



# MARITIME AUTONOMOUS SURFACE SHIPS IN INTERNATIONAL LAW

NEW CHALLENGES FOR THE REGULATION OF NAVIGATION AND SHIPPING

ALDO CHIRCOP  
CANADA RESEARCH CHAIR  
DALHOUSIE UNIVERSITY

# OUTLINE

1. Introduction
2. Technology
3. UNCLOS considerations
4. Implications for international maritime law
5. Assessment
6. Conclusion

# 1. INTRODUCTION

- IMO Maritime Safety Committee's 99<sup>th</sup> session (May 2018) undertook first consideration of a scoping exercise for MASS (target 2020)
- Are MASS a potential game-changer in shipping, and if so, in what respects?
  - International regimes in public and private law concerning shipping are largely premised on human presence and control
- Purpose of my presentation:
  - How are those regimes affected when the human presence is taken out?
  - What accommodations (interpretations, changes) may be needed?
  - Focus on commercial shipping

## 2. TECHNOLOGY

- Technology has always been a key driver of shipping regulation (e.g., steel hulls, steam engine, bulkers, tankers, refrigeration, containerization, polar class, etc.)
- Automation already on board ships (e.g., engine rooms, AIS, autopilot, etc.)
- The MASS concept:
  - Partially to fully automated and/or remotely operated ships: passive presence onboard to fully crewless ships
  - Artificial intelligence:
    - Algorithms, tools and techniques that mimic human learning to solve problems
    - Recognizes patterns in data, making predictions from previously unseen data
  - Role of big data
  - Radical new ship designs

## Pros

- Efficient:
  - Lighter build, better navigated
  - Responds to crew shortages
  - Crew savings
- Environmental benefits – greener?
  - Lower energy use/emissions.
  - No garbage, sewage discharges
- Safer?
  - Human error as the major factor in accidents is removed
  - Less attractive to pirates

## Cons

- Cost: expensive to build
- Constraints for at sea maintenance
- Interaction with crewed vessels
- Regulatory constraints (crew rules, distress response, etc.)
- Port inspections
- Cyber security
- Insurance (temporary)

### 3. UNCLOS CONSIDERATIONS

- Terminology:
  - ‘Ship’ and ‘vessel’ are not defined in UNCLOS
  - Definitions are provided in the international maritime law conventions
  - Consideration of MASS as ‘ship’ or ‘vessel’ is not likely a legal issue
- Jurisdictional issues:
  - Flag State: jurisdictional responsibilities
  - Coastal State: navigational rights and regulation of passage
  - Port State: port entry and PSC inspections

# Flag State

- Right to register any class of ship (art 91)
- Registered ships enjoy navigation rights irrespective of their class (art 90)
- Flag State enjoys a mixture of exclusive (primary) and concurrent jurisdiction (exceptional) over its ships depending on their location
- Flag state has a due diligence duty to exercise effective jurisdiction and control (administrative, technical, social)(art 94)

# Flag state due diligence responsibilities (Arts 94, 98, 217)

- To take measures necessary to ensure safety at sea
- To ensure ships are in the charge of properly qualified master and officers
- To ensure ships are crewed in accordance with their class
- To ensure master and crew are conversant/required to comply with international safety, collisions avoidance, pollution prevention, radio communications rules
- To ensure conformity with generally accepted international regulations, procedures and practices and take any steps necessary to secure their observance
- To require master to offer assistance to persons in distress at sea
- To ensure compliance with international rules and standards and provide for effective enforcement, including prevent operation of ships not in compliance with manning requirements

# Interpretational issues

- Manning requirement: is 'in the charge of' limited to an onboard crew or could this be constructively interpreted to include a shore-based team?
- Qualification requirements: extended to shore-based personnel?
- Crew according to ship's class: includes temporary crews? Shore based team?
- Radio communications: would a shore based-crew be able to discharge this requirement?
- Assistance at sea: scenarios where there is 'no master' on board or where the vessel is remotely operated
- Jurisdiction over master and crew: how could this work when the vessel is fully autonomous or remotely controlled from another jurisdiction?

# Coastal State

- Art 21: passage regulation
  - must not apply “design, construction, manning or equipment [standards] unless they are giving effect to generally accepted international rules or standards.”
  - Until the IMO regulates MASS, can a manning be required, e.g., in heavy traffic areas?
- Art 211: ditto re pollution prevention?
- Art 42: likely cannot impose a manning requirement

# Port State

- Potential PSC inspection issues re:
  - Boarding
  - Inspection of vessel, equipment etc.: extended to other equipment, processes, etc., for MASS?
  - Interviewing?
  - Communication of findings to person responsible for the vessel

## 4. IMPLICATIONS FOR INTERNATIONAL MARITIME LAW

- Maritime conventions are largely premised on a human presence on board:
  - design of ship as a safe work space
  - control of the navigation of the ship
  - provision of notices
  - log book entries
  - reporting
  - pilotage services
  - responding to distress

# Maritime safety

- Operations (SOLAS)
  - “from the point of view of safety of life at sea, all ships shall be sufficiently and efficiently manned” (V/14) (crewing = safety outcome)
  - Maintenance of continuous watch (IV/12)
  - Danger messaging and weather reporting to other ships and authorities (V/31)
  - Crew requirements for distress (IV/16)
- Design, construction, equipping (SOLAS, Load Lines Convention)
  - Bridge design and resource management (V/15); shore-based control room?
  - Some potentially redundant rules?
    - Life boats, mustering, etc.
    - Deckhouses for accommodation, guard rails, safe passageways, etc.

# Crew training, certification and work conditions (STCW)

- Expectation: States to require companies ensure ships are manned in compliance with applicable safe manning requirements of the Administration (I/14)
- Sufficient manning: companies are responsible to employ certificated seafarers, in compliance with STCW, “for service on their ships” (I/1)
- Flexibility: Principles of Safe Manning (2011) – “may increase or decrease manning levels depending on availability and appropriate procedures and of specific capability enabling technology/automation.”
- Watch requirement: continuous watch or watches appropriate to the prevailing circumstances and conditions on all seagoing ships at all times (VIII/1)
- Redundancies: STCW? MLC? Or will STCW need to change to include rules of competence for shore-based personnel?

## Rules of the road (COLREGS)

- No exemption from compliance or from exercising the precaution necessary and expected in the ordinary practice of seamen (2(a))
- No basis for a privileged right of way (3)
- What will be proper lookout on MASS? (5)
- Interaction between manned and unmanned ships: course tracking & communication
- Contributory negligence: can an algorithm substitute human judgment in good seamanship?
- Lights/shapes for day/night time navigation for MASS?

# Environment protection

- Redundancies in vessel-source pollution?
  - MARPOL Annexes IV (sewage) and V (garbage) – case for exemptions (unmanned non-self-propelled barge analogy)
  - BWM Convention: officers and crew familiarity with procedures
- Exacerbated problems?
  - Marine mammal protection from ship strikes?
  - Places of refuge when in need of assistance?

# Maritime security

- Possible need to revisit the International Ship and Port Facility Security Code to accommodate MASS?
  - Cybersecurity
  - “*Ship security plan* means a plan developed to ensure the application of measures on board the ship designed to protect persons on board, cargo, cargo transport units, ship’s stores or the ship from the risks of a security incident”
  - Rethink security assessment?

## 6. CONCLUSION

- IMO's strategic directions (2018-2023): keeping “under review the technical and operational safety aspects of all types of ships”
  - Desirability of a proactive and systemic legal response, rather than reactive and instrument-by-instrument (Polar Code example?)
  - ‘No more favourable treatment’ for MASS
  - Importance of constructive and consistent interpretation of pertinent provisions of UNCLOS and international maritime conventions (e.g., ‘manning’)
  - Cautionary lessons: technology over-reliance on radar, GPS, AIS resulted in collisions and allisions!



谢谢  
THANK YOU

Q&A?