requirements. However, it is not suited to autonomous vessels. As a result of the National Law requiring that all vessels must have a certificate of survey and certificate of operation, delegated legislation, such as AMSA marine orders, cannot operate to 'exempt' vessels from these requirements.

As such, where an autonomous vessel or its proposed operation is unable to meet the criteria for the issue of a certificate, or meet conditions imposed by the certificate, the owner is reliant on AMSA issuing an exemption. AMSA must not issue an exemption where – together with conditions – doing so would jeopardise safety. This can lead to a time-consuming process that is driven by the absence of approved alternative standards, requiring vessel owners and AMSA to identify suitable requirements on a case by case basis. This can be particularly challenging for vessel operators who are testing vessels, as they have to obtain multiple exemptions or approvals without any set of cohesive requirements or guidelines to reference.

We note that the Defence regulatory framework takes the opposite approach. Under the National Law, the starting point is that an operator must comply with certification requirements unless exceptional circumstances apply. By contrast, Defence allows the Capability Manager for a vessel propose the specific standards and requirements that it will comply with in order to be seaworthy, and operate safely. In essence, this approach starts with the vessel and operational need, and then builds in the regulatory 'scaffolding' to increase the likelihood of good safety outcomes.

Allowing marine orders, which are made by AMSA's CEO, to determine matters such as when a vessel requires a certificate, and who can survey or inspect a vessel or its systems and subsystems, may allow AMSA to be more responsive to autonomous and other emerging technology in the short to medium term. This change would improve the efficiency of the regulatory framework, thereby alleviating the current resource burden imposed on autonomous vessels operators and on AMSA.

Recommendation: That the Panel consider

- amending the National Law to enable marine orders to determine when a vessel requires a certificate, and which standards apply to the vessel (regardless of whether it requires a certificate)
- amending the National Law to enable marine orders to determine how vessel owners can demonstrate compliance with requirements, and
- amending the National Law Regulations to create greater flexibility in who can be accredited as a marine surveyor, and expanding categories of accreditation in which a surveyor may be accredited to undertake surveys and inspections.

Issue 3: Key National Law definitions are outdated

The definitions in the National Law were not drafted in contemplation of autonomous vessels, which has limited the ability of the National Law to take a risk-based approach to autonomous vessels

'Crew' and 'master'

The definitions of 'crew' and 'master' are

***crew** of a vessel means individuals employed or engaged in any capacity on board the vessel on the business of the vessel, other than the master of the vessel or a pilot*

***master** of a vessel means the person who has command or charge of the vessel, but does not include a pilot*

Importantly, the definition of 'crew' in the National Law refers to a person being on board a vessel. Consequently, AMSA's policy approach to date is that autonomous vessel operators cannot obtain a certificate of operation – which requires compliance with minimum crewing requirements, among other things – without an exemption from marine order requirements. It is unlikely that the phrasing used in the definition of 'crew' was intended to contemplate remotely operated and autonomous vessels, but it is now having a direct impact on those vessels.

By contrast, the definition of 'master' refers to a person, but does not include reference to them being on board the vessel. However, AMSA has, to date, not accepted that a master supervising an autonomous vessel remotely can be considered to meet minimum crewing requirements where the crewing requirement for the vessel is '1' (i.e. for a vessel less than 12m in length).

As a consequence of the definitions of 'crew' and 'master', key mechanisms within marine orders do not appropriately address the risks of autonomous operations. For example:

- the requirement for vessel owners to undertake an 'appropriate crewing evaluation' as a condition of a certificate of operation is unhelpful for autonomous vessel owners, as the factors they must have regard to assume persons will be on the vessel, and
- to the extent a master and crew are required to have a certificate of competency, marine orders do not allow certificate holders to perform functions and duties from shore, nor do they prescribe qualifications or competencies needed to remotely supervise or operate a vessel remotely

Amending these definitions to provide for the remote operation and supervision of vessels (including multiple vessels) would allow for the risks associated with autonomous vessel operations to be appropriately addressed through marine orders.

‘Vessel’ and ‘domestic commercial vessel’

The definitions of ‘vessel’ and ‘domestic commercial vessel’ are

***vessel** means a craft for use, or that is capable of being used, in navigation by water, however propelled or moved, and includes an air-cushion vehicle, a barge, a lighter, a submersible, a ferry in chains and a wing-in-ground effect craft.*

The National Law Regulations also provide that a specified ‘thing’ or ‘class of things’ will, or will not, be a vessel.

***domestic commercial vessel** means a vessel that is for use in connection with a commercial, governmental or research activity.*

The definition goes on to provide that

- a vessel will not be domestic commercial vessel if the vessel is a defence vessel
- the National Law Regulations may provide that a specified thing, or a specified class of thing, is or is not a domestic commercial vessel, and
- a vessel in the course of construction is a domestic commercial vessel if the vessel is, after completion, for use as a domestic commercial vessel.

Clearly, the definition of ‘vessel’ and ‘domestic commercial vessel’ are very broad. As a result, the operation of these definitions has been to include objects or things which a reasonable person would be unlikely to consider a ‘vessel’ – as domestic commercial vessels. These include, for example, 1m in length submersible equipment used for scientific research activities. To date, AMSA has exempted these vessels from the requirements of the National Law, given the very minor risk that they pose to marine safety. This process is time consuming and expensive for both AMSA and vessel owners, for little safety benefit.

However, these ultra-small vessels could be excluded from National Law requirements entirely by including additional characteristics that define what a vessel is. Alternatively, small vessels could be excluded from the National Law through amendments to the National Law Regulations by

- providing that certain kinds of very small ‘things’ will not be a vessel for the purposes of the National Law, or
- providing that a vessel will not be a domestic commercial vessel where it is a very small vessel being used for scientific research. This could be limited to vessels being used by certain research institutions.

Recommendations: The Panel consider

- amending the National Law to update the definition of crew and master to allow for remote operation and supervision of vessels (including multiple vessels)
- amending the definition of ‘vessel’ in the National Law, and/or
- amending the National Law Regulations to ‘carve out’ very small vessels

Issue 4: The National Law defence vessel carve-out is not fit for purpose

The defence vessel 'carve-out' is not fit for purpose for the current operating environment where Defence relies heavily on industry for iterative technology development and operation for use in increasingly diverse settings. Autonomous vessels and systems present important capability opportunities for Defence, and the regulatory framework needs to facilitate rather than impede this.

As noted above, a vessel will not be a domestic commercial vessel if it meets the definition of 'defence vessel', which is defined as

defence vessel means:

- (a) a warship or other vessel that:
 - (i) is operated for naval or military purposes by the Australian Defence Force or the armed forces of a foreign country; and
 - (ii) is under the command of a member of the Australian Defence Force or of a member of the armed forces of the foreign country; and
 - (iii) bears external marks of nationality; and
 - (iv) is manned by seafarers under armed forces discipline; or
- (b) a Government vessel that is used only on government non-commercial service as a naval auxiliary.

A similar carve-out exists for 'naval vessels' under the *Navigation Act 2012*.

The defence vessel 'carve-out' recognises that vessels used for Defence purposes can be best regulated by Defence rather than by AMSA. However, this approach appears to be premised on an assumption that defence vessels will always be built and operated as 'traditional vessels', and they will generally continue to meet the definition of 'defence vessel' for the life of the vessel, or will only rarely be operated as domestic commercial vessels.

In fact, Defence funds and works with numerous industry participants to develop a range of different vessels and platforms, which are intended for Defence purposes and use. Defence vessels are increasingly used in a diverse range of operational settings. However, these vessels do not fit the defence vessel carve-out as it is currently defined. This is usually because they are being constructed and tested by commercial organisations, and/or they are being operated by civilians and generally do not bear external marks of nationality – meaning they must comply with National Law requirements for domestic commercial vessels, which is not well-suited to either autonomous vessels, or the mission-specific needs of Defence operations.

The current defence vessel 'carve-out' is creating uncertainty about the regulatory requirements that apply to vessels being used in a Defence context, by both Defence and the commercial industry seeking to support the development of Defence capability. This uncertainty stifles Defence's operational agility and capacity to collaborate with industry in relation to the development and operation of new technology.

Advancing National Law amendments that allow flexibility in the approval and assurance of autonomous vessels may operate to address this issue, at least in part. However, it may be more effective to also expand the Defence vessel 'carve-out' to vessels that are constructed with the intention that they will be used by Defence, or which are being operated under instruction from, or for the purposes of, Defence. This would also operate to reduce uncertainty for defence industry, and enable capability development focussed on Defence needs and risk management practices rather than commercial safety factors, which typically present different in autonomous vessels anyway.

The exact way to implement a change of approach to the carve-out of defence vessels from the National Law is a legal drafting question. For the Panel's purposes, we respectfully submit that you consider and identify whether there is a need for a change of approach, and the outcomes that need to be achieved.

Note: there are potential international law implications that need to be further investigated before amending the defence vessel 'carve outs', noting that they are based on the definition of 'warship' in article 29 of the [United Nations Convention on the Law of the Sea](#). Advice should be sought from AMSA and from the Office of International Law within the Commonwealth Attorney-General's Department on this matter.

We also recommend that the Panel engage directly with Warfare Innovation Navy to better understand the impact of the National Law on the development of new Defence capability, and what changes would make it more suitable for them and for the commercial industry participants that they fund. TAS would be pleased to facilitate an introduction on request.

Recommendation: That the Panel consider:

- directly engaging with Warfare Innovation Navy to better understand the issues associated with the National Law approach to 'defence vessel', and the impact on Australia's Defence capability
- alternative approaches to the existing 'carve-out' which would ensure vessels being constructed and tested for defence purposes are captured, and
- seeking advice from AMSA and Office of International Law.

Overview of TAS regulatory tools and initiatives

TAS has sought to respond constructively to the absence of a fit for purpose regulatory framework for autonomous vessels in Australia. Below is a description of some of the key tools and initiatives that TAS is leading to overcome limitations in the National Law. These are designed to both aid stakeholders in identifying the requirements that apply to their vessel and operation, and how they can demonstrate compliance with those requirements.

Project	Outcome	Impact
Australian Code of Practice	Introduce tailored standards for autonomous vessels suitable for the Australian operating environment	<ul style="list-style-type: none"> <input type="checkbox"/> Create clarity, consistency and efficiency for operators and AMSA, lowering time spent on regulatory processes and the associated resource burden <input type="checkbox"/> Support innovation and technology development and uptake in Australia <input type="checkbox"/> Support the development of Australian sovereign capability <input type="checkbox"/> Support the development of improved regulatory frameworks, approaches and processes for autonomous technology
Guidance Materials for Australian Code of Practice	Assist industry to understand how to apply the Australian Code of Practice, and how to work through regulatory processes	
COLREGs Operator Guidance Framework	Make it easier to understand COLREGs, which rules apply for specific vessels and operations, the capabilities required to comply, and how to demonstrate compliance	
BRIL Challenge Feasibility study: ASSURED-M Platform	Identify the assurance requirements for autonomous vessels and use a technology-enabled systems engineering approach to help operators access, understand, and undertake them. Explore the use of simulation as an assurance mechanism	
Safety Assurance Framework for Autonomous Systems	Provide a tailored Safety Assurance Framework that addresses the complexities introduced by autonomous systems	
RAS GATEWAY	Provide an online portal for autonomous vessel stakeholders to access regulatory information, resources, and support	
Proposal to set up Trusted Autonomous Systems Advisory (TASA)	A new business unit within TAS to provide regulatory support services for commercial and defence stakeholders, and to contribute to regulatory reform for autonomous technology	

Conclusion

TAS wishes to recognise AMSA's significant efforts in seeking to work closely with industry to overcome the limitations of the National Law, and identify more appropriate approval and assurance arrangements for autonomous vessels. However, we think that if Australia is to fully recognise the benefits that autonomous technology can bring – be it in Defence, industry or research spheres – a regulatory framework that does not regulate autonomous vessels and other new and emerging technologies on a 'by exception' approach is essential. While the regulatory framework is only one part of the autonomous ecosystem, the development of fit for purpose regulatory infrastructure would provide an important signal to stakeholders that they can plan for and invest in autonomous vessels with confidence.

Australia has been lauded for its regulatory preparedness in the context of automated vehicles, and we encourage the Panel to closely consider the key aspects of the future AVSL and learnings that could be applied to a future domestic maritime safety framework.

TAS thanks the Panel for considering this submission, and would be pleased to provide any further detail that the Panel may require in the conduct of its review.