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# Developing Issues With Maritime Autonomous Surface Ships

Alan M. Weigel\*

*Almost every maritime nation is engaged in developing autonomous vessel technologies, and several countries have designated parts of their national waters as test sites for Maritime Autonomous Surface Ships. The author of this article discusses the International Maritime Organization's initiative to regulate autonomous vessels.*

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The development of large autonomous merchant vessels, also known as Maritime Autonomous Surface Ships (“MASS”), has progressed at a significant pace with new vessels entering operation every year. Almost every maritime nation is engaged in developing autonomous vessel technologies, and several countries have designated parts of their national waters as test sites for MASS.

In Norway, the YARA BIRKELAND recently began a two-year testing period of the technology that will certify the vessel as an autonomous, all-electric container ship.<sup>1</sup> In Japan, the first tests of the fully autonomous container ships MIKAGE and SUZAKU took place recently in coastal waters of the Sea of Japan and Tokyo Bay. The unmanned ships transited between ports using a system of radar and lidar sensors, cameras, and a satellite compass to navigate and pulled themselves into berths at the end of their journeys.<sup>2</sup>

## Industry Initiatives

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Despite the rapid pace of MASS development, there are currently no universally agreed upon standards governing their design, manufacture, or operations. To begin to remedy the regulatory gaps, there are several industry initiatives working toward providing owners and operators of autonomous vessels with guidance on how to integrate MASS operations into the existing regime of international and domestic regulations.

Lloyd's Register has published a code for Unmanned Marine Systems ("UMS") for use in certifying the safe design, build, and maintenance of UMS against an established framework that is acceptable to flag states and local regulators.<sup>3</sup>

The International Maritime Organization ("IMO") has approved interim guidelines for MASS trials that provide, among other things, that coastal and/or port states should ensure that MASS trials that they authorize are conducted in a manner that provides at least the same degree of safety, security, and protection of the environment as provided by the relevant IMO regulatory instruments.<sup>4</sup> The IMO guidelines recommend that risks associated with the trials are appropriately identified and measures are put in place to reduce the risks to "as low as reasonably practicable and acceptable," including that onboard or remote operators of MASS are appropriately qualified and experienced to safely conduct MASS trials.<sup>5</sup>

The U.S. Coast Guard's Navigation Safety Advisory Council ("NAVSAC"), U.K. Maritime, and the European Safety and Regulations for Unmanned Maritime Systems ("SARUMS") Group have all published voluntary best practices to provide an initial set of standards, guidance, and information to owners and operators for the safe design, manufacture, testing, operation, and maintenance of autonomous vessels.<sup>6</sup>

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## IMO's Regulatory Scoping Exercise on MASS

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To address the challenges posed by unmanned ships, the IMO has embarked on a multi-year study of the regulatory scheme for MASS, a so-called "regulatory scoping exercise," which is analyzing current IMO conventions with the goal of recommending amendments to clarify the legal rights and obligations of MASS. For purposes of the scoping exercise, the IMO has defined a MASS as "a ship which, to a varying degree, can operate independent of human interaction."<sup>7</sup> The IMO acknowledges that "the use of MASS creates the need for a regulatory framework for such ships and their interaction and co-existence with manned ships [and] . . . the need to amend the regulatory framework to enable the safe, secure and environmentally sustainable operation of MASS within the existing IMO instruments."<sup>8</sup>

IMO's Maritime Safety Committee ("MSC"), Legal Committee ("LEG"), and Facilitation Committee have included the regulatory

scoping exercise on their agendas, for treaties and conventions coming under the purview of the respective committees, to determine how the safe, secure, and environmentally sound operation of MASS may be introduced in IMO instruments.<sup>9</sup>

The exercise involved assessing a substantial number of IMO instruments under the committees' remit and identifying provisions that applied to MASS and prevented MASS operations; or applied to MASS and do not prevent MASS operations and require no actions; or applied to MASS and do not prevent MASS operations, but may need to be amended or clarified, and/or may contain gaps.<sup>10</sup> Varying degrees of autonomy were considered: crewed ship with automated processes and decision support (Degree One); remotely controlled ship with and without seafarers on board (Degrees Two and Three); and fully autonomous ship (Degree Four).<sup>11</sup>

Some of the instruments included in the MSC's scoping exercise for MASS are those covering safety and maritime security ("SOLAS"); collision regulations ("COLREG"); training of seafarers ("STCW"); and search and rescue ("SAR").<sup>12</sup> Some of the instruments included in the LEG's scoping exercise for MASS are those covering civil liability for oil pollution ("CLC" and "BUNKERS"); civil liability for the maritime carriage of nuclear material ("NUCLEAR"); limitation of liability for maritime claims ("LLMC 1976"); suppression of unlawful acts against the safety of navigation ("SUA"); and salvage and wreck removal ("SALVAGE," "NAIROBI WRC").<sup>13</sup> The process analyzed and considered the most appropriate way of addressing MASS operations, taking into account the human element, by developing treaty interpretations; and/or amending existing instruments; and/or developing new instruments.

The regulatory scoping exercise for safety treaties was finalized in May 2021 and published as IMO Circular MSC.1/Cir. 1640, "Outcome of the Regulatory Scoping Exercise for the use of Maritime Autonomous Surface Ships (MASS)."<sup>14</sup> The scoping exercise for treaties under the purview of LEG was completed in July 2021, with publication of the final results pending.<sup>15</sup>

In general, the LEG concluded that MASS could be accommodated within the existing regulatory framework of conventions within the committee's purview without the need for major adjustments or a new instrument. The LEG also concluded that while some conventions can accommodate MASS as drafted, others may require additional interpretations or amendments to address



potential gaps and themes that were revealed through the scoping exercise.<sup>16</sup>

On the other hand, the MSC concluded that the best way forward to address MASS in the IMO regulatory framework was through the development of a goal-based MASS instrument.<sup>17</sup> The committee proposed that such an instrument could take the form of a “MASS Code,” with goal(s), functional requirements, and corresponding regulations, suitable for all four degrees of autonomy, and addressing the various gaps and themes identified by the scoping exercise. The MSC agreed to a target completion year of 2025 to develop the goal-based instrument for MASS.<sup>18</sup>

## Moving Forward

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Both scoping exercises identified various gaps in IMO instruments that would need to be addressed to support regulatory compliance for MASS development and operations. Both the safety and legal committees highlighted similar high-priority issues, cutting across several instruments, that would need to be addressed at a policy level. These include the development of internationally recognized MASS terminology and definitions, and clarifying the meaning of the term “master,” “crew,” and “responsible person,” particularly in Degrees Three (remotely controlled ship) and Four (fully autonomous ship).<sup>19</sup> Other high-priority issues include the role and responsibility of the master; the role and responsibility of the remote operator; addressing the functional and operational requirements of the remote-control station; the possible designation of a remote operator as seafarer; questions of liability; and regulatory certificates.<sup>20</sup>

MASS place unique demands on those who own and operate them and the remainder of the maritime community who must interact with them. For MASS to become commercially viable alternatives to traditional means of maritime transportation, they will have to embark on international voyages outside of the tightly controlled national waters where they are currently being trialed. Before they can do so, however, the maritime community will have to agree on how they will be regulated. The IMO scoping exercises represent the necessary first step to ensuring that regulations keep pace with technological developments.

## Notes

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