



AUTONOMOUS SHIPS: A PANDEMIC VACCINE?

Since our article in January of this year¹, we have been gripped by the COVID-19 global pandemic. Despite this there have been a number of developments in the autonomous vessel space. In this briefing we discuss the impact of the pandemic on shipping and the opportunities it presents for Maritime Autonomous Surface Ships (MASS), the Maritime Autonomous Systems Regulatory Conference (MASRC), as well as some of the more recent developments in relation to MASS, such as data collection and sharing.

¹ <https://www.hfw.com/downloads/001758-HFW-Autonomous-Ships-Drawing-a-Line-in-the-Sand-Jan-20.pdf>

Covid-19

The shipping industry, like many others, continues to suffer as a result of the global spread of the coronavirus disease 2019 (COVID-19). Whilst hope remains that the outbreak can be managed and brought under control, the spread of the pandemic may stimulate or accelerate the adoption of autonomous technology onboard vessels and drive interest in the commercial use of MASS. During lockdown, we have been approached by numerous owners and charterers to advise on the impact of COVID-19 on conventional shipping, including issues regarding crew changes, repatriation, interpretation of force majeure clauses and the doctrine of frustration, insurance coverage issues, completion of the sale and purchase of vessels, ship building issues, refit and repair contracts and navigational restrictions. Whilst all of these issues will also be relevant for autonomous vessels, some MASS are, by design, insulated from the current crewing challenges facing the conventional shipping industry.

The impact of COVID-19 on crews should not be understated. The International Chamber of Shipping has estimated that every month roughly 100,000 seafarers reach the end of their employment contract and need to be repatriated. However, most jurisdictions have implemented restrictive rules for seafarers transiting their jurisdiction, either to return home or to join a vessel. Guy Platten, the International Chamber of Shipping's Secretary-General, recently warned that there are *"currently 1.2 million seafarers at sea ... limitations on crew changes have potential to cause serious disruption to the flow of trade"*.

Depending on the level of autonomy displayed by a MASS, these crewing issues are less likely to impact the vessel's operational performance and, with the uncertainty surrounding when a worldwide vaccine will become available, we expect that there is likely to be increasing interest in MASS.

The spread of COVID-19 has also forced shipping companies to implement remote working and

digital technologies for business continuation and fleet optimisation. For example, suppliers of unmanned aerial vehicles and remote-control services have found new markets in ship inspections. Further, shipping companies and original equipment manufacturers are using artificial intelligence for predictive maintenance, intelligent scheduling, real-time analytics and improving performance. Digitalisation has also opened new services and connectivity for class. For example, DNV GL now issues an e-certificate every four minutes and 80% of its customers have indicated they would use a digital tool for smart survey bookings. DNV GL has completed 17,400 remote surveys since 2018, over half of which have taken place in the past 6 months, with DNV GL conducting on average 300 remote surveys per week since coronavirus-restricted travel was implemented.

COVID-19 has, however, caused a number of MASS-related projects to be put on hold. Regular readers of our bulletins will recall that we have reported previously on the *Yara Birkeland*. The hull was launched in Romania in February 2020 and was expected to arrive at the Vard Brevik shipyard in Norway in May where it was due to be fitted with control and navigation systems and undergo testing. As a result of the pandemic and the change in the global shipping outlook, Yara International has paused further construction. We may see other projects being put on hold until the economic impact of COVID-19 is fully understood.

MASRC20

At the 5th annual MASRC, held at the UK Chamber of Shipping on 15-16 January 2020, stakeholders discussed the opportunities and issues associated with MASS, including costs, growth and performance. Despite there being more than 1,000 autonomous vessels operating in international waters, together accumulating tens of thousands of incident-free days at sea, there were differing views as to just how successful MASS will be. Operators of small autonomous vessels were optimistic. However, larger shipping operators were more sceptical,

for example as to the reliability of software and systems, and the costs of modifying conventional vessels to enable autonomous capabilities.

The event featured a number of presentations, covering a range of aspects in relation to autonomous shipping. These included presentations on the IMO's Regulatory Scoping Exercise, cyber risks and autonomous navigation. In a keynote speech, Nusrat Ghani MP discussed the UK Government's Maritime 2050 strategy, which aims to make the UK a global maritime leader and grow the industry over the next few decades. The speech focussed on technology, digitalisation and the environment, with clear support being expressed for autonomous maritime technologies. It is unclear if the financial issues caused by the current pandemic will impact this plan.

Advantages of autonomy on the transport modes

A recent TT Club online forum broached the subject of 'Drones and autonomous vehicles: The future... now?'. During the forum, the panel examined the barriers to growth of autonomous freight transport. Speakers included Svilen Rangelov (Co-Founder and CEO at Dronamics); Pranav Manpuria (CEO of autonomous truck developer, Flux Auto) and Hussain Quraishi (Strategic Innovation Manager at Wärtsilä).

The panellists suggested that increased automation at sea would lead to improved safety and voyage optimisation (which had already been realised). In the medium-term, reduced crewing was expected to impact upon coastal trade the most as crew expense forms a greater percentage of operating costs.

The lack of uniform regulation across national governments and even within countries was described as a major block to autonomous vehicle and drone deployment. The level of investment required was not, however, high on the list of obstacles.

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improve safety. However, the forum concluded that vulnerability to cyber-attack was perceived to increase with the use of computer-controlled vehicles and was therefore a strong disincentive to adoption.

Investments in MASS projects

Some stakeholders see significant market potential in autonomous vessels, with such vessels expected to promote safe, efficient and sustainable operations around the world. An example is Kongsberg, which has designed a project to test and develop a wide range of autonomous technologies in collaboration with a number of partners. This includes navigation and intelligent machinery systems, self-diagnostics, prognostics and operation scheduling capabilities, and communication technology. The project will receive a €20.1m grant from the EU's Horizon 2020 programme to equip two vessels with such technologies, so that they can be autonomous and controlled remotely.

Separately, Kongsberg has recently announced that, as part of a collaboration with Bastø Fosen and the Norwegian Maritime Authority (NMA), the world's first adaptive ferry can demonstrate automatic control. By integrating autonomous technology onto the Bastø Fosen

VI, the vessel is able to transport passengers and vehicles between docks, and is also able to perform all docking and crossing functions to a high degree of accuracy. However, it remains manned by a full crew and is currently not fully autonomous. For example, in the event that the vessel is on a collision course, an alarm will sound to signal that human intervention is required to avoid objects or other vessels. Nevertheless, the benefits of the technology are clear, and include optimised fuel consumption, operational cost savings, improved timekeeping and higher customer satisfaction. A six-month trial period is currently underway, and an anti-collision system is expected to be installed and tested later this year. Although regulations will need to keep pace, it is encouraging that bodies such as the NMA are facilitating developments in the autonomous shipping space.

A 27m harbour tug owned and operated by PSA Marine has also been equipped with technology (made by Wärtsilä) to enable it to navigate autonomously. Initial sea trials were successfully completed in Singapore in mid-March 2020, having commenced in September 2019, and work will continue throughout 2020. It was confirmed that the technology

is capable of avoiding obstacles, including both real-life moving vessels and virtual obstacles. A smart navigation system allowed for routes to be planned in real time, also sending track and speed commands to Wärtsilä's dynamic positioning system that sailed the vessel at varying speeds. The trials represent a first for commercial MASS using the Maritime and Port Authority of Singapore's regulatory sandbox, and are part of an initiative to promote the development of MASS.

A Japanese consortium consisting of Marubeni Corporation, Tryangle, Mitsui E&S Shipbuilding, and the City of Yokosuka is to launch a pilot project that will aim to establish the technology for autonomous ship operation in Yokosuka City. A pilot project is being trialled on a voyage route between Mikasa Pier and Sarushima Island in Yokosuka City. The autonomous ship technology, which is being developed by Mitsui E&S Shipbuilding, is to be retrofitted onto an existing small-sized passenger boat operated by Tryangle. Autonomous ship operations will include berthing and unberthing. The ship crew will, however, remain onboard. The retrofitting will be completed by the end of 2021, and the autonomous operation will start before the end of March 2022.

The Royal Navy has begun trials of an autonomous model of the Pacific 24, a rigid inflatable vessel which has been in service for 25 years. The autonomous model has been developed by Navy X, the Royal Navy's innovation wing, and BAE Systems. The Pacific 24's control system and sensors have been upgraded and the Royal Navy will be able to programme the vessel to fulfil an order. The vessel will then be able to calculate the best way to carry out the task.

Wärtsilä have announced that they will provide a high-speed, high-resolution K-band radar system designed to provide high levels of situational awareness – especially in densely populated marine environments to the *Mayflower* autonomous vessel. As discussed in our January bulletin, the *Mayflower* will undertake the same voyage as its namesake during which it will conduct oceanographic research. The *Mayflower* is 15 metres long and weighs 5 tonnes. Sea trials began in March 2020 and the transatlantic voyage is scheduled to take place in April 2021.

A consortium made up of C-Job Naval Architects, LISA, seazip Offshore Service, Sea Machines, MARIN, and el-Tec elektrotechnologie has released a concept design for an autonomous guard vessel (AGV). These vessels are designed to protect offshore windfarms and the ships trying to navigate around them. By removing the vessels' crew, the design is smaller and lighter than current guard vessels allowing it to be battery powered. When other vessels approach the asset protected by an AGV, the AGV is designed to take action to secure the area in order to avoid collisions and damage to the offshore infrastructure. The AGV can communicate with an intruding vessel, send information on how to safely navigate the area and also physically escort intruding vessels away from the site while recording the encounter to provide video footage in case of any incident.

Abu Dhabi Ports has begun to work with naval architects at Robert Allan to develop autonomous port vessels, including tugs for unmanned towage and harbour operations. The vessels

will be capable of remote control operations and could potentially become fully unmanned, enabling the vessels to operate in more adverse weather conditions.

South Korea has announced the launching of a project to develop MASS by 2025. The aim is to build vessels with the third level of autonomy as defined by the IMO (i.e. Remotely controlled without seafarers on board). The Korean Ministry of Commerce, Industry and Energy and the Ministry of Oceans and Fisheries have set up a specific working group and have allocated 160 billion won (US\$132 million) to the project. The project's aim is to capture 50% of the market share of the global autonomous vessel market by 2023.

India-based Cochin Shipyard Ltd (CSL) has signed contracts for the construction and supply of two autonomous electric freight ferries for Norway-based ASKO Maritime AS, a subsidiary group of Norges Gruppen ASA, with an option to build two more identical vessels. The 67-metre long vessels will initially be delivered as fully-electric transport ferries, powered by an 1,846 kwh capacity battery. The ferries are being built with the help of NOK119m (\$12.8m) in Norwegian Government funding as part of a project to provide emissions-free transportation of goods across the Oslo Fjord. They will be operated by Massterly AS, a joint venture between Kongsberg and Wilhelmsen. Massterly was set up to take technical management and operate autonomous vessels. After commissioning of autonomous equipment and field trials in Norway, the vessels will operate as fully autonomous ferries, able to transport 16 fully loaded standard EU trailers in one trip across the Fjord.

South Korea-based shipbuilder Daewoo Shipbuilding & Marine Engineering (DSME) has signed an agreement with the Port of Rotterdam Authority to develop ship-related smart technologies.

The two companies will study how to develop smart ships suitable for digitalised ports over the next three years with a significant focus on autonomous operations.

At the recent Netherlands Forum for Smart Shipping, Kotug International, Rotortug and tech start-up Captain AI demonstrated a novel piece of dispatch planning software which enables real-time optimised route planning for autonomous vessels. The system uses AIS data and artificial intelligence, connected to the autonomous tug's autopilot. The software, Captain AI Route Planner, acts as a "Google Maps for waterways" and plans the route which the tug follows autonomously, using the Captain AI Autopilot software. By using the software, autonomous vessels are anticipated to save fuel and reduce CO2 emissions by following the optimal route. The software builds on Kotug International and Rotortug's 2018 demonstration of a tug in the Port of Rotterdam being operated remotely from Marseille, France.

Regulatory and software developments

The Russian Maritime Register of Shipping has published guidelines on the classification of MASS. The guidelines address the survey of MASS under design and construction stages, conversion into MASS and manufacturing of materials and products for MASS. The focal areas include the situational awareness systems, radio and data communication, navigation and manoeuvring, and propulsion. The document also specifies the track marking and remote control centre that play an important role in the MASS monitoring and safe navigation.

A UK based company called Windward has released Maritime Artificial Intelligence Analytics (MAIA) 4.0 which it describes as software that is capable of screening, searching and analysing dynamic maritime data to connect data and discover potential risks and "questionable business partners". The intention is that the software will use dynamic predictive intelligence based on a vessel's identity, cargo, location and voyage patterns (amongst other data) and then link this to patterns and profiles. One aspect that the software has been designed to spot is voyage irregularities. Windward hopes that

its software will be able to profile activity in the shipping market so that stakeholders will be able to easily ascertain whether they are dealing with businesses that are compliant with the latest regulations.

Data sharing

Solis Marine and maritrace have developed an online platform to demonstrate how complex datasets derived from a multitude of sources at a single port can be consolidated into one distribution system. The platform is part of the UK Maritime and Coastguard Agency's (MCA) marlab project, and allows MASS to access data collected from the test site, Portland Harbour in Dorset, on demand. The datasets cover, for example, information regarding maritime traffic, seabed and weather conditions. It is hoped that the sharing of data between the MCA and other organisations will further the development of MASS, such as in relation to the programming of MASS. However, Dr. Katrina Kemp from the MCA has said that the UK needs a clear regulatory pathway for MASS.

In January 2020, the project team had invited stakeholders to test the prototype, in order to provide marlab with valuable feedback. A five month period of testing at Portland Harbour enabled the development of a technology stack to demonstrate how multiple data sources from a single port could be consolidated into a single location for MASS operators to then access the data on demand.

HFW involvement

HFW had been intending to participate in a number of events, such as the Autonomous Ship and Technology Symposium, but some of these have been postponed until next year.

Notwithstanding this, HFW have been asked by BIMCO to take part in a project to adapt SHIPMAN 2009 to provide third party management services for autonomous ships. The drafting sub-committee includes Massterly, NYK, Anglo Eastern, Gard and HFW. The project is ongoing, with meetings taking place remotely and good progress has been made.

Finally, certain events have been moved online and HFW have recently been involved with the Swansea Colloquium at Swansea University in which Paul Dean gave a paper on Autonomous Systems and looked at the impact of cyber risks and seaworthiness of MASS. The paper examined recent cyber security breaches and provided an insight as to how the courts are likely to consider an owner's failure to adequately prevent a cyber-attack.

Conclusion

Since our last bulletin, the continuing development of MASS has proven to be resilient, albeit not immune, to the challenges of COVID-19. While the pandemic continues, one can see MASS becoming increasingly attractive, if only to avoid the crewing challenges caused by the pandemic. However, it is the fear of another virus - cyber - which remains one of the biggest obstacles facing the development of MASS. HFW continues to advise in this area, including drafting one of the first bespoke cyber insurance policies and playing a key role in the BIMCO drafting sub-committee for the BIMCO Cyber Security Clause 2019.

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