Consultation Feedback Report

Outcomes of public consultation on the draft *Australian Code of Practice for the Design, Construction, Survey and Operation of Autonomous & Remotely Operated Vessels*

15 November 2021 – 15 December 2021

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Cover of the Code: Photo of Australian Institute of Marine Science (AIMS) weather station at Davies Reef. Photo courtesy of AIMS.

List of Acronyms

Acronym	Name or phrase
AI	Artificial Intelligence
AMSA	Australian Maritime Safety Authority
ASV	Autonomous surface vessel
AUV	Autonomous underwater vessel
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea, 1972
IMDG Code	International Maritime Dangerous Goods Code
NOHSC	National Code of Practice for the Storage and Handling of Workplace Dangerous Goods
NSCV	National Standard for Commercial Vessels
OROV	Observation class remotely operated underwater vehicles
RAS-AI	Robotics, Autonomous Systems and Artificial Intelligence
ROV	Remotely operated vessel

Executive summary

This document outlines the results of public consultation conducted by Trusted Autonomous Systems (TAS) on the draft Australian Code of Practice for the Design, Construction, Survey and Operation of Autonomous & Remotely Operated Vessels ('Australian Code of Practice').

The draft Australian Code of Practice, which was informed by significant stakeholder engagement, was published on the TAS website for public consultation on Monday, 15 November 2021 for a four-week period, closing on Wednesday, 15 December 2021. The consultation explanatory materials provided information on the draft Code and asked stakeholders to respond to several specific questions.

TAS received seven written submissions from a diverse range of stakeholders, include SMEs developing vessels, government departments and Recognised Organisations. TAS thanks all stakeholders for taking the time to review the draft Code and make submissions.

The submissions received were considered, and further was advice sought from third parties assisting with the project where needed, to determine where changes were required to the Code. Examples of the changes made to the Code post-consultation include:

- the accuracy of sensors is now required to be determined and declared, and their performance is required to be monitored. This will help to ensure that vessels do not operate in conditions where the sensors are not sufficiently effective, or when sensors cease to be sufficiently effective;
- the control system must now be able to be disabled and isolated to allow for inspection and maintenance activities;
- for survey-exempt vessels and vessels in survey, the risk assessment of any novel system must now be reviewed by an accredited marine surveyor or Recognised Organisation. A note has been added which provides that review by a competent person may be sufficient for a survey-exempt vessels where the vessel, due to its size, speed and shape, poses a very low risk to the safety of persons and other vessels should a failure occur;
- for survey-exempt vessels and vessels in survey, tests or trials must now be witnessed by an accredited marine surveyor or Recognised Organisation. A note has been added which provides that a competent person witnesses the tests or trials may be sufficient for a survey-exempt vessels where the vessel, due to its size, speed and shape, poses a very low risk to the safety of persons and other vessels should a failure occur;
- improved alignment of the Code with the *AMSA Guidance Notice – Small unmanned autonomous vessels*, including changing the guidance on the operational speed permitted for survey-exempt vessels from 12 knots to 10 knots.

Once the necessary changes were made to the Code, the updated draft was provided back to AMSA for further review, before confirming it was ready to be finalised as Edition 1.

TAS welcomes ongoing feedback from users of the Code, which will support further future iterations and improvements.

Background: Questions posed for public consultation

While all feedback on the Australian Code of Practice was welcome, specific questions were posed in relation to the following areas.

General questions:

1. Are there any key areas of requirements you think are missing?
2. Do you agree with the three vessel categories and the scope of vessels in each category?
3. Are there any areas of the draft Code where you think the risk does not justify the obligation/s being imposed?
4. Are there any areas of the draft Code where you think the obligation/s being imposed does not adequately address the risk?
5. What sort of guidance materials would be helpful to enable you to understand and use the Australian Code of Practice?

Technical questions (included in the draft Code of Practice):

The following questions are included in boxes in the draft Code of Practice.

Chapter 2: Autonomous Marine Equipment:

1. Would it be appropriate for autonomous marine equipment to display international maritime signal flags to inform other waterway users? If so, which flags?

2. (A) Should the Australian Code of Practice identify lights or flags that should be displayed on the vessel in order to indicate:
    - that the vessel is operating autonomously?
    - that the vessel is being controlled remotely?
    - that the vessel has been disabled or is in a failure mode?

    (B) If so, what lights and/or flags should be specified for each mode?

Chapter 3: Survey-exempt Vessels

3. Should all operators be required to hold a Coxswain 3 certificate at minimum?

4. Is clause 3.1(4)(b) appropriate?

    Clause 3.1(4)(b) states that a vessel which operates beyond 500m below the surface, or beyond expected communication links with the control station or any support vessel, may not come within the 'survey-exempt' category.

    The purpose of this arrangement is to ensure that the risks of a sub-surface vessel operating beyond communication links or beyond specified depths are managed through the higher standards that apply to vessels in survey, and through a survey process, which provides independent verification that the vessel is constructed to the required standard

5. *Table 3: Minimum design, construction, verification and operational requirements for survey-exempt vessels,* Fire equipment
    When should the fire safety requirements apply to battery powered vessels?

6. *Table 3: Minimum design, construction, verification and operational requirements for survey-exempt vessels,* Anchor or station keeping systems:
   (A) Should a standard apply to station keep systems?
   (B) If so, what standard?

7. *Table 4: Design, construction, survey, verification and operational requirements for vessels in survey*, Arrangement, accommodation and personal safety
   Should any other aspects of NSCV Section C1 apply to a surface vessel which is not built to accommodate persons, but which may have persons on board while docked, for example, to secure cargo, carry out maintenance and so on?
   In particular, should any aspects of Chapter 5 (Access, escapes and evacuation) or Chapter 6 (Personal safety) of NSCV Section C1 apply?

Chapter 14: Operations

8. Should all operators be required to hold a Coxswain 3 certificate at minimum?

Impact of public consultation

TAS received seven written submissions from a diverse range of stakeholders.

The submissions received were considered, and further advice was sought from third parties assisting with the project where needed, to determine where changes were required to the Code.

Changes made to the Code were as follows:

- the requirement for sub-surface vessels which are capable of operating more than 500m below the surface to be in survey was removed;
- the name of the 'autonomous marine equipment' category was changed to 'autonomous and remotely operated marine equipment';
- a note was included upfront in the Code to clarify that tethered vessels may not be considered to be domestic commercial vessels. As such, the specific risks of tethered vessels have not been considered in the Code of Practice, which is informative for these vessels only;
- for a vessel, not built to carry persons, but which may have persons on board while docked or at other times, changes were made to require the vessel to be safe for those persons. In particular, these vessels are now required, under the Code, to comply with the required outcomes of NSCV Section C1 covering access, exits, escapes and evacuation and personal safety. In addition, the vessel's safety management system is now required to address the safety of persons on board for limited operations, such as carrying out repairs;
- the accuracy of sensors is now required to be determined and declared, and their performance is required to be monitored. This will help to ensure that vessels do not operate in conditions where the sensors are not sufficiently effective, or when sensors cease to be sufficiently effective;
- clarifications were made to help ensure that on board control can be initiated in certain circumstances, and to require consideration to be given to procedures for alerting persons on board the vessel of communication system issues and other relevant events;
- the control system must now be able to be disabled and isolated to allow for inspection and maintenance activities;
- for vessels powered by batteries or novel fuels, the following clarifications were made:
    - for vessels in survey, the vessels may be considered to be novel vessels by AMSA, and battery and novel fuel arrangements may need to be certified by a Recognised Organisation;
    - for survey-exempt vessels, the fire safety risks of batteries installed on the vessel, and the charging arrangements for the battery, must be assessed and addressed in line with an appropriate national or international standard, or the requirements of a Recognised Organisation, and a risk assessment. This must include appropriate arrangements for battery housing, ventilation and fire detection and extinguishing systems. In addition, it is noted in the Code that advice from AMSA should be sought on the verification and certification requirements for vessels powered by a battery or novel fuels;
- for survey-exempt vessels and vessels in survey, consideration must now also be given to the certification of novel systems and their components in the risk assessments for the novel systems;

- configuration control is now an aspect to be covered in the software development standard applied;
- standards now also apply to the development of complex electronic hardware;
- for vessels in survey, the display of essential information in the control station must now comply with the NSCV requirements for the operating station;
- for survey-exempt vessels and vessels in survey, the risk assessment of any novel system must now be reviewed by an accredited marine surveyor or Recognised Organisation. A note has been added which provides that review by a competent person may be sufficient for a survey-exempt vessels where the vessel, due to its size, speed and shape, poses a very low risk to the safety of persons and other vessels should a failure occur;
- for survey-exempt vessels and vessels in survey, tests or trials must now be witnessed by an accredited marine surveyor or Recognised Organisation. A note has been added which provides that a competent person witnesses the tests or trials may be sufficient for a survey-exempt vessels where the vessel, due to its size, speed and shape, poses a very low risk to the safety of persons and other vessels should a failure occur;
- survey-exempt vessels and vessels in survey must now have a vessel maintenance and repair plan which ensures ongoing compliance to the Code;
- it has been clarified that an exemption issued by AMSA will be required in order to operate autonomous and remotely operated marine equipment without a commercial qualification;
- for survey-exempt vessels, the crew certification requirements have been aligned with the National Law requirements for domestic commercial vessels. A note has been added that exemptions from these arrangements on a case-by-case basis can be sought from AMSA; and
- all appropriate licences must be held for situational awareness and communications equipment.

A large number of minor changes have also been made to the Code as a result of the feedback, including:

- changes to definitions, such as the definition of ‘operator’ and ‘safe state’;
- additions to the required capabilities of the control system, including the ability to determine nearby shipping channels, nearby Green Zones and other areas of interest;
- the referencing of additional guidance materials and relevant standards in notes.

In addition, some changes have been made to the Code to better align the Code with the *AMSA Guidance Notice – Small unmanned autonomous vessels*. This includes changing the guidance on the operational speed permitted for survey-exempt vessels from 12 knots to 10 knots.

Consultation feedback and outcomes table

The following table details all feedback received on the Code of Practice, including answers to the specific questions posed to stakeholders and the outcome of each question/comment.

Issue	Submissions / Comments	Discussion	Outcome
GENERAL COMMENTS			
Breadth of Code of Practice	My main concern relates to the wide range of vehicles that this document attempts to address, ranging in mass from a few kilograms to multiple tons. It is not possible to practically address requirements of all classes and consideration should be given creating separate documents for specific vessel types.	The Code of Practice does cover a very large range of vessels, however the vessels are divided into three categories based on risk, and the Code also relies significantly on risk assessment processes to determine the appropriate requirements – particularly for the novel aspects of vessel (control, communications, navigation). Under this approach, the requirements are tailored to the risks of a particular vessel and its operations. As autonomous and remotely operated vessel technology continues to develop and mature, and a greater understanding is obtained of the risks of these vessels, it is likely that tailored standards will be developed in the future for different classes of autonomous and remotely operated vessel.	No changes to the Code.
Requirements are too onerous and not risk-based	COLREGs, Commercial Vessel requirements and SOLAS are all based on preventing loss of life and injury at sea. These regulations have been continuously updated after marine disasters. They have essentially evolved to mitigate the risk of loss of life at sea. The draft code interprets existing regulations without review of the risk some of these regulations are designed to mitigate. Uncrewed vessels present their own challenges and do not share all of the same risks as crewed vessels. Any new guidelines should be risk-based to ensure the application of the guidelines achieves the desired risk reduction outcome. This is called “effectiveness of controls”.	The commercial vessel requirements applied in the Code of Practice are also designed to protect other vessels, other persons on the water, and the environment. An autonomous or remotely operated vessel sinking or catching fire poses an environmental risk, as well as a safety risk to third parties. Autonomous and remotely operated vessels also need to comply with COLREGs in order to prevent loss of life on other vessels. The Code of Practice relies significantly on safety management system and risk assessment processes to determine the appropriate	No changes to the Code.

Issue	Submissions / Comments	Discussion	Outcome
	For example, the requirements for survey are designed to ensure that crewed vessels are safe for humans to venture to sea. Transferring this requirement to uncrewed vessels achieves what? There is no one on board. An ASV or ROV catching fire or sinking presents a fraction of the safety risk presented by a crewed vessel sinking or on fire. What is risk to persons that marine survey of uncrewed vessels is attempting to mitigate? There is a cost to the industry and a hurdle to development and implementation that every requirement in this draft code represents. It is essential that this cost is justified by an appropriate and effective risk reduction.	requirements – particularly for the novel aspects of the vessels (control, communications, navigation). Under this approach, the requirements can be tailored to the risks of a particular vessel and its operations.	
	This is quite comprehensive, and in general I think a few too many requirements if anything. As identified in the preamble these vehicles are not mature and the technology will develop considerably in the next 5 years. As such it's vital the regulations remain light and flexible to accommodate this need but that we also engage in strong community engagement and data collection to extract learnings through operations. It might be appropriate in reducing regulatory requirements to replace this will operational self-reporting which would prove invaluable to generating new rules which are more fit for purpose for Australia.		
	Generally, I feel this effort and draft code was well done and aligned in many ways to the comments provided during the various workshops. I do however still find the number of requirements for category 1 and 2 vessels quite disconcerting. As you can appreciate this is a rapidly evolving space with drastically changing technologies and approaches. Applying such a restrictive framework to a non-mature field will stifle innovation, prevent Australian agencies from growing investments in this area, scare away international investors and in some instances prevent Australian agencies from operating vehicles from overseas. The initial review of international frameworks focused on the most restrictive jurisdictions in which this problem is		

Issue	Submissions / Comments	Discussion	Outcome
	playing out in real time. The majority of the innovation remains in the US and similar jurisdictions which have taken the deliberate choice to adopt a very light weight regulatory approach. It may have been helpful if these approaches were also considered in contrast to say the UK code. While I appreciate the need to manage safety, I feel we should keep requirements to a minimum but engage in strong monitoring and reporting so we can learn as the technology evolves and be in a position to respond with addition of new requirements. The reality is that the Australian EEZ is huge, and many operations for say research occur in areas with very minimal public interaction and as such pose very limited risks. This approach combined with the uncertainly/ambiguity around AMSAs approach has already resulted in lost investment for Australia with a number of marine autonomy initiatives moving to New Zealand and other jurisdictions.		
Alignment with existing standards	Overall, the Code of Practice is a well-constructed document that shows alignment with existing standards. This is important for transitioning existing surveyor and marine operator skillsets to the new considerations associated with RAS-AI systems.	The intention for the Code of Practice was to align with Australian regulatory requirements for domestic commercial vessels as far as possible and appropriate. This will more easily allow the vessels to achieve Australian certification and permission to operate.	No changes to the Code.
Reliance on existing standards	One risk we face of transitioning regulations associated with crewed vessels to uncrewed vessels is inadvertently missing a bespoke hazard associated with uncrewed vessels. Battery management is one example, but there are likely others such as surrounding the safe implementation and maintenance of on-board decision making. The Code may end up looking less like existing standards once complete due to the natural differences in safe operation and construction.	Under the draft Code of Practice, the bespoke risks of autonomous and remotely vessels are managed through risk assessment and safety management processes. As autonomous and remotely operated vessel technology continues to develop and mature, and a greater understanding is obtained of the risks of these vessels, it is likely that tailored standards will be developed in the future for different classes of autonomous and remotely operated vessel.	No changes to the Code.
Non-alignment with US and European requirements	The design requirements are not aligned with US or European requirements for which the majority of commercial systems are designed. Imposing additional and highly specific design considerations including	The intention for the Code of Practice was to align with Australian regulatory requirements for domestic commercial vessels as far as possible and appropriate. This will more easily allow the	No changes to the Code.

Issue	Submissions / Comments	Discussion	Outcome
	provision or lights, independent comms systems, redundancy etc, are difficult for non-Australian sourced systems and greatly will limit the ability to source cost-effective platforms from these vendors which are not otherwise specially designed for the Australian market.	vessels to achieve Australian certification and permission to operate. However, the requirements for autonomous marine equipment are intended to be flexible, given the lower risks of these vessels, and are largely based on a safety management system approach.	
The Code needs to be flexible	This is a rapidly maturing area and for categories 1 and 2, as much flexibility as possible should be given to allow for a range of potential vehicle configurations and operating modes. As autonomous and remotely operated technologies are rapidly evolving, we recommend that the code of practice is less prescriptive, more accessible to non-maritime qualified personnel (who will likely be the operators of these units) and adaptable to emerging technologies.	The requirements for categories 1 and 2 are intended to be flexible and largely based on risk assessments and safety management systems, particularly for the novel aspects of the vessel where the technology is developing rapidly (control, communications, navigation).	No changes to the Code.
Application of non-maritime standards	The document does not appear to take into account other standards that currently exist, for examples commercial diving and aerial drone standards. Aspects of these also impact the operation of some vehicles.	Commercial diving and aerial drone standards may be relevant to the operations of small subsurface autonomous or remotely operated marine equipment, and could inform the safety management system developed in accordance with the Code of Practice to address the risks of these vessels.	No changes to the Code.
Potential for new vessels classes	Current legislation incorporates specifies a number of vessel classes. One approach would be to create a new class (class 5?) – Uncrewed and Autonomous Vessels. This new class of vessel would then have an area of operation determined by the capability of communications & telemetry and level of redundancy. For example: - 5A unlimited (ocean going requires global coms and telemetry) & adequate redundancies - 5B Within the EEZ. Vessel must be able to send receive within 200nm and stipulated redundancies	Comments noted. The Code of Practice relies on the NSCV, which applies risk-based design, construction and equipment requirements based on the A to E operational areas, similar to that proposed in the comment. Modifying the NSCV requirements further for autonomous vessels could occur in the future, as the technologies supporting autonomous and remote operation of vessels continues to develop. The comment will be brought to AMSA's attention.	No changes to the Code.

Issue	Submissions / Comments	Discussion	Outcome
	- 5C Within 50nm or 30 as determined by AMSA must be able to send receive and the stipulated redundancies - 5D Within the confines of Smooth Partially Smooth Waters must be able to send receive and the stipulated redundancies - 5E Within the confines of the inland water ways Additionally, if operating from a mother ship much like a tender you could have lesser requirements due to operating within the proximity of and under the command of a mothership.		
Minimise risk so far as reasonably practicable	Comment on 1.2(4): The intent of this provision is not clear. Are you saying if the risks are the same the outcomes should be the same, or that the outcomes should be the same regardless of the risks (the latter is more common, eg IMO MASS should be no less safe than manned vessels). If the former then an assessment of equivalence is difficult because the standards for crewed vessels don't always identify the risks that they address.	Provision should be modified to clarify that equivalent outcomes to the standards that apply to conventional crewed vessels must be achieved.	Modify provision to clarify that equivalent outcomes to the standards that apply to conventional crewed vessels must be achieved.
APPLICATION OF CODE TO SMALL REMOTELY OPERATED VESSELS AND TETHERED VESSELS			
Observational class remotely operated underwater vessels	The code of practice cannot be practically applied to observation class remotely operated underwater vehicles (OROVs). One option is to exempt OROVs from the code of practice however our preference is that a fourth vessel category is created for OROVs (and similar vessels) based on their risk profile and operating characteristics.	OROVs are captured in the three vessel categories. The appropriate category depends on the size and operations of the OROV – however, for most OROV, it is expected that they would fall into the autonomous marine equipment category. Note that 'autonomous marine equipment' also captures remotely operated marine equipment. This will be made clearer by changing the name of the autonomous marine equipment category. The requirements for autonomous marine equipment are based around a safety management system. In addition, tethered vessels may not be considered to be 'domestic commercial vessels'	Change name of 'autonomous marine equipment' category to 'autonomous and remotely operated marine equipment'.
	OROVs did not appropriately fit into any of the three vessel categories. They most closely align with the Autonomous marine equipment category, however our preference is that a separate category be created for OROVs rather than attempt to modify the scope of the autonomous marine equipment category to include OROVs.		

Issue	Submissions / Comments	Discussion	Outcome
	OROVs have similar operating characteristics and present a similar risk profile as divers (with recognition of the differences regarding diver safety considerations). They operate in a limited area and spend a majority of time underwater. Therefore, OROVs should have requirements that align with divers; use of flags and communication to waterway managers where appropriate. Many OROVs have limited ability to include additional hardware as they are designed to be light, compact and manoeuvrable. Installation of suggested hardware e.g. communication redundancies, lights, flags will likely impact negatively on operational performance and in some cases affect operator manual handling procedures.	under the National Law Act – advice from AMSA should be sought on this. The Code is predominately designed for domestic commercial vessels and the Code of Practice does not consider the specific requirements for, and risks of, tethered vessels. This includes consideration of the use of diver down flags on the parent vessel for the operations of a tethered vessel. Under Australian law, COLREGs applies to all vessels when they are operating on the surface. The Code of Practice cannot exempt vessels from the requirements of COLREGs. The difficulties of some small marine equipment in complying with COLREGs is noted, and future amendments to COLREGs may provide more viable options for these vessels.	
Tethered vessels	It is unclear where tethered vessels sit in the Code. The Code does not contain approach requirements for tethered vessels. Tethered vessels, such as tethered ROVs should be excluded from the Code.	Tethered vessels may not be considered to be 'domestic commercial vessels' under the National Law Act – advice from AMSA should be sought on this. The Code is predominately designed for domestic commercial vessels. As tethered vessels are unlikely to be considered to be domestic commercial vessels, the Code of Practice does not consider the specific requirements for, and risks of, tethered vessels. However, some aspects of the Code may be informative for tethered subsea ROV. The 'autonomous marine equipment' category also includes remotely operated marine equipment. This will be made clearer by changing the name of the autonomous marine equipment category.	Include a provision or note upfront in the Code to clarify that tethered vessels may not be considered to be domestic commercial vessels. As such, the specific risks of tethered vessels have not been considered in the Code of Practice, which is informative for these vessels only. Change name of 'autonomous marine equipment' category to 'autonomous and remotely operated marine equipment'.
Small unmanned surface vehicles that are remote controlled	It is unclear where small unmanned surface vessels, such as those used to control small subsea ROV and those used for Bathometric Surveys fit in the Code.	These vessels are captured in the three categories. They would most likely fall within the autonomous marine equipment category. The 'autonomous marine equipment' category also captures remotely operated marine equipment. This will be made clearer by	Change name of 'autonomous marine equipment' category to 'autonomous and remotely operated marine equipment'.

Issue	Submissions / Comments	Discussion	Outcome
		changing the name of the autonomous marine equipment category.	
AUTONOMOUS MARINE EQUIPMENT			
Vessel category cut-offs	The varying tasks performed by "autonomous marine equipment" are so diverse the requirements that they have a length of five metres and a speed of 5 knots is overly restrictive and relatively meaningless in terms of safety. Length x Speed?	The Code does not contain arbitrary size and length cut-offs. The limits on the categories are intended to be flexible, and provide guidance only. The limit of 5 knots contained in the Code for marine equipment should be retained. However, guidance materials prepared to accompany the Code provide information on when vessels that operate at faster speeds may be considered to be marine equipment because of the amount of kinetic energy produced by the vessel.	No changes to the Code.
	The requirements talk about kinetic energy, but make no mention of weight or any limit of kinetic energy.		
	Any ASV designed for emergency situations would naturally travel at high speed as time is critical. It is also critical that ASVs in heavy seas, particularly following seas, steam at a high enough speed that the flow of water over control surfaces results in the required control authority. The arbitrary length and speed requirements prohibit the use of ASVs for rescue operations.		
	Recommend the lowest risk category is categorised up to 7 kts in speed as this is an achievable cruise speed for small vessels while collecting valuable data (such as conducting multibeam surveys). The risk increase from 5kts to 7 kts with this level of kinetic energy is likely negligible.		
	Rather than the speed limit, far more essential for small vessels would be a requirement that they have impact absorption capability on the extremities and have no sharp vertices that could puncture the hull of another vessel. It is far more likely that injury is caused by a crewed vessel travelling at high-speed impacting an ASV than the ASV puncturing the hull of a crewed vessel during operation.	The Code of Practice requires autonomous and remotely operated marine equipment to be unlikely, due to the area of operation, size and shape of the vessel, type of operation and fuel and equipment on the vessel, to compromise the safety of persons or cause damage to property or the environment. Impact absorption capability, and no sharp vertices, on the vessel will assist in	Add a note on the need to consider the consequences of a collision of the vessel with persons or other vessels.

Issue	Submissions / Comments	Discussion	Outcome
		ensuring this requirement is met. A note on this should be included in the Code.	
Lower limit required?	Is there a need to implement a lower limit on this category or powering criteria etc, ie when do you not regulate these vessels under the Code, eg Metocean Buoys, or wave gliders?	The Code of Practice is intended to cover all equipment that could be considered to be a 'domestic commercial vessel'.	No changes to the Code.
Environmental risks	Is there really likely to be a significant environmental impact from the loss of a small vessel with any of these things onboard given the relative quantities. Novel fuel systems may pose a third-party danger (particularly in port) but not necessarily to the environment. Is there any guidance on threshold quantities in NOHSC or IMDG Code?	If the size and type of fuel systems used by the vessel is so small that it is unlikely to pose a danger to third parties or the environment, then the vessel may be classified as autonomous marine equipment under the draft Code of Practice.	No changes to the Code.
	All vessels have the potential to leak fuel if they are lost, how can you reasonably balance the requirement not to leak fuel if lost (clause 2.2(4)(a)) against the requirement that these systems present a low risk to the environment? Same for 2.2(4)(b).	Vessels carrying a significant amount of fuel, that could have an environmental impact, would not fall within the autonomous marine equipment category.	No changes to the Code.
Determining the appropriate category	Whose responsibility is it for accepting that a vessel is covered under this definition? The issue here is around uniform agreement/application of 'compromise safety', low kinetic energy, cause damage. Some of this is area specific not vessel specific, ie at sea vs near recreational users.	The Code of Practice is intended to apply mainly to domestic commercial vessels, which are required to have AMSA approval in order to operate. As such, ultimately AMSA will determine if the vessel is suitable for the autonomous marine equipment category, or if its risks as such that another category is more appropriate.	No changes to the Code.
Requirements for autonomous marine equipment	There is no risk assessment presented to justify the formulation of requirements in the code for small autonomous vessels.	The requirements for autonomous marine equipment are based around a safety management system, allowing the requirements to be tailored to the risks of the vessel and its operations.	No changes to the Code.
	For category 1 equipment the requirements should remain simple to support ongoing development of technology in Australia while making use of existing overseas vendors.		
	The lowest risk category provides a good starting point for justifying obligations/ risk management for the lower risk platforms.		

Issue	Submissions / Comments	Discussion	Outcome
Lost communications	Comment on Clause 2.2(2)(e)(i): Small AUVs built for swarming are unlikely to have any subsurface communications built in, so they will be silent whilst conducting a mission. Safety is managed through mission planning and conducting communications while surfaced to the control station and/or potentially listening for an emergency abort signal from the mother ship. When a failure is experienced, they may have a pinger but that is more for positioning the device for recovery than comms.	Clause 2.2(2)(e)(i) requires contingency plans to be initiated where communications with the vessel are lost. Clause 2.3(19) – (21) sets out when communications are considered to be lost. 2.3(20) covers marine equipment operating sub-surface, and states: *For vessels which operate sub-surface and are not expected to be in constant communication with the control station, communications with the vessel are considered to be lost where planned communication windows with the control station are missed.*	No changes to the Code.
Vessel identification	Is there a requirement to ensure that the vessel is clearly marked with the Owners name and contact details?	The Code of Practice should be amended to require autonomous marine equipment to be marked with the vessel's unique identifier, the owner's name or a relevant contact number (being the owner's, the operator's or the control station).	Require autonomous marine equipment to be marked with the vessel's unique identifier, the owner's name or a relevant contact number (being the owner's, the operator's or the control station).
Contingency plans and safe states	Comment on Clause 2.2(5) (requirement to comply with COLREGs): If a small autonomous system is in a safe state, could it be classed as floating debris or a buoy rather than a vessel? Given the close proximity to the water for these vessels, I'm thinking this requirement might need to be altered to improve the effectiveness of this safety control. Potentially one to draw on from overseas. A vessel hovering within 2m of the surface may pose the greatest risk as an example.	Under the Code of Practice, the appropriate contingency plan must be determined through the development of the safety management system. Each contingency plan involves placing the vessel into a state in which it poses the least risk to life, the environment and property, and may involve entering the vessel, or its systems, into a safe state. Hovering 2m below the surface may not be an appropriate contingency plan. Under Australian law, COLREGs applies to all vessels when they are operating on the surface. The Code of Practice cannot exempt vessels from the requirements of COLREGs. The difficulties of some small marine equipment in complying with COLREGs is noted, and future amendments to COLREGs may provide more viable options for these vessels.	No changes to the Code.
Control and monitoring arrangements	We suggest placing the focus on control rather than communications. "The safety management system must consider appropriate system redundancy for	The Code of Practice should be amended in line with the comment.	Amend the Code in line with the comment.

Issue	Submissions / Comments	Discussion	Outcome
	maintaining control between the control station and the vessel". For subsurface vessels with planned gaps in communications links, the control station still needs to provide assurance that it is in control of the vessel. This could, for example, be achieved by maintaining line of sight of the surface in the operations area to deconflict with other marine users. Here, the safety of the vessel operation is managed through broader safety controls than communications.		
COLREGs requirements for autonomous marine equipment	The requirement for COLREGs compatible lighting is not available for most existing AUV platforms and its highly unlikely manufacturers will make custom versions for the very small Australian market. In effect this rule will prevent users from using any off-the-shelf AUV system. The rules for this category should align with US jurisdiction requirements to enable the broadest availability of systems.	Under Australian law, COLREGs applies to all vessels when they are operating on the surface. The Code of Practice cannot exempt vessels from the requirements of COLREGs. The difficulties of some small marine equipment in complying with COLREGs is noted, and future amendments to COLREGs may provide more viable options for these vessels.	No changes to the Code.
Recovery of autonomous marine equipment	This category includes a large variety of single-use platforms not designed for recovery. While this is not ideal from an environmental perspective it can be impractical and very difficult to recover large numbers of systems at end of life.	Anti-dumping and other environmental legislation prohibit the non-recovery of vessels. These environmental requirements cannot be amended or altered by the Code of Practice.	No changes to the Code.
SURVEY – EXEMPT VESSELS			
Prohibition on survey-exempt vessels towing other vessels	Comment on Clause 3.1(d)(ii) (engage in vessel towing operations or be set up for the purpose of towing other vessels): Suggested enhancement: It is common to tow subsurface towed bodies from uncrewed surface vessels (for example: towed camera systems). We believe this shouldn't require the uncrewed surface vessel to require a survey. An example is a WAM-V towing a ReefScan Camera System.	Camera systems, and similar equipment that is towed, would be unlikely to constitute a separate vessel unless it was capable of independent navigation, although AMSA advice should be sought on this issue for individual vessel configurations. Clause 3.1(d)(ii) only prohibits the towing of other vessels, and does not prohibit the towing of equipment that is not capable of independent navigation.	No changes to the Code.
Should sub-surface vessels which are capable of operating more than 500m below the surface be required to be in survey?	Although I am unable to comment specifically, it would be useful to clarify how this clause might impact control of ROVs from distance across a network (i.e. operating outside the line of sight).	In line with feedback, the requirement for sub-surface vessels which are capable of operating more than 500m below the surface to be in survey should be removed.	Remove requirement for sub-surface vessels which are capable of operating more than 500m below the surface to be in survey.

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	It is unclear why 500m below surface is considered higher risk. Currently, most ROVs that operate below 500m would be considered complex vessels and therefore would not be survey-exempt 3.1.(4)(a). However, OROVs like the boxfish is rated to go to 1000m and it is not clear why it should need to go into survey to do so. As technology progresses more and more OROV units will be rated to operate deeper than 500m and it is unclear why this should present a greater risk. Requiring the units to enter into survey will simply increase operating costs for researchers and other deep sea use cases. The 'fit for purpose' application should apply for ROVs.		
	This is applying to the MSROV and WCROV classes. I'm pretty sure those operating these vehicles already have strict self-regulated codes of practices mainly delivered through the various industries they operate in, such as the Oil & Gas industry.		
	What risks are these requirements attempting to mitigate? An ROV that exceeds its operational depth and sinks is not a safety hazard. This is not a safety issue. While it may be an environmental issue, how many recreational craft venture out onto our waterways dumping and spilling sewage and bilge oil?		
	No. sub-surface vehicles are readily designed to operate below 500m and the added requirement of survey does not add any safety benefits or mitigate risks beyond those considered by the designers. "Beyond expected communication links is ambiguous". Does this imply that a surface vessel cannot operate without communication links? Does a GPS signal constitute a link? What about under-ice operations etc?		
	CASA tends to use a lighter touch on less congested traffic zones. Depths greater than 500m are always a less congested traffic zone, and to be able to operate at these depths, the engineering behind the design will be		

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	more ruggedised by default. We suggest clause 3.1(4)(b) is not necessary for >500m depth operations. A survey may not decrease the risk of AUVs operating without communications. It is the safety management system and controls that needs more scrutiny rather than the survey of the platform itself. For example, a surveyed AUV sitting 1m below the surface is a hazard whether it is in survey or not. Therefore, we suggest clause 3.1(4)(b) is not needed.		
	If we can accept the risks above 500m why not below 500m? If there are no people onboard it becomes a commercial risk only.		
Determining the appropriate category	Whose responsibility is it for accepting that a vessel is covered under this definition?	The Code of Practice is intended to apply mainly to domestic commercial vessels, which are required to have AMSA approval in order to operate. As such, ultimately AMSA will determine if the vessel is suitable for the survey-exempt category, or if its risks are such that another category is more appropriate.	No changes to the Code.
Requirements for survey-exempt vessels	Category 2 items are also a bit too stringent particularly when it comes to crewing/training, operator oversight and design compliance requirements. This category is a prime area for ongoing development and the technology has not yet matured. These stringent requirements will stifle innovation with only marginal safety improvements to the public.	The design, constructed and equipment requirements for this category are based on the *AMSA Guidance Notice – Small unmanned autonomous vessels*. They are intended to provide a lighter touch in terms of the design and construction of the vessel. However, an alternative solution or arrangement from the requirements may be sought (which AMSA approval) where the requirements are not justified or appropriate for a particular vessel.	No changes to the Code.
	The design and construction requirements for survey-exempt vessels feels arbitrary - is it underpinned by a risk assessment for survey exempt vessel design.	The design and construction requirements for survey-exempt vessels are based on the AMSA *Guidance Notice – Small unmanned autonomous vessels*. This Guidance Notice provides an indication of the requirements AMSA considers to be appropriate for smaller, lower risk autonomous and remotely operated vessels.	No changes to the Code.
Requirement not to have excessive heel or trim	We suggest this requirement isn't applicable to RAS-AI vessels. It is true of hull designs derived from traditional	The design and construction requirements for survey-exempt vessels are based on the AMSA	No changes to the Code.

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	crewed vessels, but this will not be the future. Spinning hull propulsion or underwater biomimicry style propulsion systems have no “right way up” and removing this constraint on hull design will allow for much more efficient & dynamic AUVs into the future. They will become more like animals than vessels in how they move, using the sea-state to their advantage. There is no need for an upright cabin anymore, and it doesn’t necessarily correlate to seaworthiness.	*Guidance Notice – Small unmanned autonomous vessels*. This Guidance Notice provides an indication of the requirements AMSA considers to be appropriate for smaller, lower risk autonomous and remotely operated vessels. However, a vessel may depart from the requirements set out in Table 3 of the Code, provided the departure or alternative solution is demonstrated to: - be least as effective as compliance with the standards set out in Table 3 given the vessel and its intended operations; and - not result in an increased risk to other vessels, third parties or the environment.	
Requirement to monitor bilge levels and have bilge pumps	We suggest this requirement isn’t applicable to RAS-AI vessels as the requirement to maintain water integrity and flotation can be built in by design. Bilge pumps are but one method. The vessel must prove that it can maintain control and stability with water ingress in compartments that have penetrations to the sea.	The design and construction requirements for survey-exempt vessels are based on the AMSA *Guidance Notice – Small unmanned autonomous vessels*. This Guidance Notice provides an indication of the requirements AMSA considers to be appropriate for smaller, lower risk autonomous and remotely operated vessels. However, a vessel may depart from the requirements set out in Table 3 of the Code, provided the departure or alternative solution is demonstrated to: - be least as effective as compliance with the standards set out in Table 3 given the vessel and its intended operations; and - not result in an increased risk to other vessels, third parties or the environment.	No changes to the Code.
Stability requirements	We have had lots of discussions around the suitability of stability standards for application to small uncrewed systems. No one has yet agreed on a 'fit for purpose' standard for uncrewed vessels and we still find ourselves applying crewed standards which are onerous. It would be interesting to see if AMSA would accept a vessel with only positive freeboard and self-righting capabilities.	The stability requirements for survey-exempt vessels are based on the *AMSA Guidance Notice – Small unmanned autonomous vessels*. This Guidance Notice provides an indication of the requirements AMSA considers to be appropriate for smaller, lower risk autonomous and remotely operated vessels.	No changes to the Code.

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Requirements for machinery	The traditional definition of 'remote fuel shutoff' means remote from the ER, in this context do you mean, remotely controllable from the control station?	In this context it means a shutoff located on the vessel. This requirement is based on the *AMSA Guidance Notice – Small unmanned autonomous vessels*. This Guidance Notice provides an indication of the requirements AMSA considers to be appropriate for smaller, lower risk autonomous and remotely operated vessels.	No changes to the Code.
Fire safety requirements	General expectation that fire smothering systems are initiated automatically.	Amend Code to allow for automatic initiation of system.	Amend the Code to allow for automatic initiation of fire smothering system.
Anchor system	Anchor system requirements should include the ability to be towed.	Clarify in the Code that the requirement for the vessel to be able to be recovered in the event that it stops operating will likely mean that the vessel will need to provide some means for other vessels (such as tugs) to attach towing lines.	Clarify in the Code that the requirement for the vessel to be able to be recovered in the event that it stops operating will likely mean that the vessel will need to provide some means for other vessels (such as tugs) to attach towing lines.
Requirement for anchor or station keep system	What risks have been identified that an anchor would mitigate?	Under the draft Code of Practice, survey-exempt vessels may have an anchor or another means of ensuring that the vessel can station keep. In practice, the anchor may only be used in an emergency, as an emergency stop. In order to ensure that the vessel can enter into the appropriate safe state in all situations, the requirement for the vessel to have a means to station keep (which may be an anchor) should be retained.	No changes to the Code.
	The anchor system requirements are very onerous. Suggest reconsider – why does it matter if a small vessel washes ashore?		
Should a standard apply to station keep systems? If so, what standard?	No. Where possible more flexibility on design is preferred. Simply ask the operators to state the station keeping capabilities for the vessel. These of course will be highly dependent on weather conditions, vehicle hull shape and propulsive options.	In line with comments, no standard will be applied to station keep systems.	No changes to the Code.
	We suggest no, because not all current RAS-AI systems can achieve this by design. For example, torpedo shaped AUVs cannot station keep because they need forward propulsion to maintain stability. The key is to have the ability to remain within a known area		

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	or be in a safe state where the control station can deconflict the vessel with other users – whether this is a 20 x 20m block at 10m deep, or be able to report position to the control station. The definition of what attributes constitute a safe zone may be the way to address this.		
	Strongly recommend not to propose dynamic positioning requirements, these are intended for totally different applications and require accuracy and redundancy in excess of what might be required for position holding and station keeping (think about what area a vessel at anchor covers under different tide/sea conditions). There doesn't appear to be a middle group for station keeping but the requirement should only be optional.		
VESSELS IN SURVEY			
Requirements for vessels in survey	Category 3 vessels are quite complex and will remain rare so no specific comments at this time. In general, the aim should be to minimise requirements wherever possible. My suggestion is to stick with absolutely critical requirements and through regular review and reporting add additional rules as needed.	Comment noted.	No changes to the Code.
Requirements for stability	Stability is the primary design requirement of a vessel, however we suggest the definition may differ for an autonomous platform. Stability refers to the need to remain in control of the vessel movement rather than to manage uprightness for the safety of passengers.	The Code of Practice applies the NSCV stability requirements to autonomous and remotely operated vessels in survey. The NSCV requirements cover the stability characteristics required to: - minimise the risk of the vessel capsizing; - avoid excessive angles of heel that could threaten the safety of persons on the vessel; and - return the vessel to the upright condition. As such, the NSCV requirements address the maintenance of control of the vessel and the prevention of loss of the vessel's load, both of which are relevant to autonomous and remotely	No changes to the Code.

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		operated vessels, as well as the safety of persons on the vessel.	
REQUIREMENTS FOR BATTERIES (ALL VESSELS)			
For survey-exempt vessels, when should the fire safety requirements apply to battery powered vessels?	Due to the wide range of vehicles being addressed, this should be assessed on a case-by-case basis.	Vessels powered by batteries are currently not accommodated in the standards for conventional vessels, and may be considered to be novel vessels by AMSA. As a result, a Recognised Organisation may be required to certify the battery arrangements, including housing, ventilation and fire safety arrangements for the batteries – advice from AMSA should be sought on this. In the future, national standards for the use of batteries in vessels are likely to be developed, at which point more detailed requirements for batteries will be included in the Code of Practice. For a survey-exempt vessel, the Code of Practice should be amended to require the fire safety risks of batteries installed on the vessel, and the charging arrangements for the battery, to be assessed and addressed in line with an appropriate national or international standard, or the requirements of a Recognised Organisation, and a risk assessment.	For a survey-exempt vessel, amend the Code to require the fire safety risks of batteries installed on the vessel, and the charging arrangements for the battery, to be assessed and addressed in line with an appropriate national or international standard, or the requirements of a Recognised Organisation, and a risk assessment. This must include appropriate arrangements for battery housing, ventilation and fire detection and extinguishing systems. Note also that advice from AMSA should be sought on the verification and certification requirements for a battery powered survey-exempt vessel. For vessels in survey, clarify in the Code that the vessels may be considered to be novel vessels by AMSA, and as a result battery arrangements may need to be certified by a Recognised Organisation.
	Fire risks of air transport of batteries are covered by the International Air Transport Association (IATA).		
	What risk are we trying to mitigate by applying fire safety requirements to batteries? We have already said that ASVs should not operate near other vessels without support craft (which could react to a fire) - so what is the risk to life or the risk of injury from a burning ASV?		
	This should be tied to total battery capacity to reflect the added risk of runaway reactions in the event a fire condition is reached. Perhaps starting somewhere from 50-100KWh.		
	Fire safety is required to protect the operator and nearby users from risks associated with the batteries themselves. This mainly pertains to safe recharging and providing a solid casing to help prevent fires through batteries being damaged (through collision or misadventure). We recommend a section on batteries is created.		
Standards for battery systems	Battery safety in general is an area that we recommend is specifically called out. This is beyond the risk of managing fire hazards, and is one of the current leading industry risk areas when using high-capacity batteries at sea. When recharging or when mishandled, there is a real risk of thermal runaway and explosion causing risk to personnel and property.		

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EMERGENCY POWER (SURVEY–EXEMPT VESSELS AND VESSELS IN SURVEY)			
Emergency power requirements	Redundancy for critical systems would need to be robust in the event of failure to the main system. Commercial manned vessels are required for example to have a totally separate battery bank to manage communications are required to deliver power to those comms systems for a certain period of time e.g 30 hours. A similar stipulation should at least provide minimum telemetry (location) and light and sound warnings to minimise collision with other vessels if it losses propulsion. Redundancy may not be required for the entire system, so those safety critical components may need to be called out.	The emergency power system requirements for crewed vessels are contained in NSCV Section C5B and NSCV Section C7B. Both of these sections apply under the Code to survey-exempt vessels and vessels in survey. The emergency power system must supply power to electronic navigational aids, navigation lights and sound signals as specified in NSCV Subsection 7C. It must also supply power to the communications systems of the vessel, including: - radiotelephone transmitters and receivers; - satellite communications installations; - emergency lighting sources. The Code will be amended to clarify that the emergency power system must be sufficient to also power telemetry systems and similar.	Clarify that the emergency power system must be sufficient to also power: - telemetry systems and other location tracking equipment; and - the communication, control and other systems required to place and maintain the vessel in a safe state, and to receive and execute recovery commands if the vessel is positioned to recovery itself.
MANAGING THE SAFETY OF PERSONS ONBOARD VESSELS NOT BUILT TO ACCOMMODATE PERSONS (SURVEY–EXEMPT VESSELS AND VESSELS IN SURVEY)			
Should any other aspects of NSCV Section C1 apply to a surface vessel which is not built to accommodate persons, but which may have persons on board while docked, for example, to secure cargo, carry out maintenance and so on? In particular, should any aspects of Chapter 5 (Access, escapes	No to both given that while the vehicle is docked the system is not operating and additional controls can be used to manage risk (ie entering confined spaces etc). A special section may need to be written to address this temporary configuration. Applying the NSCV standards may result in clashes in intent of the standards. For example, it may make more sense for the personnel to take portable safety equipment onboard with them rather than make it a permanent requirement of the vessel.	The Code of Practice should be amended to require a vessel which may have persons on board while docked, or at other times, to comply with the required outcomes of NSCV Section C1 covering access, exits, escapes and evacuation and personal safety. In addition, the safety of persons on board for limited operations, such as carrying out repairs, needs to be addressed in the safety	Amend the Code to require a vessel which may have persons on board while docked, or at other times, to be safe for those persons. These vessels must comply with the required outcomes of NSCV Section C1 covering access, exits, escapes and evacuation and personal safety.

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and evacuation) or Chapter 6 (Personal safety) of NSCV Section C1 apply?	One thing that should be considered is the safety of the vessel in dock/port and the means of ensuring the safety of people when working on the vessel, ie non-slip decks, signage, lighting, isolations, etc. It may be necessary to take these requirements from land-based H&S Codes of Practise as the marine-based ones are primarily intended for vessels at sea.	management system for the vessel. The Code should be amended to make this clear.	Amend the Code to require the safety management system to address the safety of persons on board for limited operations, such as carrying out repairs.
SAFETY MANAGEMENT SYSTEMS (ALL VESSELS)			
Safety Management System	The Safety Management System associated with an uncrewed or autonomous system is more complex than a crewed system. We recommend the Code include an outline or template of a typical Safety Management System architecture for the differing classes of vessels.	Guidance on safety management systems for an uncrewed or autonomous vessel will be included in guidance materials developed to support the Code.	No changes to the Code.
NAVIGATION SYSTEM AND SITUATIONAL AWARENESS (SURVEY–EXEMPT VESSELS AND VESSELS IN SURVEY)			
Carriage of binoculars	For survey-exempt vessels and vessels in survey that are not built to accommodate persons, the exemption from the requirement to carry binoculars should be modified by a requirement to have some form of zoom or PanTilt function on the remote optics.	The Code of Practice should be amended in line with the comment.	Amend the Code in line with comment.
Sensor accuracy	There is a need to establish the accuracy of the sensor, including the relative uncertainty and the degradation of accuracy under defined environmental conditions. Sensors should also be suitable for use in the marine environment and provided with means for monitoring of their performance and where necessary tuning and calibrating them to ensure continued effectiveness of use.	The Code of Practice should be amended to require the accuracy of sensors to be determined and declared, and for their performance to continue to be monitored.	Amend the Code to require the accuracy of sensors to be determined and declared, and for their performance to continue to be monitored.
CONTROL SYSTEM (SURVEY – EXEMPT VESSELS AND VESSELS IN SURVEY)			
Capability of operator or control system	We suggest the operator or control station must be capable of also knowing where nearby shipping channels, green zones and other areas of interest are within 3 nm of the vessel location. This situation awareness will be essential for safe contingency planning execution.	The Code of Practice should be amended in line with the comment.	Amend the Code in line with comment.

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Route planning	SOLAS Ch.V, Reg.34 and Resolution A.893(21) is the minimum expected standard for route planning.	These requirements and guidance materials should be highlighted in the Code, however they may not incorporate all factors that should be considered when mission and route planning for an autonomous or remotely operated vessel.	Amend the Code to refer to the IMO Guidelines for Voyage Planning.
Ability for persons on board to take control of vessel	Need to ensure the safety of the crew/pax onboard the vessel when under remote control, this should be covered separately, for example ability to take control (if qualified), means to isolate remote system (for maintenance), ability to communicate with control station operator, advance warning of any safe state initiation or violent manoeuvres, etc	The Code of Practice should be amended to consider the arrangements for onboard control of vessel, for alerting persons on board of communication system issues and other relevant events and for isolating the control system to allow for maintenance activities.	Amend the Code to allow for on board control to be initiated in certain circumstances, to require consideration to be given to procedures for alerting persons on board of communication system issues and other relevant events, and to enable the control system to be isolated to allow for maintenance activities.
Certification of control station equipment	Consider to be given to appropriate requirements for certification of control station equipment, including robustness, EMI and replacement. Configuration control.	Chapter 12 of the draft Code should be amended to include a requirement for consideration to be given to the certification of novel systems and their components in the risk assessments for the novel systems. Include configuration control in the software development standard requirements.	Amend the Code to include a requirement for consideration to be given to the certification of novel systems and their components in the risk assessments for the novel systems. Amend the Code to include configuration control in the software development standard requirements.
Display of information in the control station	Information is also expected to be displayed using HF methodologies.	NSCV Section C1 includes requirements for the display of essential information in the operating station. The Code should be amended to apply these NSCV requirements to autonomous and remotely operated vessels in survey.	Amend the Code to apply the NSCV for the display of essential information in the operating station to autonomous and remotely operated vessels in survey.
COMPLIANCE WITH COLREGs (ALL VESSELS)			
COLREGs requirements –	The prohibition of the use of strobe lights is not justified. Strobes are the standard indicator for potentially	This prohibition comes directly from COLREGs.	

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prohibition on use of strobe lights	hazardous vessels such as high-speed ferries and hydrofoils - vessels which present a hazard and which cannot alter course quickly. A standard flash pattern (such as two white flashes followed by two amber flashes and then a 2 second pause) could become a standard for all autonomous vessels in Australian waters. This would make them easily identifiable at day and night. The Code of Practice should not prevent vessels from using revolving or strobe lights. This limitation may not always be practicable.	*"Rule 36 - Signals to attract attention - …For the purpose of this Rule the use of high intensity intermittent or revolving lights, such as strobe lights, shall be avoided."* The Code of Practice is directly reflecting COLREGs. Please note though that this prohibition is limited to lights being used for the purposes of 'attracting attention'. It is not a general prohibition, so we assume that for the examples provided these vessels are using strobes in accordance with COLREGs or local requirements.	Amend the Code to clarify that strobe lights may be used where permitted under COLREGs.
Requirement to signal "distress" in a way which cannot be confused with signals associated with harm to or loss of life	There aren't many ways left, it might be useful to propose some.	Specifying signalling requirements, outside of the requirements of COLREGs, will require broader consultation with industry and AMSA. This issue should be consulted on and considered for future updates of the Code of Practice.	This issue should be consulted on and potentially addressed in future updates to the Code.
Communicating with other waterway users	The way to notify operators that the vessel is (or is capable of) operating autonomously needs to be simple and well known, but also visible which is difficult when close to the waterline.	Specifying identification requirements, outside of the requirements of COLREGs and the National Law Act, will require broader consultation with industry and AMSA. This issue should be consulted on and considered for future updates of the Code of Practice.	This issue should be consulted on and potentially addressed in future updates to the Code.
Would it be appropriate for autonomous marine equipment to display international maritime signal flags to inform other waterway users? If so, which flags?	This would be dependent upon the type, size and operation of the vessel. If the vessel is of significant size and travelling on the surface, then similar requirements to other maritime vessels should be applied. Maritime vessel signage would seem inappropriate for vessels operating underwater. In the case of tethered underwater ROVs, a dive flag is commonly displayed, and this would seem most appropriate in this case. In many cases no. Any underwater vehicles/equipment would not be able to appropriately display maritime signals/flags that would be visible to other vessels.	No recommendations on the issue of flags at this point in time. This issue should be consulted on and considered for future updates of the Code of Practice. As noted above, tethered vessels may not be considered to be 'domestic commercial vessels' under the National Law Act – advice from AMSA should be sought on this. The Code is predominately designed for domestic commercial vessels, and as such does not consider the specific requirements for tethered vessels. However, some aspects of the Code may be informative for tethered subsea ROV.	Amend the Code to require autonomous marine equipment to display the vessel's unique identifier, or name and contact number of the owner or operator. The issue of code flags and their application to autonomous and remotely operated vessels should be consulted on and considered for future updates of the Code.

Issue	Submissions / Comments	Discussion	Outcome
	Even when on the surface, due to their low profile above the water line signals/flags would need to be displayed high above the units to be seen by other vessels. These signals may be able to be displayed by the support vessel if the autonomous equipment is working in near vicinity. The suggestion made above to use flags from the point of operation (as for divers) may be a workable alternative.	The Code of Practice requires the unique identifier and/or owner / operator name and contact number to be displayed on the vessel, for vessels in survey and survey-exempt vessels. The Code will be amended so that this requirement applies to autonomous marine equipment also.	
	Vehicles of this type often do not have masts or any structure of sufficient height to make a flag generally visible or of any use.		
	We suggest no, due to the typical lack of height of these platforms to place a suitably sized flag. The key information these platforms need to dictate to other waterway users is the fact they are uncrewed or autonomous. This needs to be quickly and easily noted, whether it is via a common symbol, a colour or a pattern. The owner identifier/name should also be quickly discernible.		
	No strong position, general direction is that these vessels should not be treated separately and therefore separately identified however I don't think it is a bad thing that other marine operators are able to establish what type of vessel it is.		
Should the Australian Code of Practice identify lights or flags that should be displayed on the vessel in order to indicate that the vessel is operating autonomously, being controlled remotely or in failure mode? If so, what lights and/or flags should be specified for each mode?	Yes, but in the case of a SubSea ROV's maybe a flag similar to diver below which is displayed on the supporting surface vessel. But not in the water... Also quite often small OCROV's are controlled from shore line so maybe a flag adjacent to the ROV pilot needs to be displayed.	These are valuable comments and the issue of identification and informing the status of autonomous/remotely operated vessels is important. However, broader consultation with industry and AMSA on this issue is required. This issue should be consulted on and considered for future updates of the Code of Practice.	This issue should be consulted on and potentially addressed in future updates to the Code.
	Lights. Given the ready availability of programmable LED strobes, a standard flash pattern for autonomous or remotely controlled vessels would be easily implemented - regardless of whether the vessel is in operation or in a fault mode.		

Issue	Submissions / Comments	Discussion	Outcome
	Perhaps In lieu of COLREG lights other indicators should be present. Flags are impractical as noted in item 1. Lights may be useful to indicate to users that the systems is operating or under external control. The most common interaction we have with other marine users with these types of vehicles is they will approach out of curiosity and attempt to recover or remove the equipment. An external indicator of the vehicles condition would hopefully dissuade them from interacting with the system which may otherwise appear to idle.		
	The Australian Code of Practice could work with regulators to standardise a new symbol representing a vessel capable of operating autonomously. This must be in place when the vessel is being operated remotely or autonomously. We believe a painted symbol, with a defined pattern/colour would be ideal, and potentially a flag for surface vessels. A flashing light similar to those used on buoys whilst in autonomous mode would also assist drawing attention to the device.		
	Flags cannot be used for submersibles and lights are only useful whilst in really close range when close to the surface. For these vessels, perhaps we need flexibility in notification. Bluetooth broadcast / radio broadcast may be more suitable perhaps? The devices may also be able to register their position through existing marine tracking systems and come up with an autonomous marker so they appear on charts as an example.		
	In time this will come, however local implementation is unlikely to be of benefit as other marine users are not going to be able to interpret the signals being displayed.		
	Yes, for vessels operating on the surface, but not practical for underwater vehicles. The issue becomes more complicated if an underwater vessel is required to surface for short periods or travel across the surface.		
	Yes. Not sure which lights or flags. For OROVs the dive flag may be appropriate and is well recognised with most waterway users. However, being underwater, a		

Issue	Submissions / Comments	Discussion	Outcome
	flag on the vehicle will not be visible so a flag or light displayed at point of operation is necessary (as with divers). If required a flag on a float could be used above the Area of operation. Many OROV operations will be conducted from shore and lights are not appropriate in this situation.		
	I suggest removing this completely. If status lights are necessary they should only could be visible only when close to the system with say. Flashing green – operating Flashing yellow – under remote control Flashing red – failure mode		
	As for lighting and distinguishing between manned unmanned we believe it will need to be a unique flashing light that then becomes the norm to educate the public. For example, a hovercraft is required to display an all-round flashing yellow light. Something unique like an all-round flashing Blue (or other colour) light would make a RAS vessel particularly unique. We can't really use white red or green as these are all used for navigation markers.		
Operating in restricted visibility	For autonomous marine equipment, at 2.2(7) include avoiding operating in restricted visibility (unless the vessel has the capabilities to comply with the COLREGs requirements for operating in restricted visibility)	Operating in areas or conditions of restricted visibility should be included in 2.2(7).	Include operating in areas or conditions of restricted visibility in 2.2(7).
Annex A – COLREGs Guidance Framework	This is a great piece of work but simplistic and may understate the difficulty in actually achieving a verifiable and acceptable measure of COLREGs compliance.	This initial piece of work in developing the COLREGs Guidance Framework was undertaken to determine the responsibilities which COLREGs imposes and describe them in a way which is understandable when considering an unmanned vessel. It was not within the scope of this initial work to derive compliance solutions.	No changes to the Code.

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		There is a follow-on phase currently underway progressing the development of a pro-forma where designers/operators can record the actual capabilities of their systems against the functional capabilities required by COLREGs. Again, this work will not provide compliance solutions but it will provide a consistent means of capturing relevant information. This is seen as an important first step on the road to measuring 'compliance'. The initial COLREGs work will also be published separately to the Code of Practice with a supporting briefing paper. This briefing paper articulates where this initial framework can help a lot and where the autonomous vessel community still has further challenges and work ahead to achieve 'compliance' with COLREGs.	
	Classification of autonomous marine equipment as vessels restricted in ability to manoeuvre: I don't know if this is legally accurate, RAM is also intended for large vessels etc, suggest confirm whether RAM and CBD etc are privileges small vessels can claim.	This aspect of the COLREGs Guidance Framework has proposed a practical way forward. There is no specific reason within the wording of COLREGs that precludes small vessels from making this claim. However, the COLREGs Guidance Framework is guidance only and guidance from AMSA on the application of COLREGs to a particular vessel should be sought.	No changes to the Code.
	Land-based or simulated sensor testing may not be sufficient. In addition, the statement on sea trials undersells the challenge of using sea trials to prove system safety, the initial purpose is to confirm everything is wired correctly and that basic behaviours are correct, however extensive sea trials will not always result in acceptance of compliance (which is reason for simulation, but also robust software development processes). It may be worth identifying that a progressive approach to acceptance is needed, and sea trials and operational trials will be required to support assurance.	This element of the framework is only a high-level proposal to initiate the conversation about how 'compliance' could be confirmed. It is expected that over time the views or the regulator, potentially with the support of Recognised Organisations (Classification Societies) will evolve generally accepted methods for assuring autonomous systems against the responsibilities imposed by COLREGs.	No changes to the Code.
FIRE SAFETY SYSTEMS (VESSELS IN SURVEY)			

Issue	Submissions / Comments	Discussion	Outcome
Breakers for battery banks	In addition to remote shut-offs for fuel oil supply and ventilation and exhaust systems, the Code may need to require breakers for battery banks.	Vessels powered by batteries are currently not accommodated in the standards for conventional vessels, and may be considered to be novel vessels by AMSA. As a result, a Recognised Organisation may be required to certify the battery arrangements, including housing, ventilation and fire safety arrangements for the batteries – advice from AMSA should be sought on this.	For vessels in survey, clarify in the Code that the vessels may be considered to be novel vessels by AMSA, and battery arrangements may need to be certified by a Recognised Organisation.
Fire-fighting systems	Note that consideration may need to be given to the more extensive use of firefighting systems given the inability to fight fires, ie fixed systems in all hull spaces containing fire hazards, not just engine rooms.	NSCV Section C4 requires fixed fire fighting systems to be installed in: - high fire risk machinery spaces - Ro-Ro spaces - cargo spaces containing dangerous goods - store spaces containing flammable liquid - closed vehicle spaces - medium and high-risk cargo spaces (larger vessels only) (Fixed fire extinguishing systems are also required for many galley and accommodation spaces, but these requirements will not be relevant to many autonomous and remotely operated vessels). The Code should be amended to require fire appliances (fire equipment that requires an operator to deploy and control the item when manually fighting a fire) required under NSCV Section C4 to be replaced with the installation of fixed fire extinguishing systems in spaces containing fire hazards where needed to achieve the same performance outcomes as the deemed-to-satisfy solutions of NSCV Section C4. This should be determined through a risk assessment.	Amend the Code to require a risk assessment to be undertaken to determine whether fixed fire extinguishing systems need to be installed in enclosed spaces containing fire hazards, beyond the requirements of NSCV Section C4, in order to achieve the same outcomes as the deemed-to-satisfy solutions of NSCV Section C4.
Emergency power	A fire emergency may result in the total loss of power and propulsion onboard. Emergency power should be available from a separate compartment to continue to supply comms and safety signals to the vessel.	NSCV Section C5B, which applies to survey-exempt vessels and vessels in survey, requires: *An emergency source of electrical power must be self-contained.*	Amend the Code to require the emergency power system to be sufficient to also supply systems required to place and maintain the

Issue	Submissions / Comments	Discussion	Outcome
	Potentially even recovery commands if the vessel is positioned to recover itself post fire event.	*Unless otherwise provided for in clause 4.3.3 the emergency source of electrical power, including any fuel required to supply that source must, if located within a space, comply with the following:* *a) not be located forward of the collision bulkhead;* *b) be located above the freeboard deck, or where there is no freeboard deck then above the water line, and must be accessible from the open deck;* (note that this aspect does not apply to survey-exempt vessels under the draft Code of Practice) *c) be located and arranged so that a fire or other unplanned occurrence in the propulsion machinery space will not interfere with the supply or distribution of emergency power outside that space; and* *d) the space in which it is located must be:* *i) protected from exposure to moisture; and* *ii) provided with ventilation sufficient to enable the emergency power source to operate at full power.* The Code should be amended to require the emergency power system to be sufficient to also supply systems required to place and maintain the vessel in a safe state as well as recovery commands.	vessel in a safe state as well as recovery commands.
ENGINEERING, ELECTRICAL AND AUXILIARY SYSTEMS (VESSELS IN SURVEY)			
Sophisticated diagnostic functions	The requirement to have sophisticated diagnostic functions which monitor the condition of the engineering system may not be necessary for short duration voyages or where mission abort and vessel retrieval for repair is acceptable.	The Code should be amended to note that sophisticated diagnostic functions may not be necessary for short duration voyages and other voyages where mission abort and vessel retrieval for repair is acceptable. This will need to be addressed in the risk assessment.	Amend the Code to note that sophisticated diagnostic functions may not be necessary for short duration voyages and other voyages where mission abort and vessel retrieval for repair is acceptable. This will need to be addressed in the risk assessment.
Redundancies for engineering, electrical and auxiliary systems	For both 9.4(1) and (2) (redundancies required for engineering, electrical and auxiliary systems) it may be	Clarify in the Code that redundancies may not be required where justified by compensating factors,	Clarify in the Code that redundancies may not be required

Issue	Submissions / Comments	Discussion	Outcome
	acceptable for the failure to result in the loss of function and the vessel to be retrieved - dual redundant propulsion and control is reasonable but not always necessary and fire/flood segregation is even more so.	such where the vessel is used only for short duration voyages and other voyages where mission abort and vessel retrieval for repair is acceptable. This will need to be addressed in the risk assessment.	where justified by compensating factors, such where the vessel is used only for short duration voyages and other voyages where mission abort and vessel retrieval for repair is acceptable. This will need to be addressed in the risk assessment.
ANCHOR SYSTEM FOR VESSELS IN SURVEY			
Anchor system	Anchor system requirements should include the ability to be towed. Uncrewed vessels should be capable of being taken under tow safely and preferably without the need to board the vessel.	Clarify in the Code that the requirement for the vessel to be able to be recovered in the event that it stops operating will likely mean that the vessel will need to provide some means for other vessels (such as tugs) to attach towing lines.	Clarify in the Code that the requirement for the vessel to be able to be recovered in the event that it stops operating will likely mean that the vessel will need to provide some means for other vessels (such as tugs) to attach towing lines.
RISK ASSESSMENTS AND TESTING FOR NOVEL SYSTEMS (SURVEY – EXEMPT VESSELS AND VESSELS IN SURVEY)			
Risk assessment process	Need to also consider the likelihood (as well as impact) of potential system failures in the risk assessment.	The Code of Practice should be amended in line with the comment.	Amend the Code in line with the comment.
Risk assessment standard	Instead of referring to the IMO circular on formal safety assessment, this text from LR Naval Rules might be more useful: A Risk Assessment (RA) supported using a technique selected from IEC/ ISO 31010 Risk Management – Risk Assessment techniques is to be performed.	IEC 31010 should be included in the notes as providing guidance on risk assessment techniques.	Amend the Code to include a reference to IEC 31010 as providing guidance on risk assessment techniques.
Review by accredited person	Risk assessments should be required to be reviewed by an AMSA accredited person.	The Code of Practice should be amended to require the risk assessment to be reviewed by an accredited marine surveyor or a Recognised Organisation.	Amend the Code to require the risk assessment to be reviewed by an accredited marine surveyor or Recognised Organisation.
Witnessing trials	Trials should be required to be witnessed by an AMSA accredited person.	The Code of Practice should be amended to require the trials to be witnessed by an accredited marine surveyor or a Recognised Organisation.	Amend the Code to require the trials to be witnessed an accredited marine surveyor or a Recognised Organisation.

Issue	Submissions / Comments	Discussion	Outcome
SOFTWARE INTEGRITY (SURVEY – EXEMPT VESSELS AND VESSELS IN SURVEY)			
Software integrity requirements	While it is in its early stages in literature, we recommend a systems approach for managing the risks associated with AI-controlled missions. It may be worth mentioning specifically that the software components also require a failure/degradation analysis, as well as the physical failures. Furthermore, a section on safety considerations associated with AI-enabled craft could be very useful guidance.	IMO Circular 1512 encompasses a large number of international software development standards, including the ISO 25000 series. The circular references standards covering: - System and Software Quality Requirements and Evaluation - System and Software Assurance - System and software life cycle processes. The Code should be amended to require the software development standard(s) used to also cover software failure and degradation analysis. The Code should also be amended to include reference to IEC 61508 Functional safety of electrical/electronic/programmable electronic safety-related systems. More detailed guidance on safety management systems AI-enable craft will be included in guidance materials developed to support the Code.	Amend the Code to require the software development standard(s) used to also cover software failure and degradation analysis, and to include reference to IEC 61508 Functional safety of electrical/electronic/programmable electronic safety-related systems.
Software development standards	There are more appropriate standards than IMO Circ 1512, note that IMO guidance tends to be weighted towards management of cyber risk on existing ships from an operator perspective and not systems design.		
MANAGEMENT OF THROUGH-LIFE MODIFICATION AND REPAIR (ALL VESSELS)			
Management of modifications and repairs to the vessel and its systems	The Code of Practice should include requirements covering the management of modifications and repairs throughout the vessel's life.	Requirements covering maintenance and repair should be included in the Code of Practice. Note that vessels in survey must also comply with the Part 2 of the *National Law – Marine Surveyors Accreditation Guidance Manual 2014*, which includes requirements for periodic surveys of the vessel.	Amend the Code to include requirements covering the development and implementation of a maintenance and repair plan and ongoing compliance to the Code.
CREW / OPERATOR QUALIFICATIONS AND RESPONSIBILITIES (ALL VESSELS)			
Commercial qualifications	The requirement for commercial certification of operators cannot be justified. Once again, the major training of an Exemption 38 is about the safety of those people on board. The majority of the syllabus does not apply to the operation of an uncrewed vessel and include; person overboard recovery, tying knots, fighting fires on board, etc.	For vessels in survey and survey-exempt vessels, the Code of Practice should be aligned with the National Law requirements for certification. However, exemptions from these arrangements on a case-by-case basis can be sought from AMSA.	For vessels in survey and survey-exempt vessels, amend the Code to align with the National Law requirements for certification. Include a note that exemptions from these arrangements on a

Issue	Submissions / Comments	Discussion	Outcome
			case-by-case basis can be sought from AMSA.
Should operators of autonomous marine equipment be required to hold a Coxswain 3 certificate at minimum?	No, the requirement should be dependent on the type of operation, speed and size of the vehicle.	The Code of Practice should be amended to clarify that an exemption from AMSA will be required in order to operate autonomous marine equipment without a commercial qualification.	Clarify in the Code that an exemption from AMSA will be required in order to operate autonomous marine equipment without a commercial qualification.
	No. Operators should be trained to a level appropriate to their responsibilities. For OROVs the operator should not require coxswain and the level of training should be identified based on the model being used, the work task and the environmental conditions (informed by guidance for operation as suggested above). In some situations, vessels will be used in non-navigable environments, in other situations a recreational boat licence may be appropriate to demonstrate basic maritime safety knowledge, whereas other situations may require higher qualifications due to the high risks relevant to the circumstances.		
	No, certainly not for Subsea craft within the OCROV class range		
	No. Coxswain training does not provide any useful details on the operation of these systems.		
	No, a recreational license is likely appropriate. However, an additional RAS-AI specific training course must be added, in a similar way to how CASA controls drone certifications.		
	I am not sure of the specifics of this certificate, however I would suggest that a commercial operator should hold a commercial license as they are exposing themselves to greater liabilities that a recreational license might not cover - specifically with regard to COLREGs		
Should operators of survey-exempt vessels required to hold a Coxswain 3 certificate at minimum?	No, requirements should be dependent on size, speed and type of operation.	For survey-exempt vessels, the Code of Practice should be aligned with the National Law requirements for crew certification. However, exemptions from these arrangements on a case-by-case basis can be sought from AMSA.	For survey-exempt vessels, amend the Code to align with the National Law requirements for crew certification. Include a note that exemptions from these arrangements on a case-by-case basis can be sought from AMSA.
	Yes, commercial quals should be required. Operators need to understand COLREGs.		
	The vessel size often tracks to public expectations of the risk of the vessel in terms of collision. If a Coxswain 3 certificate is required to pilot a crewed vessel of this		

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	size, then it is reasonable to mandate an operator holds a Coxswain 3 certificate, as well as specific autonomous systems training.		
	No. Operators of type 1 and 2 should not require coxswain training.		
	I am not sure of the specifics of this certificate, however I would suggest that a commercial operator should hold a commercial license as they are exposing themselves to greater liabilities that a recreational license might not cover - specifically with regard to COLREGs		
A new licensing model	The existing system could be used based on deployment area. - Coxswain Grade 3 this is being proposed as ticket that commercialises recreational marine drivers. (Not in place as yet) - Coxswain Grade 2 within Smooth Partially smooth waters - Coxswain Grade 1 Within 15nm of the mainland coast - Master Near costal <24m Beyond 15nm out to the EEZ (Trained in Radar)	The comment will be brought to AMSA's attention for consideration.	No changes to the Code.
Radio equipment qualifications	A more relevant requirement would be the Australian marine short or long range radio operator's certificate to ensure that remote operators were proficient in the use of marine radio to communicate with other vessels. Proficiency in establishing, fault finding and maintaining communications networks would be far more useful than an ability to tie figure 8 knots.	Under the Code of Practice, the operator (or watchkeeper) of a survey-exempt vessel or vessel in survey must be qualified to operate the radio or other communication equipment fitted on the vessel. In addition, for autonomous marine equipment, the Code of Practice requires the operator, or another member of crew, to have the appropriate training and qualifications to operate the radio or other communication equipment fitted on the vessel or in the control station.	No changes to the Code.
	As standardised training frameworks evolve for uncrewed and autonomous systems, these will become mandatory for piloting these platforms. However, in the short term, these qualifications could be considered in addition to the licensing requirements. - Short Range Operator Certificate of Proficiency (Marine VHF radio Cert)		

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	- Long Range Operator Certificate of Proficiency (Marine HF radio Cert) - GMDSS all comms safety systems including VHF, HF, DSC, AIS, Inmarsat C, 406 EPIRBS, SARTS and other relevant detail for global marine comms. The above qualifications would not necessarily be needed the operator but most likely the minimum requirement to overall manage 5A, B, C, D or E vessels operations (operations areas), with a qualified staff member in the loop.		
	Note a wider comment around ensuring that operators have appropriate licenses in place for use of spectrum bands in relation to the use of the vessel, this is not just limited to comms equipment but may also include the use of sensors, for example most ships radio licenses only permit them to use X and S band radar.	The Code of Practice should be amended to require all appropriate licences are held for situational awareness and communications equipment.	Amend the Code to require all appropriate licences to be held for situational awareness and communications equipment.
Role of the operator	The ultimate goal in the marine autonomy space is to increase levels of autonomy while simultaneously growing vehicle fleet at scale. The paradigm of "operator" requirements needs to be reviewed in this context.	The Code of Practice makes it clear that an operator may be the operator of multiple vessels and the monitoring arrangements are risk-based. However, ultimately a person must be responsible for the vessel at all times. See the note to clause 6.2(12) and clauses 2.3(8) and 2.3(9) of the Code.	No changes to the Code.
	The Code of Practice should not open the door to multi-vessel operation by single operators (which will come but not via this concession).	As above, the Code of Practice does allow for this arrangement. However, the monitoring arrangements must be determined through a risk assessment and safety management system, and the appropriate arrangements will depend on where and how the vessels are operating.	No changes to the Code.
Definition of the operator	Interesting definition, why has the definition of an operator been limited to only the Master, and not a crew member with delegated responsibility for the operation of the vessel during a given period. Also is the operator here intended to be an individual or a corporate entity, ie Owner/Operator/Builder. I think it would be better to distinguish between Master, operator and Operator.	The Code of Practice should be amended to allow the operator to be either the master or a crew member delegated responsibility for monitoring and control of the vessel. The 'term' owner in the Code of Practice encompasses the person or company with overall responsibility and management of the vessel (including the corporate operator). This	Amend the Code to allow the operator to be either the master or a crew member delegated responsibility for monitoring and control of the vessel.

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		aligns with the use of the term operator in the National Law Act.	
OTHER COMMENTS ON DEFINITIONS			
Definition of 'dangerous goods'	Why not the IMDG Code, note does the NOHSC definition include goods in transit?	The definition is taken from the NSCV Section C4, Fire safety, as this is the definition used in all National Law Act instruments and the NSCV. It is important for the Code of Practice to align with the NSCV. The NOHSC definition covers goods in transit.	No changes to the Code.
Definition of 'safe state'	Is it possible that the safe state for a component or system might not be compatible with the safe state for the vessel, ie the shutdown of power might result in the vessel drifting out of control. Immediate harm or eventual harm, what is the timeliness of the harm - I would suggest that this definition is reviewed and consideration given to external sources which deal with this in better detail. Where a vessel or system enters into a safe state, it may be able to function again without intervention. This should be clear in the definition.	The definition of *safe state* should be amended to clearly differentiate between a safe state of a vessel and a safe state of a system or component of a vessel. Remove the indication that intervention will be required to return to normal operations.	Amend the definition of *safe state* to clearly differentiate between a safe state of a vessel and a safe state of a system or component of a vessel, and to remove the indication that intervention will be required to return to normal operations.
Levels of autonomy	It's important to understand why Levels of Autonomy are needed, and what they are used for. No system can be fully described under single level but it is important to understand what the impact of autonomy has on risk and safety, particularly with regard to requirements definition. Therefore, I understand that you are defining them here not for the purposes of vessel classification but rather for context for later requirements definition. ie these definitions are not important to designation of the vessel but rather the application of the code.	The levels of autonomy are informative only and are not linked to specific vessel designations or requirements in the Code. The levels of autonomy described are based on those developed by the Central Commission for the Navigation of the Rhine (CCNR). To provide greater clarity, the full descriptions of the levels of autonomy used by the CCNR should be included in the Code of Practice.	Amend the Code to include the full descriptions of the levels of autonomy used by the CCNR.

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	However, these definitions do not make clear the relative burden of responsibilities between the system and the operator.		
GUIDANCE MATERIALS			
What sort of guidance materials would be helpful to enable you to understand and use the Australian Code of Practice?	1. Great use of examples and case studies. 2. Greater clarification of the vessel classification system. 3. Taking into account that this is a voluntary code of practice, consideration should be given to clarifying which aspects are legal requirements.	These comments will be taken into account in the development of the guidance materials. In regards to the request for a single consolidated document, the NSCV is comprised of a large number of standards, some of which are very long. In addition, copyright in the NSCV is owned by the Commonwealth and not by TAS, and the NSCV is also updated / revised through separate processes, which would leave the Code of Practice out dated very quickly. For these reasons, it is not practical to create a single document incorporating all referenced standards.	
	A lot of OROV users will not have coxswain or similar qualifications and will not be familiar with the COLREGs. Guidance on the technical aspects of the code of practice would assist these users. Guidance on developing a safety management system for the classes of vessels covered by the code would also assist users in adopting the principles outlined in the document.		
	Webinars, web forms, videos FAQ's		
	While reference to the relevant NSCV chapters is helpful it's quite difficult to review the complete code of practice as it requires referencing many documents. Can these sections be referenced while also combined into one wholistic document? The flow chart on page 58 is helpful. Also, it's unclear how one would document progress against this voluntary code. Perhaps pro-formas can be provided for inexperienced operators.		
	Templates for the architecture design of the safety management system associated with AXVs may be useful.		