

# Autonomous Ship Operation in New Zealand

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September 2020

ITN-002-20

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## Purpose

The purpose of the Interim Technical Note (ITN) is to provide guidance to operators who wish to conduct commercial operations using Maritime Autonomous Surface Ships (MASS), or those who wish to trial such autonomous ships in their operation.

This ITN may be updated or revised following the International Maritime Organization's (IMO) work on MASS.

## Background

Maritime New Zealand is aware of MASS operations and trials currently being undertaken in New Zealand, as well as the development of technology for use on autonomous ships. These activities are not unique to New Zealand, as the maritime industry shifts into a new phase of technology applications. Maritime New Zealand seeks to encourage the safe, secure and clean development of the industry and emerging technologies, which could benefit all New Zealanders. In that regard, it is imperative that autonomous ships and the associated technological developments meet the requirements of the regulatory framework, such as the Maritime Transport Act (1994), the Maritime Rules and the Health and Safety at Work Act, (2015).

In 2017, following a proposal by a number of Member States, IMO's Maritime Safety Committee (MSC) agreed to include the issue of MASS on its agenda. This has taken the form of a regulatory scoping exercise to determine how the safe, secure and environmentally sound operation of MASS may be introduced through IMO instruments.

## Application

This ITN is relevant to all ships operating in New Zealand with degrees of autonomy as defined below, which are remotely operated or fully autonomous, or which otherwise do not conform to the standard methodology of manned operation. All operators of commercial ships are required to participate in a safe operating system, suitable to their ship's size, construction, area of operation and function, as prescribed by the Maritime Rules. This ITN is a guide to assist operators with entry to a safety system and further operation. It is not a substitute for meeting the requirements of the regulatory framework mentioned above.

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## **Exclusions**

This ITN is not relevant to:

- a) Any warships of the New Zealand Defence Force or other States; or
- b) Any ship owned or operated by the New Zealand Government or a State other than New Zealand, if the ship is being used for wholly governmental (but not including commercial) purposes; or
- c) The master or the crew of any ship referred to in (a) and (b); or
- d) SOLAS Ships; or
- e) Remotely operated vehicles (ROVs) such as those used in subsea operations, which during the mission are physically or wirelessly connected to the relevant support vessel from which they are controlled.

## **Analysis**

Maritime New Zealand has considered the concept of autonomy and is of the view that it is defined as the ability of technology to perform autonomous functions to various degrees. It is envisaged that as the IMO develops further regulation of MASS operations, unified definitions of autonomy would be agreed upon. The below may be used in the interim as general descriptors to reflect the conceptual degrees of autonomy:

For the purpose of autonomous ships, for which this ITN is designed, the following definitions apply:

- **Decision:** Deciding upon a range of options that will result in a change in operation based on an intelligent assessment of external and internal factors and influences, e.g.; deciding the heading that the ship should be taking, or the speed at which the ship should travel. The decision-making process can take place on-board or remotely.
- **Action:** Implementing a decision by interacting with the ship's systems to match the operation specified by the decision, e.g.; moving the ship's rudder to attain a specified heading. Actions can be implemented on-board or remotely and do not require external information – simply the desired and current operation of the system.
- **System:** A collection of processes governing one of the operations of the ship and which contributes to the safe navigation and working of the ship during normal operation, or is required in the event of any emergency, e.g. rudder control and engine power can be grouped as part of the navigation system.

## **Degrees of Autonomy**

### **Manual/ No autonomy**

Operation of the ship involves no assistance from autonomous programs – all decisions are taken by humans and actions are carried out by humans who are located aboard the ship.

### **Program assisted decisions**

Decisions are made by a human and actions are human-supervised, but an autonomous program may assist these decisions and can carry out actions. An example could be a programme which suggests decisions, or the use of supervised systems such as an autopilot where a human enters each waypoint and the desired speed and the programme navigates in a straight line between each point. Humans can be located aboard (crew) or remotely outside the ship (remote operator/personnel).

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### **Program supervised decisions**

Decisions on board are supplied by the program but a human is supervising and must approve decisions for the program to implement the action. An example could be an autopilot where a human specifies the final destination with the best route suggested by a program which is then approved by a human. Humans may be located aboard (crew), however may exercise control remotely (remote operator/personnel).

### **Program semi-supervised decisions**

Decisions aboard are made by the program but a human operator is informed of decisions with time to over-ride before action is taken. Humans are not necessarily constantly supervising the system and may be located aboard (crew), however may exercise control remotely (remote operator/personnel).

### **Program unsupervised decisions**

Decisions on board are made by the program without informing an operator in real-time. The system is likely to be unsupervised for the majority of the time. Decisions can still be over-ridden by a human, but this would happen post-decision as the program will implement the decision without awaiting human approval. The supervision can be exercised aboard (crew) or remotely (remote operator/personnel).

## ***Safety Systems for New Zealand Ships***

New Zealand flagged ships must be operated under a safety system appropriate to the ship and the operation, as prescribed by the Maritime Rules. While many autonomous ships may meet the requirements for application of Maritime Rules 19, 21, 40A, 40B, 40C, 40D, 40E and 40F, it is recommended that operators of autonomous ships with systems utilising program unsupervised decisions, or remotely exercised supervision at any degree of autonomy, approach Maritime New Zealand for exemption from the application of these rules in order to be able to operate under Maritime Rules Part 40G, which sets out the requirements for the Safety Case operating system for novel ships.

Where ships utilise programme semi-supervised decisions with humans aboard, the operator should approach Maritime New Zealand for exemption from specific parts of Maritime Rules 19, 21, 40A, 40B, 40C, 40D, 40E or 40F as required.

#### **Maritime Rule 40G**

##### **40G.3 Application**

This Part applies to every New Zealand and foreign ship that—

- (a) operates on the New Zealand coast; and
- (b) is a commercial ship—
  - (i) to which the requirements of Parts 40A, 40B, 40C, 40D, 40E, 40F, 80 and 82 do not apply; or
  - (ii) that is required to comply with this Part as a condition of an exemption.

For the purposes of carrying out testing of autonomous ships, sea trials are considered outside of the scope of commercial use and therefore there is no requirement to be a participant in a safety system administered by Maritime New Zealand. Before the autonomous ship is entered into commercial operation, operators should make contact with Maritime New Zealand in relation to how their operation can enter into one of the safety systems prescribed by the Maritime Rules. In most cases it is envisaged that autonomous ships would enter into the Safety Case safety system, as set out in Maritime Rule 40G. Operators of autonomous ships which are already in operation are required to bring their operation into one of the safety systems.

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Additional information on safe operating systems and how to get approval for a Safety Case under Maritime Rule 40G can be found at: <https://www.maritimenz.govt.nz/commercial/safety/safety-management-systems/default.asp>

There may be cases where the ship is fitted with autonomous systems, which cause it to not comply with other applicable parts of the Maritime Rules, for example Maritime Rules Part 31 – Crewing and Watchkeeping. In such cases, the operator may apply for exemption from those rules. Applications for exemption should include, as applicable and, not limited to:

- a) A declaration of the concept of use of the autonomous ship, including any limits of use
- b) The part of the rule which the operator has determined to not be in compliance with
- c) Equivalent measures which achieve the same or higher standard of safety in comparison to the requirements of the maritime rule
- d) Recognised standards which the equivalent measures (in the case of technological measures) adhere to eg; IACS Classification Society codes or similar
- e) Evidence of compliance with the recognised standard as far as is applicable
- f) Arrangements for a New Zealand based master and the responsibilities of the master
- g) Remote crewing methodology

## **Exemptions Framework**

Noting that the Director is unable to provide exemptions from any part of the Maritime Transport Act (1994), Section 47 and Section 395 of the Act contain provisions for exemption from any specified requirement in the Maritime Rules and Marine Protection Rules. The exemptions framework is intended to be used where an alternative but equivalent measure of compliance to that which is specified in a Maritime Rule, is intended to be implemented, or where the Maritime Rules are inappropriate, unreasonable or substantially complied with. There are other cases in which an exemption might be appropriate, as set out in the excerpt below, however the core principle is that any exemption achieves the same standards of safety and marine protection to those of the rules.

Exemption may be sought where the features of an autonomous ship make compliance with the Maritime Rules or Marine Protection Rules impracticable, provided that such features can be proven to function to the same level of safety, security and environmental protection as required by the Maritime Rules and Marine Protection Rules and not to pose any additional risk.

### **Maritime Transport Act (1994)**

#### **Section 47 - Exemption**

(1) The Director may, if he or she considers it appropriate and upon such conditions as he or she considers appropriate, exempt any person, ship, or maritime product from any specified requirement in any maritime rule.

(2) The Director shall not grant an exemption under subsection (1) unless he or she is satisfied in the circumstances of each case that—

(a) the granting of the exemption will not breach New Zealand's obligations under any convention; and

(b) either—

(i) the requirement has been substantially complied with and that further

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- compliance is unnecessary; or
  - (ii) the action taken or provision made in respect of the matter to which the requirement relates is as effective or more effective than actual compliance with the requirement; or
  - (iii) the prescribed requirements are clearly unreasonable or inappropriate in the particular case; or
  - (iv) events have occurred that make the prescribed requirements unnecessary or inappropriate in the particular case; and
- (ba) the risk of harm to the marine environment will not be significantly increased by the granting of the exemption; and
- (c) the risk to safety will not be significantly increased by the granting of the exemption.

(4) Nothing in this section shall apply in any case where any maritime rule specifically provides that no exemptions are to be granted.

### **Section 395 - Exemptions**

(1) The Director may, if he or she considers it appropriate, and upon such conditions as he or she considers appropriate, exempt any person, ship, marine protection product, offshore installation, pipeline, reception facility, or any real or personal property, from any specified requirement in any marine protection rule.

(2) The Director shall not grant an exemption under subsection (1) unless he or she is satisfied in the circumstances of each case that—

(a) the granting of the exemption will not breach New Zealand's obligations under any convention; and

(b) either—

(i) the requirement has been substantially complied with and that further compliance is unnecessary; or

(ii) the action taken or provision made in respect of the matter to which the requirement relates is as effective or more effective than actual compliance with the requirement; or

(iii) the prescribed requirements are clearly unreasonable or inappropriate in the particular case; or

(iv) events have occurred that make the prescribed requirements unnecessary or inappropriate in the particular case; and

(ba) the risk to safety will not be significantly increased by the granting of the exemption; and

(c) the granting of the exemption will not significantly increase the risk of harm, —

(i)

for a marine protection rule on ballast water, to the environment, human health, property, or resources; or

(ii) for any other marine protection rule, to the marine environment.

(3) The number and nature of exemptions granted under subsection (1) shall be notified as soon as practicable in the Gazette.

(4) Nothing in this section shall apply in any case where any marine protection rule specifically provides that no exemptions are to be granted.

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## **Responsibilities of Masters (Maritime Transport Act, 1994)**

The Maritime Transport Act (1994) defines a master as any person (except a pilot) having command or charge of any ship. In the case of autonomous ships, the master is responsible for the safe operation of the ship, passengers, crew and cargo carried. The master holds final authority for the operation of the ship and is responsible for the compliance with the Act and the Rules. This requirement remains for all degrees of autonomy outlined above.

All ships must have a master in command of the ship, including autonomous ships. To facilitate autonomous ship operation, Maritime New Zealand can accept a remote operator as the master of the ship, for instance a “Master Remote Operator”, or similar. This role will hold the responsibilities as defined in the Act and is necessary under New Zealand law. A master remote operator, or similar, of a New Zealand ship must be physically located in NZ and therefore subject to NZ law.

The master, like other crew (or remote personnel) is required under the Act, as a participant in the maritime system to hold appropriate maritime documents and all the necessary qualifications. This remains the case with autonomous ship operation. However, where the requirements in attaining certain documentation are not appropriate for the operation of autonomous ships, an exemption may be sought.

### **Maritime Transport Act (1994), Part 3, Section 19 - Duties of master**

- (1) The master of a ship shall—
- (a) be responsible for the safe operation of the ship on a voyage, the safety and wellbeing of all passengers and crew, and the safety of cargo carried; and
  - (b) have final authority to control the ship while in command and for the maintenance of discipline by all persons on board; and
  - (c) be responsible for compliance with all relevant requirements of this Act and regulations and maritime rules made under this Act, except in an emergency when, in the interests of safety, immediate action in breach of this Act or of regulations or maritime rules made under this Act is necessary; and

## **Responsibilities of PCBUs (Health & Safety at Work Act, 2015)**

The Health & Safety at Work Act, 2015 (HSWA) applies on New Zealand Ships, wherever they may be, as well as foreign ships on a demise charter to a New Zealand-based operator when operating in New Zealand.

The HSWA defines persons conducting a business or undertaking (PCBU) and sets out the requirements with which PCBUs must comply so that the health and safety of other persons is not put at risk from work carried out as part of the conduct of the business or undertaking. This is considered to be the primary duty of care of a PCBU and exists alongside the responsibility to eliminate and minimise risks to health and safety as far as reasonably practicable.

In relation to autonomous ship operation in the context of the HSWA requirements, some examples of issues operators must consider include, but are not limited to:

- a) the nature of operation of their ship and risks it poses
- b) possible interactions with the ship and the PCBU
- c) how the ship is controlled and the standards in relation to operational systems and operating personnel
- d) Legislative and documentary requirements which the ship and PCBU would be subject to

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## ***Certification of Personnel (including Master)***

Where an autonomous ship requires any degree of remote human operation, personnel must have an appropriate seafarer certificate of competence applicable to the area of operation and ship size, and they must be medically fit to carry out their roles and responsibilities related to autonomous ship operation. It is therefore the responsibility of the owner or operator to ensure that all personnel are adequately trained, developed, medically fit (physically and mentally, to the purpose of their duty) and where appropriate, certified to undertake their roles and responsibilities.

The owner or operator must ensure that their personnel undertake the required initial training and that the operator(s) are adequately familiar with the equipment installed on the autonomous ship, both for normal operations and emergency situations. All training undertaken, and all subsequent operational experience should be recorded by the operator. All training should be endorsed by the training provider, which could be the owner. Operational experience should be endorsed by an appropriate company representative. Evidence should include dates, operational hours, and operational area, as well as where and when any training took place.

Exemption may be sought where the features of an autonomous ship make compliance with the crewing requirements of the Maritime Rules impossible or inappropriate, provided that such features can be proven to function to the same level of safety as required by the Maritime Rules and not to pose any additional risk.

## ***Foreign Flagged Ships In New Zealand***

Operators of foreign flagged ships, whether conducting trials or under commercial operation in New Zealand, should contact Maritime New Zealand at the earliest opportunity and seek advice on compliance with New Zealand legislation.

Any autonomous ship operating in New Zealand must adhere to a certification, oversight and active compliance regime co-ordinated by its flag Administration, evidence of which must be made available to Maritime New Zealand upon request.

Additionally, foreign flagged ships in New Zealand are subject to the provisions of Port State Control. All foreign flagged ships must be in compliance with the applicable international conventions, which New Zealand may verify as a Port State.

## **Applying for an Exemption and Approval of a Safety Case**

### ***How to Apply***

The exemption application form can be found on the Maritime New Zealand website at:

***<https://www.maritimenz.govt.nz/commercial/safety/exemptions/rule-exemptions.asp>*** and may be sent to the Exemption Officer by emailing ***[Exemptions.Officer@maritimenz.govt.nz](mailto:Exemptions.Officer@maritimenz.govt.nz)***.

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You may also discuss this with your surveyor or speak to a Maritime Officer at your regional Maritime New Zealand office.

### ***Trial Period***

Upon receipt of an application for exemption related to the operation of an autonomous ship, Maritime New Zealand will consider the application and if appropriate, may issue an initial exemption with a 6-month validity and appropriate conditions.

After the initial 6-month period has elapsed, the operator may apply for an extension of the exemption at which point Maritime New Zealand will consider the appropriate duration of the exemption.

### ***Safety Case Approval***

To apply for a safety case, you must complete and send the following to Maritime New Zealand:

- a) a safety case plan providing an overview of your operation and its safety, such as:
- b) the nature of your operation
- c) its ships
- d) its crew
- e) its safety systems (safety procedures)
- f) its ongoing maintenance
- g) the safety case application form and
- h) the fit and proper person form

Full guidance on Safety Case applications and associated applications forms can be found at:  
<https://www.maritimenz.govt.nz/commercial/safety/safety-management-systems/safety-case/default.asp>

Further information on this note may be obtained from:

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#### ***Operator Certification***

#### ***Maritime New Zealand***

New Zealand (toll free): **0508 225 522**

Calling from outside New Zealand: **+64 4 473 0111**

Email: **[operators@maritimenz.govt.nz](mailto:operators@maritimenz.govt.nz)**

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