



AUTONOMOUS SHIPS: DRAWING A LINE IN THE SAND?

In our first 2020 briefing¹ for our series on Maritime Autonomous Surface Ships (MASS), we consider changes to both the UK Code of Practice (COP) on MASS, signs of progress from the IMO in mapping the regulatory framework of autonomous shipping and a host of other exciting projects, vessel developments and events in which HFW has participated.

¹ Our last briefing is available at <https://www.hfw.com/Autonomous-ships-MASS-The-Pearl-of-an-Opportunity-July-2019>.

Maritime UK publishes revised Code of Practice (COP) for autonomous ships

Maritime UK has published a third revision of its COP for autonomous ships. The new updated edition now includes setting out general points of conduct that would be expected of the industry including: quality control, environmental and employee protection. The ninth and final industry principle requires that “MASS Operators” are trained and certified to an equivalent standard to counterparts on manned vessels, with a longer-term goal of standardised training. This may mean the definition of Master and crew will have to be broadened and is an issue we deal with below.

Additions to the COP extend this theme, setting out detailed methodologies to determine training needs and to manage associated risks, with the identification of a skills gap being formalised as part of the training process.

The updated COP also includes a new section on inland waterways, particularising the levels of human oversight required when carrying out dynamic navigation tasks in various inland contexts.

Update on IMO Regulatory Scoping Exercise

In our last briefing, we reported on the IMO Maritime Safety Committee’s (MSC) 101st session. Since then, an Intersessional Working Group (IWG) has been held with regard to autonomous shipping.

As with the COP, the IWG focused on training, with particular scrutiny of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). The MASS Special Interest Group, a voluntary group made of IMarEST² members, will be supporting the development of training frameworks.

The IWG found that the STCW only applied if seafarers were on board an autonomous vessel, and that the STCW must be amended to reflect a changing skills requirement. Interestingly, this points to a potential void of regulation for

remote operators of a MASS, where there would be no application of the STCW at all. The IWG concluded that a remote operator is yet to be defined, but that legal provisions such as SOLAS would need to be revisited again if these were to be considered seafarers. The definition of the “Master” in the context of a MASS continues to be viewed as an overriding issue.

Autonomous ships will have to comply to the same extent as manned ships with SOLAS Chapter VII on dangerous goods and SOLAS Chapter III on the carriage of life-saving appliances, with the IWG commenting that technology in this area will have to be developed before full autonomy can be realised. Other aspects of SOLAS were discussed, with each requiring technological challenges to be solved before increasing the level of autonomy and potentially heralding a long period of remotely-operated vessels rather than fully autonomous ones. Finally, the IWG encouraged a shift in rhetoric from autonomous ships to autonomous functions, again signalling a gradual introduction of varying degrees of autonomy into the industry.

Comment

Both the COP and the IMO’s IWG session have focused heavily on ensuring that training frameworks are integrated into the growth of autonomous shipping. Notably, both streams have taken a mature approach to skills-building, acknowledging the need to identify where skills gaps exist. This will help to ensure that the skills of existing mariners are preserved and transposed into new roles, rather than creating a new and separate class of employees from the ground-up.

Importantly, the focus on delivery of training will help to prevent potential disruption resulting from unregulated operations of autonomous vessels by unqualified personnel. The need to avoid such a scenario is also borne out in the industry guidelines in the COP. These emphasise protection and assurance of stakeholders involved in the shipping industry, including members of the public

and other seafarers. The COP is comprehensive, and could already be used as a tool to judge duties owed by MASS operators and whether this they have been breached in a tortious claim. We anticipate that further revisions in due course will only increase its utility.

Preservation of life is also a clear theme of the works of the IWG. Its recent meeting dealt with multiple provisions of SOLAS, marking a clear preference for existing, well-developed regulations over the wholesale creation of new measures. The drawback of this is seen in the IWG’s examination of the COLREGS; namely the need to integrate machine intelligence with historic legal concepts such as “seamanship” and “sight and hearing”.

This preference for leaving existing statutory provisions in a lightly modified state, combined with the instinctive human knowledge of what would or would not constitute proper levels of these maritime standards of care, gives some reassurance. It is likely that a MASS, with a theoretically advanced yet mechanically dependent cluster of sensors, would not be burdened with more than human-equivalent expectations to monitor and navigate safely. Such a concession should greatly assist the courts in dealing with cases involving autonomous vessels, and it serves as a critical reminder for a vessel operating near a MASS to communicate its intentions and allow for margins of error in navigation, as it would when navigating near a manned vessel.

HFW publicity

HFW is delighted to have had a chapter published in “New technologies, Artificial Intelligence and Shipping Law in the 21st Century”, a book edited by Professors Baris Soyer and Andrew Tettenborn of Swansea University. The chapter, written by Paul Dean and Henry Clack and titled “Autonomous Shipping and Maritime Law”, takes a detailed look at how a MASS might fit into existing regulations, the scope for reform and the impact of autonomy on other maritime spheres such as insurance and salvage.

Autonomous vessels in the news

USV Maxlimer, known for crossing the North Sea in May 2019 with a 5kg cargo of oysters, continues its preparations to attempt the world's first transatlantic crossing. The voyage from Canada to the South of England is expected to take approximately 35 days. In addition to winning the Shell Ocean Discovery XPRIZE competition for the work of the *USV Maxlimer*, Sea-Kit has also completed an underwater pipeline inspection survey for Swire Seabed.

Construction of the *Yara Birkeland* continues apace. In June 2019, Kongsberg Maritime agreed that MacGregor, part of Cargotec, would produce a fully automated mooring system for the vessel. It is anticipated that this mooring system will become operational before the vessel itself is operated in an autonomous manner in 2022.

400 years after its namesake's historic journey that brought European settlers to America, the autonomous vessel *Mayflower* will undertake the same voyage, backed by Artificial Intelligence systems provided by IBM. The journey is expected to be as quick as two weeks, with the vessel running entirely on solar and wind power. IBM's software will help to guide the *Mayflower* in the long periods of little or no connectivity in its journey. On its journey, the vessel will also sample the ocean for pollutant microplastics. This voyage will be insured by Gard who are also to be the P&I Club for *Yara Birkeland*.

Stellar Systems, a UK-based naval architecture and consultancy firm in partnership with Thales, has devised a military ship that it hopes will maximise use of autonomy to assist crew. The ship, dubbed the "*Transition Ship*" or "*TX*", already leverages the benefits of autonomy with reduced crew space freeing up capacity to equip the ship for a wide variety of missions. The ship will be built in the trimaran style, with a length of 70m and space for a crew of 15, although it will be able to operate with fewer crew or none at all as needed in its role as a testbed for autonomous operations.

In a similar vein of bridging a gap between capabilities, the *Aquanaut*, developed by Houston Mechatronics, is a long distance autonomous AUV which also retains the tactile manipulative capabilities of an ROV. The vehicle, at 3.5m in length, travels with a familiar AUV profile. However, upon reaching the target, hull plates split, exposing seven-jointed arms and additional control thrusters. The long distances would present a challenge for radio-control of a traditional ROV, but *Aquanaut's* 4 on-board computers (1 just for computer vision) also harness a traditional AUV's autonomy, allowing it to follow broader directives communicated less frequently.

Other developments

The UK Maritime & Coastguard Agency (MCA) have chosen Portland Harbour in Dorset as the test site for a new online platform that will facilitate data sharing regarding autonomous shipping. Hosted by MARLab, this site will collect environmental data using the port's existing infrastructure, including traffic, weather and seabed patterns. Data will be shared with software developers for autonomous vessel software.

One Sea, an industry alliance representing developers of autonomous vessels, has partnered with Awake.AI, a tech company is seeking to build a platform to facilitate data sharing between ships, ports and other maritime logistics players. The project will focus on interoperability between systems with different designs. Awake.AI's project follows other recent partnerships with One Sea, including the Royal Institution of Naval Architects (RINA) which has agreed to become an associate member. The alliance has already been given permission by Finnish regulators to oversee future trials in its waters.

China has built its first research and development test base for autonomous ships in Zhuhai, following on from its completion of the world's first autonomous cargo terminal. The test base, occupying 32,000 square kilometres, will develop platforms for both civilian and military applications. The waters

surrounding Zhuhai face competing claims from Brunei, Malaysia, the Philippines, Taiwan and Vietnam, and China has already made use of small autonomous drone ships to police this politically sensitive area.

In September 2019, NYK conducted a trial of an autonomous vessel in accordance with the IMO Interim Guidelines. The vessel in question was *Iris Leader*, a Pure Car Truck Carrier with a GT of 70,826mt and a length of 199m. The vessel sailed from Xinha, China to Nagoya, Japan, and then to Yokohama, Japan. The vessel navigated during both daytime and night-time using existing navigational devices, determining routes and speeds.

Summary

As the technological developments surrounding MASS continue, the legal and regulatory progress in the field has encountered its first difficult choices. The law will be forced to change to accommodate MASS, but now we are seeing a real possibility of two-fold change; firstly to blend the concept of remote operation into the current matrix of responsibilities on a vessel, and secondly to replicate this exercise with a fully autonomous vessel. Many of the projects and trials have not and do not intend to make a quantum leap into full autonomy, but provide for human control as part of various contingencies and situations.

This is not to say that the technology will wait for these difficult questions to be answered. The use of smaller ships for military and civilian applications is only increasing. Whilst smaller vessels bring fewer problems of scale and quicker returns on investment, the driving stakeholders of autonomy in the shipping industry will be faced by their own questions of how larger vessels will be operated in the short, medium and long-term.

It is also increasingly apparent that autonomy does not start and end with the vessels themselves, with similar excitement behind the automation of the complex logistics surrounding the loading and unloading of vessels. We anticipate that port infrastructure will grow to accommodate the increased levels of data shared between autonomous

ships, other seagoing traffic and shore-based surface providers.

HFW's Autonomous Shipping Group continues to raise awareness of these difficult choices whilst providing advice to our clients, including governments, defence companies, insurers and owners, so that they can draw the all-important line in the sand.

We are pleased to be able to leverage joint technical and legal expertise to pose questions both great and small within the industry and will continue to do so in future publications and events.

HFW presentations

Claire Womersley, Master Mariner & Senior Associate presented to the Society of Maritime Industries on 18 September 2019, focusing on integrating autonomy and traditional legal concepts, the COP and a collision case study.

Tom Walters, a partner in HFW's Autonomous Shipping Group, presented to Interferry on 8 October 2019 on the legal and insurance ramifications of autonomous ferries.

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Dates for your diary

HFW will be attending the following conferences in early 2020. We look forward to meeting you there.

Event	Place	Date
RINA - Autonomous Ships	London, UK	1 – 2 April 2020
IEEE Oceans 2020	Singapore	6 – 9 April 2020
Transport Research Arena 2020	Helsinki, Finland	27 – 30 April 2020
Autonomous Ship Technology Symposium	Amsterdam, the Netherlands	23 – 25 June 2020

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