



**The Journal of Robotics,
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Advanced Automation in Shipping Takes Center Stage at IMO

Sean T. Pribyl*

The maritime industry is no stranger to innovation, having accepted the introduction of unmanned engine rooms, automated ports, and electronic navigation. The author of this article discusses the International Maritime Organization's regulatory scoping exercise to evaluate existing legal frameworks in order to assess the safe, secure, and environmentally sound operation of Maritime Autonomous Surface Ships.

Advanced automation in the international maritime industry has officially arrived on the international stage, as the International Maritime Organization's ("IMO") Maritime Safety Committee ("MSC") 99th session furthered the discussion on Maritime Autonomous Surface Ships ("MASS"). The topic garnered a great deal of attention, with the IMO receiving 19 papers from industry and various countries in support of the MASS regulatory scoping exercise. The international interest in this topic echoes sentiments of the IMO Secretary-General Kitack Kim, who recently acknowledged that digitalization—including autonomous ships—remains at the top of his agenda, along with climate change and seafarer issues.

It is clear that technology continues to outpace the regulators, however, and more is still needed in the way of cultural acceptance. In fact, the industry challenges that the IMO faces over the next decade harkens those of disruptive technologies at the end of the 19th century with the advent of the automobile. At that time, England adopted what were commonly referred to as "red flag" traffic laws, which essentially required someone to walk in front of a moving automobile while waving a red flag to warn the public of the approaching automobile. Near the turn of that century, the Pennsylvania state legislature also proposed a law that would require the driver of a "horseless carriage" when approaching livestock to stop, disassemble the vehicle, and conceal the components behind nearby bushes. Cultural acceptance has long dismissed such initial concerns presented by the automobile.

While the automobile is not directly analogous to ships, the maritime industry is no stranger to innovation, having accepted the introduction of unmanned engine rooms, automated ports, and electronic navigation. To that end, Norwegian company Kalmar recently announced that they will deliver digitalized and autonomous container handling when the autonomous container vessel *Yara Birkeland* calls on port in Porsgrunn, Norway. The port of Caofeidian, China, is adding 20 self-driving container trucks, and APM Terminals in Vado Ligure, Italy, recently received remotely operated gantry cranes. In these operations, a human will likely remain in the loop. Thus, even as technology transforms intermodal transportation, and companies decide whether being an early adopter of disruptive technologies is the right fit for them, cultural acceptance remains vital to progress.

MSC 99—One Small, but Significant, Step

Over the next two years, the IMO's regulatory scoping exercise will evaluate existing legal frameworks in order to assess the safe, secure, and environmentally sound operation of MASS. The scoping exercise will assess the human element, port infrastructure, and the marine environments, and examine several international instruments related to safety, collision regulations, stability, seafarer training, and search and rescue. MSC 99 was thus not intended to answer all industry questions attendant to MASS. Rather, it was meant to be a first step in the larger regulatory scoping exercise. To that end, it succeeded and achieved important consensus on three threshold areas related to MASS for purposes of the scoping exercise: (1) a methodology in which the scoping exercise will be conducted; (2) the definition of vessels with advanced automation as MASS; and (3) a description of the levels of autonomy applied to MASS. In other words, MSC 99 gave the IMO and stakeholders a common language on which to build the discussion.

The scoping exercise will first identify current provisions in IMO instruments and their applicability to ships with varying degrees of autonomy. Next, the MSC will conduct an analysis to determine the most appropriate way to address MASS operations. MSC 99 also succeeded in reaching agreement on a much-needed term to apply to vessels with advanced autonomy—"MASS," defined as "a ship which, to a varying degree, can operate independently of human interaction." While such a determination may seem

nonconsequential, much debate has surrounded this issue given the meaning of vessel or ship under domestic and international law. Moreover, MSC 99 received contributions from several countries and stakeholders on descriptions of the degrees of autonomy under which MASS may operate, and the IMO announced the following agreed upon degrees of automation to facilitate the scoping exercise:

- *Ship with automated processes and decision support:* Seafarers are onboard 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 onboard.
- *Remotely controlled ship without seafarers onboard:* 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.

With these discussion points, the IMO is poised to develop thoughtful dialogue in the scoping exercise. Notably, the Legal Committee will also conduct a separate scoping exercise in parallel with the MSC, both of which will help shape the much needed legal discussions related to advanced automation on ships, such as those related to negligence, liability, marine insurance, and navigational risk.

Status of Advanced Automation in the United States

As the MSC continues its scoping exercise, the United States is also attempting to close the innovation gap on European counterparts. While the United States has never lagged technologically, Europe has been more active in the practical application of advanced automation. Now, U.S. innovators are capitalizing on emerging opportunities in several maritime sector segments. In fact, A.P. Moller-Maersk recently selected Boston-based Sea Machines Robotics to trial artificial intelligence technology aboard one of their container ships to augment situational awareness for safer and more efficient maritime operations. Such investment in technology could lead to the ability to add more containers to a

vessel with the same crew complement, and has the collateral effect of furthering the point that “autonomous” does not necessarily mean “unmanned”—a common misnomer in the industry.

U.S. innovators are also developing new technologies that are furthering growth in the “Blue Economy,” a sector focused on sustainable use of the oceans that contributes approximately \$1.5 trillion annually to the global economy, according to the World Bank. The Department of Defense’s Project Overlord, an ongoing government solicitation for unmanned surface vehicles, will help drive the domestic conversation on issues such as COLREGs compliance. And, federal agencies like the Maritime Administration are taking formal strides to help bolster the U.S. marine sector through dedicated initiatives. Overall, the United States is making formidable strides toward embracing more innovation technologies.

Conclusions

The IMO has indicated that it has a strategic view on the future of disruptive technologies in the industry—an industry in which regulations and international instruments are in many cases borne out of disaster. The proactive steps made by MSC 99 show that the IMO is balancing the advanced technologies with the human element, all with the aim of reducing the number of marine casualties and incidents. Importantly, MSC 99 set a valuable tone in the first steps of the scoping exercise in understanding the issues surrounding MASS before an incident occurs.

As the industry awaits formal IMO guidance or resolutions on MASS, domestic testing and practical implementation of MASS must continue under existing legal frameworks with an emphasis on equivalencies and competencies, as compared to those of manned vessels. Stakeholders should therefore continue to consult with counsel when considering use of these emerging technologies to ensure necessary compliance under the current legal regime.

Note

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