

## IUMI Policy Agenda

### 2. Autonomous / unmanned transports

#### *Brief description*

Unmanned transports are gaining acceptance from industry and public entities as research and innovation bring the possibility of driverless trucks and vessels closer to realization. This raises some legal and liability issues that need to be resolved.

Insurers also need to address the risks related to innovative technologies and the internet of things. New types of failure modes may be introduced due to the lack of knowledge and unforeseen interdependencies in the system design, operation complexity, and environmental challenges. Cyber-attacks, connectivity, interactions between components and between technical systems and humans, and autonomy assisted accidents are among the challenges.

To become insurable, the use of autonomous systems must rely on proper industry standards, certification and classification regimes. Verification of safe performance is crucial.

#### **Vessels**

An unmanned vessel can be both remote controlled or fully automated, and it has been suggested that the first crewless vessel will be in service by the end of the decade. Most likely, there will be a number of variations and a stepwise progress, including the use of automated technologies with a reduced number of crew on board and for certain manoeuvres.

Numerous industry and government-run projects are driving the development, but for unmanned vessels to become a reality the regulatory framework must also be in place. Requirements concerning the person having command of a vessel, sufficient manning, training and proper lookout must be considered in international conventions (SOLAS, STCW, COLREG). In June 2017, IMO's Maritime Safety Committee (MSC) agreed to undertake a regulatory scoping exercise to determine the extent of the need to amend the regulatory framework to enable the safe, secure and environmental operation of maritime autonomous surface ships (MASS) within the existing IMO instruments.

In December 2018, MSC agreed to maintain the initial four degrees of autonomy although focusing on levels two and three: (2) Remotely controlled ship with seafarers on board and (3) Remotely controlled ship without seafarers on board. A proposal on how to

characterize and classify ship autonomy is currently considered by the International Organization for Standardization (ISO).

Interim guidelines for trials of MASS were finalized by MSC in June 2019. As a basic principle, these trials shall meet at least the same level of safety, security and environmental protection as required for conventional vessels.

In May 2021, MSC 103 approved the outcome of the regulatory scoping exercise (RSE) for the use of MASS, and invited Member States and international organizations to submit output proposals on the best way forward to address MASS. MSC 104 (October 2021) included in the biennial agenda of the Committee for 2022-2023 and the provisional agenda for MSC 105 a new output on 'Development of a goal-based instrument for maritime autonomous surface ships (MASS)', with a target completion year of 2025. MSC 104 further agreed that the first step in this new output would be the finalization of a road map to have a common understanding of the following steps, and that the title of the output might need to be adjusted based on the outcome of discussions at MSC 105.

In April 2018, the IMO Legal Committee (LEG) agreed to include a new output entitled "Regulatory scoping exercise and gap analysis of conventions emanating from the Legal Committee with respect to Maritime Autonomous Surface Ships (MASS)", with a target completion year of 2022.

There are also several other initiatives relating to legislation and insurance of autonomous vessels. These include; Comité Maritime International (CMI) has formed an International Working Group on Unmanned Vessels, Association Mondiale de Dispatcheurs (AMD) are considering how the adoption of unmanned vessels may impact marine insurance claims and the application of general average, and International Group of P&I Clubs (IG) has formed a working group to consider liability matters. BIMCO is drafting a standard contract for autonomous vessels, adapted from the SHIPMAN 2009 agreement, titled AUTOSHIPMAN and expected to be published in 2021. The contract will include provisions for autonomous vessel-related services and the operation of a remote control centre.

## **Trucks**

The rapid progress of sensor technology and software processing has enabled truck manufacturers to introduce varying levels of autonomy to the trucking sector. Autonomous trucks can enable fewer accidents and fatalities, increase operational efficiency for fleet owners (for example, reduced truck downtime), and reduce labour costs. Furthermore, a high share of greenhouse gas emissions and local air pollutants is attributed to heavy-duty trucks. Autonomous features such as platooning can enable reduced fuel consumption. These factors are driving the demand for self-driving trucks.

In 2014, the Society of Automotive Engineers (SAE) defined 6 levels of driving automation ranging from 0 (fully manual) to 5 (fully autonomous). These levels have been adopted by the U.S. Department of Transportation.

- **Level 0: Fully manual vehicle**  
Level 0 vehicles rely on the driver for every driving action; they might include some basic features such as cruise control or warning systems to prevent impending accidents.
- **Level 1: One single automated aspect**  
Examples for such driver assistance systems include automatic braking to avoid collisions and lane-keep assist technology; they are quite ubiquitous in today's vehicles.
- **Level 2: Automated steering and acceleration capabilities**  
Though the vehicle is allowed to automate certain parts of the driving experience, but the driver remains in complete control of the vehicle at all times. Examples of level 2 include helping vehicles to stay in lanes and to brake automatically as well as self-parking features.
- **Level 3: Environment detection**  
With this level of automation, the vehicle is capable of driving autonomously over long distances (e.g., on freeways) and can make informed decisions for themselves such as overtaking slower moving vehicles but the driver must be able to take back control within seconds after a warning.
- **Level 4: No human interaction required**  
Level 4 vehicles can complete entire journeys without driver intervention, but it might be confined to limited spatial areas (e.g., freeways) or under specific circumstances (e.g., traffic jams). According to some, there is thus still the need for a cockpit with steering wheels and pedals for the situations when a driver might assume control. This level of automation might not even require an actual steering wheel; a remote operator can take over control in some instances.
- **Level 5: Human driving is completely eliminated**  
A level 5 vehicle is capable of completing an entire hands-off, driverless journey, it can basically go anywhere, anytime, under any condition. There are no geographical constraints as there are for Level 4 vehicles and no cockpit is needed anymore, making every person inside the vehicle a passenger. To ensure this level of automation, these vehicles rely heavily on advanced vehicle-to-vehicle and vehicle-to-environment communications.

Freight shipments with trucks driving in “trains” along the highway are now being tested. Truck platooning, in which two or three trucks drive in a column connected by Wi-Fi with the first truck determining the speed, enables shorter gaps between trucks. This frees up space for other vehicles, and is expected to ensure better traffic flow and speed of deliveries. Truck platooning is also said to realise up to ten per cent fuel savings, as well as reducing CO<sup>2</sup> emissions.

In Europe, the approval for a fully automated commercial vehicle with SAE Level 4 still faces massive hurdles. One sticking point is UNECE R 79 for steering systems, which gives the driver primary responsibility for driving the vehicle. The existing EU law concerning the approval and market surveillance of motor vehicles are based on this rule, and thus, always require a person in command of the vehicle and thus the full controllability of the vehicle. Pending harmonization under EU law, some EU member states (e.g., Germany) are willing to establish a national legal framework to create suitable conditions for the introduction of regular operations.

#### Samples

The European Truck Platooning Challenge demonstration project was successfully completed in 2016. While the test showed that technology already has come a long way, it also made it clear that in going forward there is a need for EU harmonisation of rules of the road and rules for drivers.

In January 2017, Singapore Ministry of Transport and PSA Corporation signed agreements with two automotive companies to design, develop and test an autonomous truck-platooning system for use on Singapore's public roads (between ports).

In 2019, ZPMC Smart Solutions Group completed a phased R&D testing of five all-electric unmanned vehicles in the Tangshan Port Container Terminal (China).

In 2021, the Swedish Transport Agency granted Scania, the Swedish manufacturer of trucks, permission to run self-driving trucks transporting goods on the E4 motorway between Södertälje and Jönköping in Sweden, the first permission on public roads in Europe. The trucks will enter commercial service with the Scania Transport Laboratory and will be loaded with goods for Scania's production operations. The system will cover technology according to level 4 on the 5-point SAE scale for self-driving vehicles. Scania has been testing self-driving trucks for mining transportation since 2018 in the Pilbara region in Western Australia, moving more than one billion tons of waste and iron ore material. As a result, these trucks have proved to be more efficient than regular trucks and also provide considerable safety benefits as there have been zero road accidents with the trucks used.

#### *Relevant authority / organisations and documents*

- **IMO:**
  - **MSC98/20/2;** Maritime Autonomous Surface Ships, Proposal for a regulatory scoping exercise, submitted by Denmark, Estonia, Finland, Japan, the Netherlands, Norway, the Republic of Korea, the United Kingdom and the United States, 27 February 2017.
  - **MSC98/20/13:** Comments on MSC98/20/2, submitted by the International Transport Workers' Federation (ITF), 13 April 2017.
  - **MSC99/INF.3:** Final report – analysis of Regulatory Barriers to the use of Autonomous Ships, submitted by Denmark, 18 January 2018.

- **LEG105/11/1:** Proposal for a regulatory scoping exercise and gap analysis with respect to Maritime Autonomous Surface Ships (MASS), submitted by Canada, Finland, Georgia, the Marshall Islands, Norway, the Republic of Korea, Turkey, CMI, ICS and P&I Clubs, 19 January 2018.
- **MSC99/INF.5:** Report of a survey on what maritime professionals think about autonomous shipping, submitted by IFSMA and ITF, 9 February 2018.
- **MSC.1/Circ.1604:** Interim guidelines for MASS trials, 14 June 2019.
- **LEG107/8:** Summary of results of analysis of IMO instruments under the purview of the Legal Committee, submitted by CMI, 13 December 2019.
- **MSC102/5/16:** Summary of result analyses of IMO instruments under the purview of the Maritime Safety Committee, submitted by CMI, 11 February 2020.
- **MSC103/5/3:** Updates to proposed terminology for MASS, submitted by ISO, 15 March 2021.
- **MSC.1/Circ.1638:** Outcome of the regulatory scoping exercise for the use of maritime autonomous surface ships (MASS), 3 June 2021.
- **MSC104/15/25:** Introduction of MASS in IMO instruments – proposal for a new output, submitted by France, Japan, Russian Federation, United Arab Emirates and IACS, 2 July 2021.
- **MSC104/15/26:** Proposal for a new output on the development of international provisions for MASS, submitted by Belgium, Canada, Denmark, Finland, Germany, Marshall Islands, Norway, Singapore, United States, BIMCO and IMCA, 2 July 2021.
- **LEG108/WP.7:** Regulatory scoping exercise and gap analysis of conventions emanating from the Legal Committee with respect to MASS, report of the LEG WG, 28 July 2021.
- **MSC105/7:** Proposal by the Chair for a draft road map for maritime autonomous surface ships, 10 January 2022.
- **University of Gent:** Article in Journal of International Maritime Law on the law of unmanned merchant shipping – an exploration, Professor Dr Eric Van Hooydonk, 2014
- **Maritime UK & LR:** MASS UK Industry Conduct Principles and Code of Practice (V5), November 2021
- **Maritime Unmanned Navigation through Intelligence in Networks (MUNIN)**
- **Norwegian Forum for Autonomous Vessels**
- **Denmark:**
  - Pre-study. Cooperation between Danish Maritime Authority & the Technical University of Denmark (MSC 98/INF.13).
  - Danish Maritime Authority/Rambøll/Core Advokatfirma: Analysis of regulatory barriers to the use of autonomous ships, December 2017.
- **The European Truck Platooning Challenge**
- **ONE SEA Autonomous Maritime Ecosystem (Finland):** Finnish Maritime Industries, ecosystem for autonomous marine transport in the Baltic Sea in 2025.

- **European Parliament:** Resolution on Civil law rules on robotics, 16 February 2017.
- **CMI:** International Working Group on “Maritime Law for unmanned craft”; MSC 99/INF.8: Work conducted by the CMI WG, 13 February 2018.
- **Classification societies:**
  - **Lloyd’s Register:** Cyber-enabled ships – ShipRight procedure assignment for cyber descriptive notes for autonomous & remote access ships, Version 2.0, December 2017.
  - **Bureau Veritas:** Guidelines for Autonomous Shipping, December 2017.
  - **DNV GL:** Autonomous and remotely operated ships (DNVGL-CG-0264), September 2018.
- **CORE Advokatfirma & Cefor:** Maritime autonomous surface ships – zooming in on civil liability and insurance, 10 December 2018.
- **European Maritime Safety Agency (EMSA):** Study of the risks and regulatory issues of specific cases of MASS (SAFEMASS), DNV GL report, 25 March 2020.
- **MarLab Marine Autonomous Surface Ships Data Project**
- **UK Department of Transport:** Future of transport regulatory review consultation: Maritime autonomy and remote operations, September 2021.

#### *Timeline / important dates*

- MUNIN: 2012 until August 2015.
- IUMI webinar: Legal aspects, Dr M. Guth, Dabelstein & Passehl, 11 May 2017.
- MSC scoping exercise June 2017 - June 2020.
- EU research programme Horizon 2020: 2018-2020.
- LEG scoping exercise agreed April 2018. Target completion year 2022.
- IUMI webinar: Update on regulatory developments for Maritime Autonomous Surface Ships (MASS), Dr L. Wiedenbach, ASD, 29 January 2019.
- MSC 103: 3-14 May 2021.
- MSC 104: 4-8 October 2021.
- MSC 105: 20-29 April 2022.
- Target completion year within MSC for a new mandatory code: 2025.

#### *IUMI will:*

- Monitor ongoing industry and government-run projects, and provide input as appropriate.
- Monitor scoping exercises performed by the IMO and take part in discussions on regulatory amendments.
- Encourage classification societies to take an active role in both technical and operational risk aspects of increasingly autonomous vessels.
- Encourage the development of industry standards, certification schemes and class requirements for autonomous systems and remote control centres.
- Participate in the LEG web platform working group.