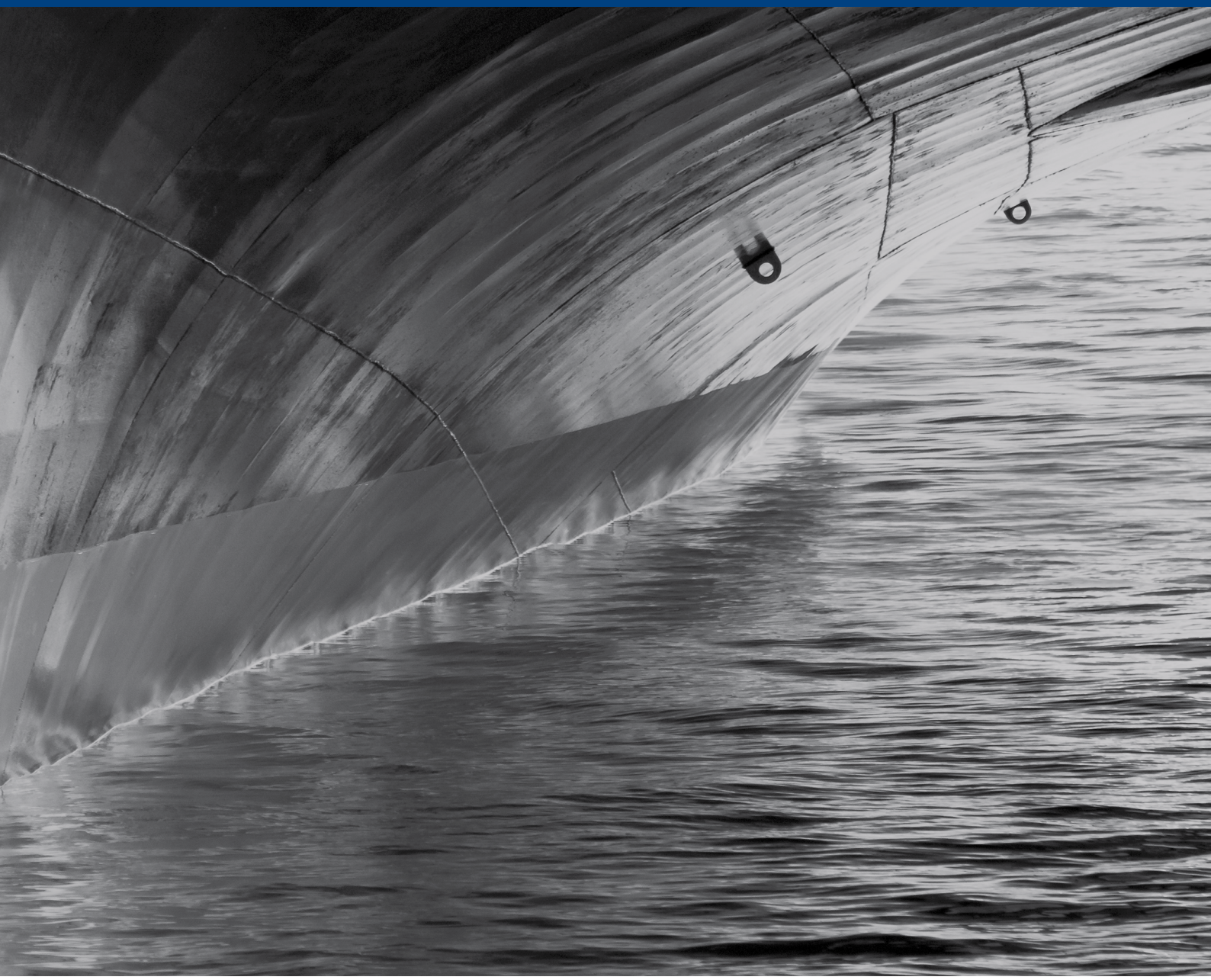

# AUTONOMOUS SHIPS: SUCCESSFULLY NAVIGATING THROUGH THE SHALLOWS?

**In this, the latest in our series on Maritime Autonomous Surface Ship (MASS), we provide an update on news from the International Maritime Organization (IMO) on its regulatory scoping exercise; take a look at some of the insurance issues arising as the use of MASS becomes more widely recognised; and consider the recent developments worldwide, including how the technology used in MASS is being trialled to assist the situational awareness in conventional vessels.**

## IMO regulatory scoping exercise update

In our July 2017 briefing[1] we reported that the IMO's Maritime Safety Committee (**MSC**) had, in its ninety-eighth session, approved a scoping paper to address how existing IMO regulatory instruments can be applied to the safe, secure and environmentally sound operation of MASS.

The MSC recently met for its ninety-ninth session at the IMO's headquarters in London (16-25 May 2018) to focus on the framework of the regulatory scoping exercise and has decided that the following conventions should be covered:

- Safety of Life at Sea (**SOLAS**)
- Convention on the International Rules for Preventing Collisions at Sea (**COLREGs**)
- Load Lines
- Standards of Training, Certification and Watchkeeping for Seafarers
- Maritime Search and Rescue
- Tonnage Convention
- Special trade passenger ship instruments

The existing regulatory framework applies to ships. With no uniform definition of "ship" across the international conventions, a lot of the previous discussion on the regulation of MASS has been focused on whether a MASS can be considered a "ship" or not. Our view has always been that a MASS **should** be considered a ship and, for the purpose of the regulatory scoping exercise, the IMO has defined a MASS as a ship which *"can operate independently of human interaction"*. To facilitate the scoping exercise, it has been agreed that the various degrees of autonomy within which a MASS will operate should be organised in escalating autonomy as follows:

- **Ship with automated processes and decision support (most likely to be a conventional ship):** seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated.
- Remotely controlled ship with seafarers onboard: the ship is controlled and operated from another location, but seafarers are on board (which would include a Periodically Unmanned Ship and a ship with a Periodically Unmanned Bridge). For example, *Svitzer Hermod*, the *RT Borkum* and *Highland Chief*.
- **Remotely controlled ship without seafarers on board:** the ship is controlled and operated from another location. There are no seafarers onboard.
- **Fully autonomous ship:** the operating system of the ship is able to make decisions and determine actions by itself (also known as a Continuously Unmanned Ship).

The MSC established a correspondence group on MASS to test the framework of the regulatory scoping exercise. The remit of work to be carried out by the correspondence group was agreed at the ninety-ninth session and is scheduled to report back at MSC 100 which will take place in December 2018. The correspondence group will test how IMO instruments may or may not be applicable to ships with varying degrees of autonomy – or whether they may preclude MASS operations by conducting an initial assessment of SOLAS regulations for recovery of persons from the water, carriage requirements for navigation equipment and systems, and load lines information to be supplied to the Master. If time permits, the correspondence group will also consider SOLAS regulations for emergency towing and navigation bridge visibility. Further, the MSC has invited interested member states to submit proposals for the development of interim guidelines for MASS trials to MSC 100.

So how long will the scoping exercise take? It was originally envisaged that it would require at least two sessions of the MSC, although some delegates have suggested it could take up to at least 8 years. There is a lot of work to do and plenty of hurdles to overcome, especially with some countries favouring fully autonomous ships, some remotely controlled ships, and a number of countries advocating that all ships should be manned.

### Comment

With amendments to the various relevant international instruments unlikely to be fully addressed in the immediate future, the short-term focus is likely to be on national regulations and the operation of MASS in national waters. As discussed in our November 2017 briefing[2], the *Yara Birkeland* is a good example of this. The vessel is designed to operate on limited routes within Norwegian territorial waters and will be subject to Norwegian law and regulations.

In our November 2017 briefing we also reported on the UK Maritime Autonomous Systems Regulatory Working Group Voluntary Code of Practice which set initial standards and best practice for those who design, build, manufacture, own, operate and control MASS of less than 24m in length. This type of work and similar exercises are being carried out in other countries. As well as lessons learned from operating MASS, the IMO is encouraging states to submit this information so that it can be assimilated and form part of the IMO regulatory scoping exercise going forward.

But perhaps the biggest challenge the maritime industry faces will be to ensure that MASS and conventional vessels can operate safely within the same waters, particularly in busy ports and harbours. This will require close cooperation between port operators and MASS users. In the UK, Peel Ports Group and ASV Global have launched a partnership to support the use of autonomous technology across various ports, to promote shared learning and to address the challenges related to using autonomous technology. The same sort of shared learning and understanding will also be required of port operators and remote-controlled tug operators. For example, under a port's marine safety code, how will the requirements for tugs/workboats

1. http://www.hfw.com/downloads/HFW-Maritime-Autonomous-Surface-Ships-July-2017.pdf
2. http://www.hfw.com/downloads/HFW-Autonomous-vessels-are-regulations-keeping-up-with-innovation-November-2017.pdf

and operators' approval adapt to accommodate MASS? This will need to be addressed as the use of MASS is taken up.

## Insurance issues

The majority of insured marine losses arise from human error. If MASS can eliminate the capacity for human error and reduce the number of casualties and incidents then this will be attractive to both hull and P&I insurers alike. While the majority of MASS currently in operation are less than 10m in length, there are some larger vessels capable of being operated remotely. The *Svitzer Hermod* and the *Yara Birkeland* are such examples.

A number of insurers are already offering products to insure MASS. For example, the Shipowners' Club has developed a new autonomous vessel policy and Gard is providing Hull and Machinery and P&I insurance to the *Yara Birkeland*.

Owners of MASS will also need to carefully consider the level of insurance cover they require, which might differ from conventional ships. This is because MASS are more dependent on technology and in the event of an accident fault may lie in the underlying software, errors in data processed by software, mechanical breakdown and human operator mistakes.

There will, however, still be some difficult issues for insurers to contend with as vessels increase in size and begin to operate in international waters. Consideration will have to be given to the particular degree of autonomy since it is conceivable that during a voyage, a ship will employ different types or degrees of autonomy at different stages such as leaving the berth, departing the port and during the sea passage.

## Cyber resilience

As the uptake of MASS grows, there will inevitably be significantly more data transferred to facilitate their operation. This in turn will, potentially, increase the risk of a cyber event which could put at risk the safety of the vessel, its cargo and the environment[3].

One of the most heavily relied upon navigational aids is GPS. However, GPS signals are vulnerable to "spoofing", a process whereby GPS information is falsified. In 2017, a number of spoofing attacks took place in the Black Sea, which resulted in a number of vessels reporting that their navigational equipment displayed their position to be a significant distance away from their actual positions – often in implausible locations, such as airports. While these attacks are unlikely to adversely impact manned vessels which can use secondary navigational methods such as plotting visual bearings and radar ranges on ECDIS or paper charts, MASS might be more vulnerable to these sorts of attacks.

In order to counter the increased risk of cyber events, cyber resilience must therefore go hand-in-hand with autonomy. In particular, BIMCO's Guidelines on Cyber Security Onboard Ships identifies ship to shore interfaces, such as engine performance monitoring, cargo, crane and pump management and voyage performance monitoring, as a source of potential vulnerabilities for all ships[4]. Remote access to MASS must therefore be taken into consideration as an important part of assessing the risks of a cyber event[5].

## Other developments

Rolls-Royce, with the assistance of Warsash Maritime Academy, has now completed its MAchine eXecutable Collision regulations for Marine Autonomous Systems (**MAXCMAS**) project. Rolls-Royce claims that AI-based navigation systems were able to comply with the COLREGs even when approaching "manned" vessels that were interpreting the rules differently.

In our April 2017 briefing[6] we suggested that collision avoidance systems which made use of a combination of AIS, Light Detection and Ranging (**LiDAR**), infrared cameras and radar had the potential to be integrated with existing systems on board conventional ships to assist bridge awareness. This has proven to be prescient with AP Moller-Maersk and Boston-based Sea Machines Robotics recently announcing[7] that situational awareness technology will be trialled on board one of Maersk's new-build ice-class container ships. LiDAR and perception software will be used to augment bridge awareness, object identification and tracking capabilities, said to be similar to Advanced Driver-Assistance Systems found in automobiles. This will reduce the line of sight issues from the bridge, and the data will be collected for autonomous collision avoidance development in the future.

While Svitzer can claim to have been the first company to demonstrate the remote control of a tug from its Copenhagen HQ – the *Svitzer Hermod* in Copenhagen harbour – KOTUG has recently demonstrated[8] what it believes to be the first remote control of a tug from a long-distance location. The *RT Borkum*, which was sailing in Rotterdam, was controlled remotely via a remote secured internet line and camera images at the International Tug, Salvage & OSV Convention and Exhibition in Marseille. KOTUG believes that real time sensor technology makes it possible to give the remote control captain the situational awareness required for safe operation, and KOTUG is also developing drone technology to transfer the tow messenger, which it says will be safer than existing methods of transfer.

## Summary

With the technology developing faster than the international regulations and conventions, it is difficult to predict what types of MASS will be operating in the next 10 years or so when the IMO's regulatory scoping exercise is anticipated to be completed. Some delegates at the recent MSC 99 are apparently of the view that MASS could represent up to 20% of global shipping in the next twenty years. While that figure

3. http://www.hfw.com/downloads/HFW-Cyber-security-the-increasing-threat-to-your-business-May-2017.pdf
4. Note that HFW are on the BIMCO's drafting sub-committee for their new cyber charterparty clause.
5. http://www.hfw.com/New-BIMCO-Guidelines-July-2017
6. http://www.hfw.com/downloads/HFW-Autonomy-at-sea-the-future-April-2017.pdf
7. http://www.sea-machines.com/updates/2018/04/25/maersk-selects-sea-machines/
8. https://www.youtube.com/watch?time_continue=17&v=04rE8DgR4JA

might be ambitious, there is little doubt that MASS and its associated technology is here to stay and that it will have a significant part to play in shaping the global maritime industry going forward. While cyber risks are considered by some stakeholders to be a significant risk to the adoption of MASS, the regulatory issues combined with legal and liability issues remain by far the biggest obstacle. It is therefore ever more important for all stakeholders to ensure that their legal, contractual and compliance practices are up-to-date and aligned with the new technology so that they can *"successfully navigate through the shallows"*. But while regulatory preparedness might be a pressing concern, regulations should not become a barrier to innovation which is why "goal-based" frameworks have been adopted by some countries and preferred by others.

HFW's Autonomous Group has been advising a number of stakeholders how to *"successfully navigate through the shallows"*, including governments, insurers, the defence sector and owners/operators of marine assets being used autonomously offshore.

We will continue to monitor developments and report on these in our forthcoming thought leadership bulletins.

Recent HFW Autonomous Group seminars include:

- Paul Dean gave a talk at the Autonomous Ships & the City event on 17 April 2018[9].
- Jonathan Goulding gave a presentation on the Legal Implications of Autonomy at the British Tug Association's Annual Conference on 18 April 2018[10].
- Matthew Dow gave a talk on Autonomous Vessel's at HFW's offshore day on 18 April 2018.

9. https://www.youtube.com/watch?v=3dOmRdHCzDI)
10. https://britishtug.com/bta-conference-presentations-18-april/

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