

【欧州】 【海事】

Maritime Issues - Autonomous ships: The EU operational guidelines on the safe and secure testing environments for maritime autonomous surface ships (MASS)

Andrea Antolini Former Researcher JTTRI

【概要 : Summary】

The Maritime Autonomous Surface Ships (MASS) will offer opportunities for the maritime transport sector, but also challenges regarding safety and security. Furthermore, changes of legislation will become necessary. In national territorial waters, a country's government and authorities can decide where and how MASS can be tested and operated. Trials with autonomous vessels are already taking place in several country's waters. However, regarding international maritime transport, international legislation will have to be amended in order to include regulations for the operation of MASS, set up by the International Maritime Organisation (IMO). Currently, the review of necessary changes and the implementations of MASS related legislation is delayed, partially due to the impact of the COVID-19 pandemic.

In the European Economic Area (EEA), as of 30 November 2020, the EU and other EEA Member States can base their trials and testing with MASS on common "EU Operational Guidelines for Safe, Secure and Sustainable trials of Maritime Autonomous Surface Ships (MASS)". These guidelines were elaborated in a joint effort of EU Member States, maritime authorities, key industry stakeholders, under support of the Maritime Autonomous Surface Ships (MASS) expert

group, chaired by the European Commission, and the European Maritime Safety Agency (EMSA). Most importantly, the guidelines will allow for a harmonised European approach of conducting trials with MASS. This first set of non-mandatory guidelines is intended to support the common application of operational processes for trials and testing of MASS. It will provide the basis for common procedures in the overall process of establishing MASS trial/test areas, granting authorizations for trials and for performing such tests/trials for all interested EEA countries. The guidelines also address the risks and vulnerabilities inside and outside the determined area/zone by ensuring the safety of navigation and considering environmental interests and third-party interests. The common guidelines are expected to be reviewed and updated by the practical experience gained during future trials.

【記事 : Article】

1. Background of introducing Maritime autonomous surface ships (MASS) in the EU

In recent years, all means of transport are developing toward automation and automated movements. The shipping industry's main goal from the MASS is to eliminate the requirement

that humans are physically present on the vessels at all times. Remotely controlled and autonomous ships are expected to be safer as they reduce the risk of human errors and reduce the risk of injury and even death to crewmembers. Even regarding the threat of pirates, autonomous ships seem to have advantages, as access to the ships' control could be made physically unavailable and crews would not be kidnapped for ransom payments. MASS are also expected to be more efficient and cheaper to run than manned ships. Autonomous ships would also provide owners and operators with a solution to respond to the growing shortage of seafarers. However, cyber security and the protection of the ship's data streams and the IT systems from hackers would be crucial for MASS and as well its main security problem. Therefore, the development of fully or partly autonomous ships will pose both, opportunities and challenges for the sector in terms of safety, security, existing legal frameworks, and operations.

There are expected large scale minimally manned and unmanned ships to come into operation in the next five to seven years. However, a swift uptake of MASS will depend on trials and testing of the autonomous ships in a safe predictable area/environment as well as to ensure safe navigation, as mixed situations at sea or ports, where both manned and unmanned ships will be sailing on the same routes and enter the same ports, will occur.

Furthermore, regarding the legal preparations for introducing MASS into the maritime transport, existing legislation and regulations of international maritime transport like the Safety of Life at Sea, the Convention on the International Rules for Preventing Collisions at Sea and others will have to be reviewed and revised in order to taking account of the new autonomous and remote-controlled ship technology. Moreover, regulations should also be made more flexible to allow for a support of the development of autonomous ships.

2. The IMO's position and work on MASS

The increasing use of digital technologies in the management of vessels has made them vulnerable against cyberattacks. In the past years, the IMO started to consider necessary regulations on cybersecurity. In 2016, the IMO issued interim guidelines on cybersecurity risk management. In 2017, the IMO's Maritime Safety Committee (MSC) stated that the IMO should take a proactive and leading role in determining the safety, security and the environmental friendliness of the operation of MASS. The overall approach is to regulate autonomous vessels in a way that they reach at least the safety levels of conventional ships. The MSC 98 also agreed that proper consideration should be given to legal aspects, including the question of responsibility in case of an accident involving a MASS.

The MSC 100 approved the framework and methodology for the regulatory scoping exercise on MASS, including preliminary definitions of MASS and identified four degrees of autonomy for the purpose of the scoping exercise. The two-year IMO regulatory scoping exercise (RSE) for MASS is important to determine how existing IMO instruments can be leveraged to ensure that autonomous ships are safe, secure, and environmentally sound.

The IMO amended its general security management codes to include cybersecurity. The International Ship and Port Facility Security Code (ISPS) and the International Security Management Code (ISM) were amended regarding cyber security. These amendments to the ISM and ISPS will come into force on 1 January 2021. However, the list of IMO instruments to be covered in the MSC's scoping exercise for MASS is long. It includes safety (SOLAS); the collision regulations (COLREG); loading and stability (Load Lines); training of seafarers and fishers (STCW, STCW-F); search and rescue (SAR); tonnage measurement (Tonnage Convention); Safe Containers (CSC); and special trade passenger ship instruments (SPACE STP, STP).

The RSE results for the use of MASS have been reported to the MSC, but due to the COVID-19 pandemic, the IMO MSC 's 102nd session from 4 to 11 November 2020 was a virtual meeting with a reduced agenda. The work on the RSE for the use of MASS will continue at MSC 103, which is scheduled for May 2021.

Finally, there is not existing any legislative basis for cyber security of remote and autonomous ships. However, the shipping industry had to integrate the cyber security rules into their Safety Management Systems, SMS by 1 January 2021. Considering the general delay in the review of the IMO' s legislation and the additional negative impact of the COVID-19 pandemic, further delays in all tasks related to autonomous ships can be expected.

3. Cybersecurity of MASS

While about 80% of accidents on manned ships are related to human errors, autonomous ships are expected to offer some safer solutions than crewed ships. However, in case of MASS, the risks are partially transferred to the onshore remote-control centres as cyberattacks could pose an increasing security threat to the MASS but also to the about 50,000 operating manned ships. Regardless the exact level and form of autonomy of a ship, cyber security is a serious issue for autonomous ships, because they have an increased dependence on ICT for ship control. In case of autonomous ships, it is important to examine together security, safety and resilience aspects. Since remotely controlled and autonomous ships need to communicate in real time in order to navigate to its destination, avoid collisions along the way, and perform complex manoeuvres, such as docking, the autonomous ships need an even superior safety and security assessment to prevent any cyberattack or malicious interruption of their communication network.

Therefore, the remote and autonomous ships will pose an extra difficulty to cyber security of

systems on board and at land, if those ships intend to reach at least the same security level of existing modern manned vessels. Autonomous ships' IT systems architecture and operations have not been defined in full detail and the particular potential of cyber threats and cyberattacks for autonomous ships have not been fully identified, yet.

4. The European Commission' s guidelines for MASS trials

In Europe, in particular Norway is supporting the development of MASS operations with the launch of the 80 m long Yara Birkeland autonomous container ship. The ship was planned to undergo testing for container loading and stability, before it will undergo further preparations for autonomous operation. In April 2019, Wilhelmsen and KONGSBERG established the first autonomous shipping company named "Massterly", which is expected to offer a complete value chain for autonomous ships, from design and development, to control systems, logistics services and vessel operations. Furthermore, Estonia-based shipping company Tallink Grupp is preparing to form a partnership with maritime IoT start-up Fleetrangle, researchers from the Finnish Geospatial Research Institute (FGI) and Aalto University to develop autonomous ship navigation techniques.

These several trials in Europe with autonomous vessels are taking place at national level, and they only need approval by national regulators for their operation. At international level, the IMO is still in the middle of amending the several pieces of international legislation with regard to the future use of MASS and there are a number of regulatory challenges directly related to MASS. Meanwhile, since administrations and industry are involved in preparing and performing the various trials and tests with MASS, it is necessary to establish common regulations to ensure a safe operation of autonomous systems and vessels. On the occasion of the 2nd International Ship

Autonomy and Sustainability Summit on 30 November 2020, the high-level participants, including the Secretary-General from IMO Kitack Lim and five Ministers addressed aspects surrounding the MASS development and trials, via three interactive panel discussions. At this summit, the European Commission, the EU Member States and Norway also presented the comprehensive “EU operational guidelines for safe, secure and sustainable trials of maritime autonomous surface ships (MASS)”, in cooperation with the key industry stakeholders and with the support of the European Maritime Safety Agency (EMSA) and under the auspices of the Maritime Autonomous Surface Ships (MASS) expert group.

The main objective is to develop procedures to be used for designating the test area(s) or a ship safety zone, when conducting trials of MASS-related systems and infrastructure. These guidelines also address the risks and vulnerabilities inside and outside the determined area/zone by ensuring the safety of navigation and considering the environmental interests and third-party interests, as well as any monitoring and communication issues from the land side.

The EU Operational Guidelines allow for a harmonised European approach by clarifying the roles of authorities and applicants and provide guidance of what to consider in their assessments when facing MASS trials, including risk assessments. The EU Operational Guidelines build on and complement the interim Guidelines on MASS developed by the IMO. The EU’s Guidelines will be adjusted and improved continuously as experience will be gained from trials and tests as well as results from relevant EU funded research and studies.

The Commission has identified extensive trials and tests as a prerequisite and crucial step for safe and successful MASS traffic operation and for ensuring safe navigation in the future. Especially, the difficulties of a mixed traffic situation where both manned and unmanned ships

will be sailing on the same routes/ports will have to be considered.

The EU Operational Guidelines should also be brought to the attention of the IMO and other appropriate stakeholder fora.

Furthermore, the work on the improvement of the EU Operational Guidelines will continue, in all its aspects, including uptake from relevant R&D projects to address the challenges and achieve alignment of standards and common understanding for trials and operations of MASS, including in ports. The already applicable EU legislation - Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system (VTMIS), as amended by Directive 2009/17/EC - includes provisions that need to be looked at under the perspective of autonomous vessels and future challenges.

According to the European Commissioner for Transport Adina Vălean, automated ships have the potential to increase safety and productivity. They can also contribute towards the sustainability goals for maritime transport. Their deployment needs to build on tests and trials, with their safety as top priority.

5. Conclusion and outlook

Autonomous and unmanned vessels are seen as a key element for a competitive and sustainable shipping industry of the future. They are expected to have safety, efficiency and price advantages and there is no doubt that autonomous shipping will continue to develop throughout the maritime transport industry at global level.

There are currently no full-scale trials taking place within the EU. In fact, it still needs detailed regulation and preparation for introducing MASS. However, it can be expected that MASS of different levels of autonomy will be introduced in regular maritime transport. As for the EU, it is expected that short-sea services and feeder traffic within and between the EU and EEA’s countries will come first, while fully

autonomous deep-sea international shipping is a more distant prospect.

The operational guidelines for trials and tests of MASS in the EU and EEA will enable the next steps in the development of MASS.

For the international maritime transport with MASS, the IMO instruments will have to be amended regarding the necessities of the utilisation of MASS. However, this process can be expected to be delayed because of the current COVID-19 pandemic.

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