Once thought to be a mere concept on the distant horizon, Unmanned Surface Vessels (“USVs”) are garnering increasing attention in the maritime industry as a means to cut costs, increase efficiency, and enhance safety. While some view USVs as more akin to futuristic science fiction, in reality, unmanned vessels are far from a novel concept—Nikola Tesla envisioned maritime drones in his November 8, 1898 patent for “Method of and apparatus for controlling mechanism of moving vessels or vehicles.” More recently, unmanned and autonomous technology has been developed in multiple industries, in particular in the subsea sector.

Projections of practical implementation into the maritime surface sector have rapidly shifted from a mere concept decades away to the immediate future. Today, innovators are not only developing USV technology, but are also conducting on-the-water testing of USVs. As a result, the potential applications and benefits of unmanned technologies are driving investment and shaping the conversation of both regulators and the industry. The question is no longer if, but when. And the answer to when, in some regards, is “now.”

As with unmanned technologies in other industries, USVs have the potential to provide enhanced safety and cost savings by removing the human element from certain operations. Generally, two options are currently being evaluated for operating vessels with unmanned technologies: (1) new purpose-built vessels, or (2) retro-fitting current vessels to operate to some level of autonomy. USVs may operate with various levels of autonomy, including remotely operated (by humans); partially autonomous vessels (with human input); or fully autonomous (using artificial intelligence decision-making). For the foreseeable future, while humans will remain in the operational loop for the majority of operations, long-term goals include transportation of cargo and passengers with fully autonomous vessels. Regardless of the approach to the construction or level of autonomy, unmanned vessels offer the possibility of advantages to the maritime industry. But the advantages will not come without addressing serious challenges.

Benefits of USVs

USVs can offer advantages in terms of safe vessel operations. Even with advanced and integrated bridge navigational systems aboard current vessels, studies indicate that approximately 96 percent of marine casualties and accidents are still caused by some level of human error. Seafarers also account for around 40 percent of the ship operating expenses, second only to fuel costs. Such expenses include wages, but also costs of litigating personal injury and other accident cases. Over the past century, advances in technology have resulted in a steady decline in the number of mariners required to operate commercial vessels. Yet, manning is still an area in which owners/operators seek to reduce operating costs, and these costs are potentially mitigated by a crewless vessel. And, by removing seafarers entirely from vessels, owner/operators limit the risk of piracy and hostage-taking. Such unmanned operations may therefore lead to lower insurance coverage rates for vessels operating in high-risk pirate waters.

In cases where unmanned vessels are purpose-built, overall construction costs may be reduced as vessels will no longer require seafarer amenities and superstructure components, such as berthing accommodations, air conditioning/heating, galleys, and sewage treatment systems. Space aboard vessels previously allotted to accommodating the crew will allow for increased cargo capacity as well as reduced maintenance costs. To mitigate the threat of piracy, crewless vessels can be designed to severely limit access to interior spaces, with remote disabling capabilities to leave the vessel dead in the water during a pirate attack.

USVs potentially offer more environmentally sustainable operations as well. Crewless vessels no longer need to manage garbage or treat sewage. Ships can also be designed to afford greater fuel efficiency, and alternate fuel sources may be used. For example, the Yara Birkeland, a container vessel being developed by Kongsberg Gruppen ASA and Yara ASA and intended to operate autonomously by 2020, will operate with zero emission and no ballast as it transits Norwegian waters. Such an ambitious endeavor moves the time for implementation of an autonomous vessel from decades to

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only a couple years. This has the potential to drive the maritime industry towards more rapid acceptance of autonomous technology.

Practical Uses for USVs

Remotely operated to fully autonomous USVs are envisioned for use in a wide variety of vessel operations, such as offshore supply, towing, passenger ferries, salvage, oil spill response, carriage of cargo, marine scientific research, underwater surveys, security patrols, and military purposes. Some in the commercial maritime industry believe autonomous shipping can revolutionize the ongoing cargo trade. Thus, companies such as Rolls Royce Marine are pursuing the development of crewless vessels over the next several decades. In the near-term, USVs will be developed by retrofitting existing vessels with various levels of autonomous technology to support shipboard operations traditionally considered hazardous, tedious, and requiring coordinated maneuvering, essentially the “workboat” rather than vessels capable of transoceanic passages. Also, domestic short sea shipping is already under development in Europe, alleviating concerns related to international trade.

On-the-water commercial USV testing is already taking place domestically in the United States, although the United States lags behind Europe in the development, testing, and investment in commercial USVs. In the United States, investment has focused on USVs for military purposes, while European countries have largely invested in commercial projects. To illustrate, the European Commission ("EC") has funded a collaborative research project specifically related to the autonomous ship: the Maritime Unmanned Navigation through Intelligence in Networks ("MUNIN"). More recently, the Norwegian Maritime Authority and the Norwegian Coastal Administration designated a testing site for commercial autonomous ships in the Trondheimsfjord, the only commercial USV test area in the world. The world’s first unmanned and fully-automated vessel for offshore supply operations, the Hrønn, may conduct sea trials in the Trondheimsfjord as early as 2018. In addition, the Port of Rotterdam is investing in surveillance and inspection by unmanned vessels, intended to operate in locations deemed too dangerous or undesirable to use manned vessels. Finally, European-based companies such as Wärtsilä Corporation have joined a project aimed at creating an autonomous marine transport system for cargo ships and freight transportation in the Baltic Sea.

Challenges to Implementing USVs

All vessels operating in the marine transportation system must adhere to the applicable navigational rules and comport with vessel traffic patterns—USVs are no exception. As USV operations increase on waterways, operators must evaluate how their respective USVs fit within the existing framework of international regulations, such as:

- International Regulations for Preventing Collisions at Sea ("COLREGS")
- International Convention for the Prevention of Pollution from Ships ("MARPOL")
- International Convention for the Safety of Life at Sea ("SOLAS")
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers ("STCW")

Besides these international obligations, owner/operators must also be cognizant of domestic maritime laws, rules, and conventions in their respective area of operations. USV operators also should evaluate the current guidance in best practices, such as those established by the U.S. Navigation Safety Advisory Council ("NAVSAC") and the U.K. Marine Industries Alliance Code of Conduct. Questions relating to safely implementing USVs into current maritime operations have garnered sufficient attention at the international level—as a result of receiving numerous papers from the international community, the IMO will now take up the issue at MSC 98 in June. While stakeholders will aim to comply with current legal obligations under the existing “rules of the road,” and regulators develop the next steps in addressing unmanned technologies, innovators will continue to develop collision sensing and avoidance technology to assist USVs in maneuvering to avoid other vessels, navigational aids, and obstructions.

Similar to unmanned technologies in other industries, USV operators are finding gaps in both the regulatory frameworks and general acceptance of USVs as an alternative in the near-future to manned vessels. As technology and guidance on safely implementing USVs into the maritime transportation system continue to
develop, several legal issues will require further analysis regarding their applicability to USVs. Notably, concepts such as who is the master when operating a USV remotely or autonomously, the ability of a USV to maintain a “look out,” limitation of liability concerns, standard definitions as to “vessel,” navigation lights and shapes, vessel design and manufacturing standards, and applicability to minimum manning requirements, may require changes to account for autonomous capabilities. U.S. courts have not considered specific USV operations in any of these areas, and as such, there is a lack of legal precedent with which to guide such issues. As a result, regulators and operators must continue to look to best practices and current legal standards to ensure safe operation.

Conclusion

While USVs present numerous benefits, critics of various levels of autonomous technology question whether the concept can overcome problems of public perception and acceptance of the technology, reliability of the equipment, regulatory compliance, and the challenges with safely operating in the complex marine environment. Additionally, labor organizations may oppose autonomous shipping out of concern that the technology will render seafarers obsolete. Even with obstacles to implementation, such as developing a regulatory and legal framework necessary to safely implement USVs into the maritime domain, it appears that various maritime industry factors will continue to drive integration of USVs, making the question not “if” they will be commonly employed, but “when”—at least in certain aspects of the maritime industry. Stakeholders interested in developing and implementing USV technology should seek counsel in order to ensure compliance in this complex environment. Moreover, the maritime community should expect that USVs become incrementally more commonplace in the near future, not the distant horizon.

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Alan M. Weigel, Of Counsel, Blank Rome LLP, is a 1979 graduate of the United States Naval Academy and a 1987 distinguished graduate of the United States Naval Postgraduate School, and received his JD from the University of Connecticut School of Law. During his twenty-year career as a submarine officer in the United States Navy he attained the rank of Commander and developed focused skills as both a deck officer and engineer, as well as in deep ocean search and salvage. He commanded a Deep Submergence Vehicle and served ashore in a variety of staff positions.

Sean T. Pribyl, Associate, Blank Rome LLP, U.S. Naval War College, MA, Washburn University School of Law, JD, U.S. Merchant Marine Academy, BS. He served for six years as a U.S. Coast Guard officer and attorney, where he gained experience as an attorney-adviser in legal and policy matters related to international and maritime law, national security, major marine casualties, regulatory compliance, internal government investigations, cybersecurity, environmental crimes, maritime law enforcement, piracy, rulemaking, maritime and critical infrastructure security, the Arctic and Antarctic, Suspension & Revocations, and unmanned aircraft and vessels (“drones”).