ARMADA DEL ECUADOR
ACADEMIA DE GUERRA NAVAL
Guayaquil
-o-

LECTURA RECOMENDADA

CARACTERIZACIÓN LEGAL DE LOS SISTEMAS MARÍTIMOS AUTÓNOMOS LETALES: ¿BUQUE, TORPEDO O MINA NAVAL?

HITOSHI NASU Y DAVID LETTS
REVISTA DE ESTUDIOS DE DERECHO INTERNACIONAL. USNWC

Lectura recomendada por:

CPFG-EM David Vélez Altamirano.
Jefe del Departamento de Seguimiento y Evaluación de la Academia de Guerra Naval

2021

MOTIVACIÓN A LA LECTURA

Los autores de este artículo, tomado de la Revista de Estudios de Derecho Internacional, del US Naval War College, son destacados docentes e investigadores en el ámbito del derecho internacional, el Profesor Hitoshi Nasu es docente de derecho internacional en la Universidad de Exeter, y el Profesor David Letts es profesor asociado en la Facultad de Derecho de la Universidad Nacional de Australia.

El propósito de la presente lectura es analizar las implicaciones del empleo de sistemas marítimos autónomos con capacidad letal (LAMS, por sus siglas en inglés) en los diferentes conflictos presentes y futuros; más aún cuando el uso de sistemas autónomos han sido utilizados a lo largo de la historia en el contexto naval.

Inicia con un breve resumen del empleo de los LAMS a lo largo de la historia en los conflictos navales, y establece que al ser los LAMS un sistema de armas *sui generis,* ciertamente generará desacuerdos sobre su condición legal; la situación legal de estos sistemas depende de la caracterización que le dé cada Estado y en qué medida los Estados comparten dicha caracterización para la aplicación del marco legal adecuado.

Actualmente no existe un acuerdo entre Estados sobre si los LAMS deben ser considerados como buques de guerra o como otros medios de guerra naval, tales como torpedos o minas navales, todo lo cual puede tener implicaciones estratégicas y operacionales si no es resuelto.

Posteriormente revisa el estatus legal de los buques, torpedos y minas navales como un potencial marco referencial para el empleo de los LAMS; además revisa las implicaciones de legalidad del empleo de LAMS, considerando los derechos de navegación en tiempos de paz y los derechos de los beligerantes en la conducción de hostilidades en un conflicto armado internacional.

Finalmente concluye identificando los aspectos claves que deben guiar a cada Estado para evaluar los intereses nacionales y estratégicos atendidos al caracterizar los LAMS bajo los respectivos regímenes legales y resolver desacuerdos sobre la caracterización legal de los LAMS.

Sin duda, una interesante lectura recomendada para quienes desean conocer más sobre los aspectos legales del empleo de las nuevas tecnologías en el campo de la guerra naval.

La lectura puesta en su consideración se la puede encontrar en:

Nasu H. & Letts D., R. (2020). https://digital-commons.usnwc.edu/ils/vol96/iss1/4/

INTERNATIONAL LAW STUDIES

Published Since 1895

The Legal Characterization of Lethal Autonomous Maritime Systems: Warship, Torpedo, or Naval Mine?

Hitoshi Nasu and David Letts

96 INT'L L. STUD. 79 (2020)

Volume 96 2020

Published by the Stockton Center for International Law

ISSN 2375-2831

The Legal Characterization of Lethal Autonomous Maritime Systems: Warship, Torpedo, or Naval Mine?

Hitoshi Nasu[*] *and David Letts*[**]

CONTENTS

* Professor of International Law, University of Exeter.

** Associate Professor, Australian National University College of Law. This article is partly based on the presentation and discussion at the U.S. Consultative Meeting for the Revision of the San Remo Manual Applicable to Armed Conflicts at Sea, hosted by the Stockton Center for International Law at the U.S. Naval War College, December 16–18, 2019. We thank the participants of the meeting for informative discussion.

The thoughts and opinions expressed are those of the authors and not necessarily those of the U.S. government, the U.S. Department of the Navy, or the U.S. Naval War College.

I. INTRODUCTION

In August 2019, the Group of Governmental Experts of the High Contracting Parties to the Convention on Certain Conventional Weapons[1] concluded its deliberation on lethal autonomous weapons systems, deciding that "[t]he potential use of weapons systems based on emerging technologies in the area of lethal autonomous weapons systems must be conducted in accordance with applicable international law, in particular IHL [international humanitarian law] and its requirements and principles, including inter alia distinction, proportionality and precautions in attack."[2] While this statement does not limit the geographical scope of its application, the regulation of lethal autonomous maritime systems (LAMS) requires special consideration under the specialized legal regime that governs naval warfare.[3]

Naval warfare focuses primarily on the act of violence against objects and platforms, rather than individuals. As an advanced type of unmanned maritime systems, the autonomous lethality of LAMS—primarily the ability to navigate independently and damage or destroy an object—must be considered to address a different set of concerns unique to the maritime environment and the specialized legal regime applicable to it.

The use of unmanned systems has a long history in the maritime context. "Fireships," vessels filled with gunpowder, set ablaze, and then left to drift into enemy formations, are an ancient technique used in pre-modern naval warfare.[4] Self-propelled and self-guided underwater explosive devices (torpedoes) emerged in the mid-nineteenth century, with the employment of various configurations during the 1854–56 Crimean War and the 1860–65 U.S. Civil War. Most notably, W.B. Cushing of the U.S. Navy employed

1. Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Apr. 10, 1981, 1342 U.N.T.S. 137.

2. Draft Report of the 2019 Session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems ¶ 17(a), U.N. Doc. CCW/GGE.1/2019/CRP.1/Rev.2 (Aug. 21, 2019); s*ee also* Report of the 2018 Session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems ¶ 26(g), U.N. Doc. CCW/GGE.1/2018/3 (Oct. 23, 2018).

3. Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts art. 49(3), June 8, 1977, 1125 U.N.T.S. 3 [hereinafter Additional Protocol I].

4. 3 ALEXANDER GILLESPIE, A HISTORY OF THE LAWS OF WAR 27 (2011).

spar-mounted torpedoes in the sinking of the Confederate ram CSS *Albemarle* at Plymouth, North Carolina in October 1864.[5] Following the U.S. Civil War, this progression continued and the first naval torpedo station was established at Newport, Rhode Island in 1869.

This period also saw the emergence and use of automatic contact mines. The extensive and unrestricted use of such mines in the Russo-Japanese War of 1904–05 prompted the adoption of the 1907 Hague Convention VIII Relative to the Laying of Automatic Submarine Mines[6] (Hague VIII) to protect commercial shipping from the indiscriminate effects of naval mines.[7] With the advancement of technology, various types of unmanned underwater vehicles have been developed and employed for a variety of military purposes.[8] While the majority of unmanned vehicles remain tethered to a surface ship and are remotely controlled, the application of artificial intelligence technology edges closer to the development of fully autonomous underwater vehicles with the adaptive ability to make independent decisions regarding navigation, detection, the assessment of potential threats, and engagement in belligerent acts.[9]

---

5. Using a "ram" to attempt to sink or disable a vessel was a feature of naval warfare for many centuries. During the American Civil War, a number of vessels, such as the *Albemarle*, were built as rams and used to varying effect in naval battles that took place in that conflict. *See* HOWARD J. FULLER, CLAD IN IRON: THE AMERICAN CIVIL WAR AND THE CHALLENGE OF BRITISH NAVAL POWER 195 (2008) (discussing "ram fever"). For a description of the attack on the *Albemarle* by Cushing, see IVAN MUSCIANT, DIVIDED WATERS: THE NAVAL HISTORY OF THE CIVIL WAR 418–21 (1995).

6. Convention VIII relative to the Laying of Automatic Submarine Contact Mines, Oct. 18, 1907, 36 Stat. 2332 [hereinafter Hague VIII].

7. GILLESPIE, *supra* note 4, at 28; INTERNATIONAL SECURITY DEPARTMENT WORKSHOP SUMMARY, CHATHAM HOUSE, INTERNATIONAL LAW APPLICABLE TO NAVAL MINES (2014) 2.

8. *See* RONALD O'ROURKE, CONG. RESEARCH SERV., RL45757, NAVY LARGE UNMANNED SURFACE AND UNDERSEA VEHICLES: BACKGROUND AND ISSUES FOR CONGRESS (2019); Natalie Klein, *Maritime Autonomous Vehicles within the International Law Framework to Enhance Maritime Security*, 95 INTERNATIONAL LAW STUDIES 244 (2019); Wolff Heintschel von Heinegg, *Unmanned Maritime Systems: Does the Increasing Use of Naval Weapon Systems Present a Challenge for IHL?*, *in* DEHUMANIZATION OF WARFARE 119 (Wolff Heintschel von Heinegg et al. eds., 2018); Michael N. Schmitt & David S. Goddard, *International Law and the Military Use of Unmanned Maritime Systems*, 98 INTERNATIONAL REVIEW OF THE RED CROSS 567 (2017).

9. It has been reported that the People's Republic of China has deployed two HSU-001 autonomous submarines for underwater surveillance and, in February 2019, Boeing was granted a contract to build four Orca autonomous vehicles for the U.S. Navy. *See*

With the prospect of LAMS entering military service in the near future, there is an urgent need to determine the legal classification of these systems. One possibility is to characterize LAMS as warships in order to assert legal entitlement to navigational rights under the law of the sea, coupled with the ability to exercise belligerent rights during an international armed conflict.[10] Alternatively, LAMS may be characterized as torpedoes or naval mines, in which case various obligations and requirements under the law of naval warfare might restrict their development and use.

An application of relevant legal regimes to accommodate LAMS by reference to the function these vehicles are intended to serve may go some way to regulate the use of unmanned maritime systems within the existing legal framework. However, difficulties arise when multiple functions merge in the form of LAMS possessing the dual autonomous abilities to navigate and detonate itself as an explosive device.

With the focus on LAMS as *sui generis* hybrid weapon systems, this article examines the legal implications of designation as a warship, torpedo, or naval mine under the applicable rules of international law for each. The legal status of LAMS ultimately depends on how States characterize LAMS and to what extent other States share that characterization, such that general agreement is reached. Accordingly, this article does not adopt or advocate for a particular position; rather, it articulates the legal implications of deploying LAMS under each of the legal regimes mentioned above.

To that end, Part II reviews the legal status of warships, torpedoes, and naval mines as a potential legal framework for the regulation of LAMS. Next, Part III discusses the implications for the lawfulness of conduct involving the use of LAMS, with specific consideration of navigational rights in peacetime and belligerent rights in the conduct of hostilities during an international armed conflict. Part IV concludes by identifying key considerations that should guide each State in assessing the strategic and national interests served by characterizing LAMS under the respective legal regimes and in resolving disagreement over the legal characterization of LAMS.

Sebastien Roblin, *The U.S. Navy Has Orca Robot Submarines on the Way that Could Transform Naval Warfare*, THE NATIONAL INTEREST, Oct. 20, 2019.

10. Difference of opinion exists regarding the application of the "doctrine of belligerency" in non-international armed conflict. See, for example, the discussion on this topic in Phillip J. Drew, *Blockade? A Legal Assessment of the Maritime Interdiction of Yemen's Ports*, 24 JOURNAL OF CONFLICT AND SECURITY LAW 35, 39 (2019).

II. LEGAL FRAMEWORK FOR REGULATING THE USE OF LETHAL AUTONOMOUS MARITIME SYSTEMS

Currently, there is no specific rule of international law that regulates the development, acquisition, use, or transfer of LAMS. States, therefore, have largely unfettered freedom in developing, acquiring, using, or transferring a maritime unmanned system unless it qualifies as an object that is accorded legal status for the specific purpose of regulation under the relevant rules of international law. For example, the 1982 U.N. Convention on the Law of the Sea (UNCLOS) regulates specific types of maritime objects, such as "ships,"[11] "installations and structures,"[12] and "submarine cables and pipelines,"[13] primarily to establish the conditions under which a State is entitled to exercise jurisdiction over those objects or grant them jurisdictional immunities. Thus, certain entitlements attach to LAMS to the extent they qualify, for example, as ships or installations and structures over which a State exercises jurisdiction or, provided certain conditions are met, for which the State may claim jurisdictional immunities.[14]

Alternatively, obligations may arise to conduct a legal review of weapons as a means of warfare to ensure compliance with a specific treaty prohibiting or restricting the use of a certain weapon, if LAMS fall within the scope of such regulation.[15] More generally, States that are party to Additional Protocol I would be required to conduct a weapons review if LAMS are characterized as a "weapon, means or method of warfare."[16] Additional considerations arise, and certain obligations may be imposed on the use of

11. United Nations Convention on the Law of the Sea arts. 17–32, 90–97, Dec. 10, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS].

12. *Id.* arts. 60, 80.

13. *Id.* arts. 79, 112–15.

14. *See* Schmitt & Goddard, *supra* note 8, at 575–77.

15. *See* WILLIAM H. BOOTHBY, WEAPONS AND THE LAW OF ARMED CONFLICT 342 (2d ed. 2016).

16. Additional Protocol I, *supra* note 3, art. 36. For differences between the weapons review obligation under Article 36 of Additional Protocol I and under customary international law, see Damian P. Copeland, *Legal Review of New Technology Weapons*, *in* NEW TECHNOLOGIES AND THE LAW OF ARMED CONFLICT 43, 47–52 (Hitoshi Nasu & Robert McLaughlin eds., 2014). On the customary international law status of Article 36, *see* Natalia Jevlevskaja, *Weapons Review Obligation under Customary International Law*, 94 INTERNATIONAL LAW STUDIES 186 (2018).

LAMS, if, and to the extent, they qualify as "vessels" as defined by regulations for preventing collisions at sea.[17]

In an attempt to resolve some of these issues, the International Maritime Organization (IMO) is currently undertaking a scoping exercise to determine how marine autonomous surface ships should be regulated to ensure that trials of related systems and infrastructure are conducted safely, securely, and with due regard for the protection of the environment.[18] While this effort is moving towards integrating autonomous ships into one element of the existing regulatory framework, the scope of application is limited to specific areas of maritime safety and environmental protection.[19]

The IMO's readiness to embrace different degrees of autonomy for ensuring maritime safety is not indicative of a general agreement among States regarding the legal characterization of unmanned maritime systems. At best, it is only inchoate evidence of State practice under customary international law. In the absence of a general definition of a ship, the following analysis focuses on the potential legal arguments supporting the classification of LAMS as warships, torpedoes, or naval mines, as these terms are defined under the respective legal regimes.

A. Warship

Drafted between 1973 and 1982, and often referred to as a constitution for the oceans, UNCLOS came into force in 1994. It defines a warship as:

> [a] ship belonging to the armed forces of a State bearing the external marks distinguishing such ships of its nationality, under the command of an officer duly commissioned by the government of the State and whose

17. Convention on the International Regulations for Preventing Collisions at Sea, Oct. 20, 1972, 28 U.S.T. 3459, T.I.A.S. No. 8587, 1050 U.N.T.S. 16. The Convention defines "vessel" as "every description of water craft, including non-displacement craft and seaplanes, used or capable of being used as a means of transportation on water." *Id.* r. 3(a). Accordingly, one may question whether maritime unmanned systems used solely for intelligence, surveillance, and reconnaissance, while ill equipped for transportation, must comply with the Convention.

18. *See* International Maritime Organization [IMO], MSC.1/Circ.1604, *Interim Guidelines for MASS [Marine Autonomous Surface Ships] Trials* (June 14, 2019), https://www.register-iri.com/wp-content/uploads/MSC.1-Circ.1604.pdf.

19. For a list of conventions and legal instruments covered in this scoping exercise, see *In Focus: Autonomous Shipping*, INTERNATIONAL MARITIME ORGANIZATION [IMO], http://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx (last visited Apr. 14, 2020).

> name appears in the appropriate service list or its equivalent, and manned by a crew which is under regular armed forces discipline.[20]

This definition is derived from the 1958 Geneva Convention on the High Seas,[21] which in turn relied upon the definition used in the 1907 Hague Convention VII relating to the Conversion of Merchant Ships into War-Ships.[22] The term warship includes submarines and surface ships, as well as Coast Guard vessels that belong to the armed forces of the State.[23]

A plain language interpretation of the UNCLOS definition suggests that LAMS are precluded from having the legal status of warships because there is no duly commissioned officer authorized to take command or a crew physically present on board.[24] However, this definition originated to codify the conditions for the conversion of a merchant ship into a warship.[25] Once converted, the vessel was entitled to all the privileges associated with a warship, including the exercise of belligerent rights. The converted ships also became subject to restrictions imposed by neutral States under customary international law arising from State practice during the latter half of the nineteenth century.[26]

There is no evidence to indicate that when the definition of warship was developed in 1907 the drafters of the Convention, or the States they represented, intended to prevent unmanned maritime systems developed and employed for military purposes from characterization as warships. Rather, the issue simply did not arise, as the technology at the time obviously did not contemplate anything other than manned warships.

The legal status of LAMS under customary international law will remain unsettled until relevant State practice develops into an extensive, widespread, and virtually uniform position to support or deny their status

---

20. UNCLOS, *supra* note 11, art. 29.

21. Convention on the High Seas art. 8(2), Apr. 29, 1958, 13 U.S.T. 2312, T.I.A.S. No. 5200, 450 U.N.T.S. 11.

22. Convention VII relating to the Conversion of Merchant Ships into War-Ships arts. 1–4, Oct. 18, 1907, 205 Consol. T.S. 319 [hereinafter Hague VII].

23. SAN REMO MANUAL ON INTERNATIONAL LAW APPLICABLE TO ARMED CONFLICTS AT SEA 90 (Louise Doswald-Beck ed., 1995) [hereinafter SAN REMO MANUAL].

24. *See, e.g.*, Schmitt & Goddard, *supra* note 8, at 579; Robert McLaughlin, *Unmanned Naval Vehicles and the Law of Naval Warfare*, *in* NEW TECHNOLOGIES AND THE LAW OF ARMED CONFLICT, *supra* note 16, at 229, 238–40.

25. A. PEARCE HIGGINS, THE HAGUE PEACE CONFERENCES AND OTHER INTERNATIONAL CONFERENCES CONCERNING THE LAWS AND USAGES OF WAR: TEXTS OF CONVENTIONS WITH COMMENTARIES 312–15 (1909); *see also* Hague VII, *supra* note 22.

26. HIGGINS, *supra* note 25, at 312–15.

as warships.[27] Of course, a treaty with sufficient State participation defining their status would settle the question. However, given the paucity of successfully negotiated treaties addressing naval warfare since the 1907 Hague Conventions such a decisive outcome appears unlikely.

During this period of uncertainty, a State may adopt its own views on the legal status of LAMS under customary international law, or define LAMS as warships based on policy considerations regarding the strategic, political, and legal consequences of doing so.[28] Alternatively, a State may adopt a normative approach by proposing a contextual assessment, as Judge Yusuf did in the *Jurisdictional Immunities* case,[29] particularly in light of the UNCLOS objective to promote the peaceful uses of the seas and oceans.[30] This normative perspective may carry greater weight as the number of LAMS deployed, and the ease of their production and operation, create a viable threat to freedom of navigation for merchant vessels.

The legal status of warships, as distinct from other governmental ships, carries particular significance during an international armed conflict in that only warships are entitled to exercise belligerent rights. Without that entitlement, LAMS can be legitimately employed only when launched from a warship that retains sufficient control over the LAMS to facilitate the exercise of belligerent rights, for example, as a means to maintain and enforce a naval blockade.[31] The use of autonomous functions resulting in destruction or damage to objects or death or injury of persons would otherwise be restricted to situations of self-defense. Therefore, LAMS would lose much of their strategic and tactical value if States treated the platforms merely as ships, but not warships, without any independent entitlement to exercise belligerent rights.

---

27. Jurisdictional Immunities of the State (F.R.G. v. It.; Greece intervening), Judgment, 2012 I.C.J. Rep. 99, ¶¶ 83–84 (Feb. 3); North Sea Continental Shelf (F.R.G. v. Den., F.R.G. v. Neth.), Judgment, 1969 I.C.J. Report 3, ¶ 74 (Feb. 20); Fisheries (U.K. v. Nor.), Judgment, 1951 I.C.J. Rep. 116, 131 (Dec. 18); Asylum (Colom. v. Peru), Judgment, 1950 I.C.J. Rep. 266, 276 (Nov. 20).

28. *See infra* Part III.

29. Jurisdictional Immunities of the State (F.R.G. v. It.; Greece intervening), Judgment, 2012 I.C.J. Rep. 99, 298, ¶¶ 26–36 (Feb. 3) (dissenting opinion by Yusuf, J.) (advocating for the consideration of normative values from human rights or humanitarian law in assessing the scope and extent of State immunity under customary international law when the issue remains uncertain and unsettled).

30. UNCLOS, *supra* note 11, pmbl. ¶ 4, arts. 88, 301.

31. Schmitt & Goddard, *supra* note 8, at 581–82.

B. Torpedo

One of the key advantages of a torpedo is that it can be launched from a variety of platforms with the potential of devastating effect upon even the largest of vessels. In today's navies, many classes of surface vessels, as well as submarines and aircraft, carry torpedoes. Torpedoes are one of the submarine's primary weapons, but they also can be dropped from fixed- and rotary-wing aircraft. The greatest use of torpedoes in hostilities occurred during World War II, when the torpedo proved to be a highly versatile weapon.[32]

Hague VIII prohibits the use torpedoes that do not become harmless when they have missed their target.[33] In practice, this has meant that torpedoes must sink or otherwise become harmless when they have run their course.[34] The rule prevents torpedoes from becoming a hazard to vessels exempted from attacks,[35] consistent with the general principle of distinction that is applicable in armed conflict.[36] Moreover, belligerents are required to employ torpedoes in conformity with various rules of targeting that apply in naval warfare.[37]

During the drafting of Hague VIII, there was little discussion of torpedoes except to distinguish them from naval mines.[38] Technological capabilities drove the distinction. Torpedoes could be made harmless after they

---

32. For example, the U.S. Navy fired approximately 14,750 torpedoes from submarines during World War II, which sank 1,314 ships and accounted for 55 percent of Japanese shipping losses. *See* E.W. JOLIE, NAVAL UNDERWATER SYSTEMS CENTER TECHNICAL DOCUMENT 5436, A BRIEF HISTORY OF U.S. NAVY TORPEDO DEVELOPMENT 44 (1978), http://large.stanford.edu/courses/2015/ph241/hernandez2/docs/TorpDevel-Usn-JolieNusc1978.pdf.

33. Hague VIII, *supra* note 6, art. 1(3).

34. SAN REMO MANUAL, *supra* note 23, r. 79.

35. OFFICE OF THE GENERAL COUNSEL, U.S. DEPARTMENT OF DEFENSE, LAW OF WAR MANUAL § 13.12 (rev. ed., Dec. 2016) [hereinafter U.S. DOD LAW OF WAR MANUAL]; U.S. NAVY, U.S. MARINE CORPS & U.S. COAST GUARD, NWP 1-14M/MCTP 11-10B/COMDTPUB P5800.7A, THE COMMANDER'S HANDBOOK ON THE LAW OF NAVAL OPERATIONS § 9.4 (2017) [hereinafter U.S. COMMANDER'S HANDBOOK]; SAN REMO MANUAL, *supra* note 23, ¶ 79.2.

36. DANISH MINISTRY OF DEFENCE, MILITARY MANUAL ON INTERNATIONAL LAW RELEVANT TO DANISH ARMED FORCES IN INTERNATIONAL OPERATIONS 363 (2016); FEDERAL MINISTRY OF DEFENCE (GERMANY), ZDV 15/2, LAW OF ARMED CONFLICT MANUAL §1052 (2013).

37. SAN REMO MANUAL, *supra* note 23, rr. 38–46.

38. HIGGINS, *supra* note 25, at 328. There is only one reference to torpedoes in Hague VIII. *See* Hague VIII, *supra* note 6, art. 1(3).

missed their target, whereas anchored floating mines remained dangerous for an indefinite period.[39] With modern advancements in sensors and propulsion, much of the functional traits that distinguished torpedoes from naval mines have lost their legal significance. For example, the U.S. Navy deployed the CAPTOR mine, which launched a torpedo targeting a hostile submarine upon detecting its acoustic signature,[40] and now employs the Submarine Launched Mobile Mine, which navigates itself to a predetermined location to await a specified surface target.[41] Modern arrays of torpedoes are increasingly equipped with advanced technologies such as sonar seekers, wire-control systems, and magnetic field sensing to detect and pursue identified targets with greater precision.[42]

In the absence of a legal definition of torpedo, questions may arise as to whether unmanned maritime systems armed with warheads and the ability to detect and attack identified targets, qualify as torpedoes, requiring them either to sink or become harmless when they have missed their target or run their course. The design intent will likely determine the answer; LAMS are likely to be designated as torpedoes when they are intended for a one-off use, whereas such designation would not be warranted if they are recoverable and allow for multiple uses. However, a teleological interpretation could expand the scope of this rule because even recoverable unmanned maritime vehicles may pose hazardous risks to innocent vessels. In cases where LAMS are equipped with self-guiding navigation systems, uncertainty would arise regarding the point at which they would be considered to have missed their target or completed their run.

C. Naval Mine

The use of an explosive or incendiary device to attack ships at sea has been a feature of naval warfare for thousands of years, however, the development of a weapon that can be said to have many of the same characteristics

39. HIGGINS, *supra* note 25, at 337.

40. *MK [Mark] 60 Encapsulated Torpedo (CAPTOR)*, GLOBALSECURITY.ORG, https://www.globalsecurity.org/military/systems/munitions/mk60.htm (last visited Apr. 14, 2020).

41. *MK [Mark] 67 Submarine Launched Mobile Mine (SLMM)*, FEDERATION OF AMERICAN SCIENTISTS: MILITARY ANALYSIS NETWORK, https://fas.org/man/dod-101/sys/ship/weaps/mk-67.htm (last updated Dec. 12, 1998).

42. *See, e.g.*, NATIONAL RESEARCH COUNCIL 2000, AN ASSESSMENT OF UNDERWATER WEAPONS SCIENCE AND TECHNOLOGY 15–16 (2000).

of the modern naval mine only emerged in the nineteenth century.[43] Since that time, many States have produced large quantities of naval mines. Naval mines feature various types and characteristics, including the technologically simple contact mine—a mine containing high explosives that detonates on contact with a vessel—and more advanced mines that detonate following the recognition of an acoustic, magnetic, or seismic pressure signature.[44]

The primary focus of Hague VIII is the regulation of one type of naval mine—the automatic submarine contact mine—and, through the regulation of that mine, to ensure as far as possible, peaceful and secure navigation for vessels not engaged in an armed conflict.[45] The Convention requires States to maintain effective control over naval mines to prevent hazardous risks to commercial shipping. It prohibits the use of unanchored, free-floating mines unless they are directed against military objectives and constructed to become harmless as soon as control over them is lost.[46] The employment of naval mines must also conform to the rules of targeting in naval warfare, including the duty to exercise every possible precaution not to interfere with commercial shipping, and the recording and notification of danger zones.[47] While Hague VIII itself is limited in scope to the type of naval mine in existence when the Convention was adopted, these basic restrictions have subsequently been applied more generally to regulate how all naval mines are employed in peacetime or during armed conflict.[48]

---

43. David Letts, *Naval Mines: Legal Considerations in Armed Conflict and Peacetime*, 98 INTERNATIONAL REVIEW OF THE RED CROSS 543, 547 (2016); RICHARD DUNLEY, BRITAIN AND THE MINE 1900–1915: CULTURE, STRATEGY AND INTERNATIONAL LAW 9 (2018); *see generally* MURRAY F. SUETER, THE EVOLUTION OF THE SUBMARINE BOAT, MINE AND TORPEDO FROM THE SIXTEENTH CENTURY TO THE PRESENT TIME (2d ed. 1908).

44. Letts, *supra* note 43, at 546.

45. Hague VIII, *supra* note 6, pmbl.

46. *Id.* art. 1. For a detailed analysis, see Steven Haines, *1907 Hague Convention VIII Relative to the Laying of Automatic Submarine Contact Mines*, 90 INTERNATIONAL LAW STUDIES 412, 422–25 (2014); C.H. Stockton, *Submarine Mines and Torpedoes in Time of War*, 2 AMERICAN JOURNAL OF INTERNATIONAL LAW 276 (1908).

47. SAN REMO MANUAL, *supra* note 23, rr. 80–91.

48. Military and Paramilitary Activities in and against Nicaragua (Nicar. v. U.S.), Judgment, 1986 I.C.J. Rep. 14, ¶ 215 (June 27); Corfu Channel (U.K. v. Alb.), Judgment, 1949 I.C.J. Rep. 4, 19–22 (Apr. 9); U.S. DOD LAW OF WAR MANUAL, *supra* note 35, §13.11; U.S. COMMANDER'S HANDBOOK, *supra* note 35, §9.2; UNITED KINGDOM MINISTRY OF DEFENCE, THE JOINT SERVICE MANUAL OF THE LAW OF ARMED CONFLICT ¶¶ 13.52–13.64 (2004); COMMANDER'S HANDBOOK: LEGAL BASES FOR THE OPERATIONS OF THE GERMAN NAVAL FORCES 185 (Wolff Heintschel von Heinegg & Hans-Joachim Unbehau eds., 2004); SAN REMO MANUAL, *supra* note 23, ¶ 79.2; *see also* Letts, *supra* note 43, at 549; Wolff Heintschel von Heinegg, *The International Law of Mine Warfare at Sea*, *in* THE

Due to technological advances and accompanying State practice, the definitional restriction of naval mines subject to Hague VIII has lost much of its legal significance. Instead, certain underlying principles guide the legal assessment of the wide-ranging types of mines developed in the succeeding years. The regulations governing naval mines are now a composite legal regime under which a variety of customary international law rules and treaty instruments apply.[49] Thus, the *San Remo Manual* defines mines broadly as an "explosive device laid in the water, on the sea-bed or in the subsoil thereof, with the intention of damaging or sinking ships or of deterring ships from entering an area."[50]

Under this composite regime, the basis for the legal regulation of naval mines is not the characteristics of the weapon system itself, but rather how militaries employ the weapon. It is uncertain, however, whether this approach extends to a maritime platform that integrates explosives such that the platform itself becomes a weapon system. Further, when assessing the adequacy of this approach to classify LAMS, one must consider the legal implications of extending the regime governing naval mines to a new generation of maritime platforms with autonomous lethal capability.

III. LEGAL IMPLICATIONS OF EACH CHARACTERIZATION

As discussed above, the legal characterization of LAMS determines which body of international law applies to regulate their legal status and the manner in which they can be used in peacetime and during armed conflict. This characterization has significant implications on the lawfulness of conduct involving, or in relation to, the use of LAMS under specific circumstances.

An illustrative example is the Chinese Navy's seizure of a U.S. unmanned underwater vehicle (UUV) as the USNS *Bowditch*, a U.S. government vessel, was recovering the UUV in the South China Sea.[51] The UUV was one of two ocean gliders that the *Bowditch* was recovering at the time of

---

PROGRESSION OF INTERNATIONAL LAW 373–94 (Yoram Dinstein & Fania Domb eds., 2011); JAMES J. BUSUTTIL, NAVAL WEAPONS SYSTEMS AND THE CONTEMPORARY LAW OF WAR 29–71 (1998); HOWARD S. LEVIE, MINE WARFARE AT SEA 175 (1992).

49. David Letts, *Beyond Hague VIII: Other Legal Limits on Naval Mine Warfare*, 90 INTERNATIONAL LAW STUDIES 446 (2014).

50. SAN REMO MANUAL, *supra* note 23, ¶ 79.2.

51. *See* Missy Ryan & Dan Lamothe, *Pentagon: Chinese Naval Ship Seized an Unmanned U.S. Underwater Vehicle in South China Sea*, WASHINGTON POST, Dec. 17, 2016, https://www.washingtonpost.com/news/checkpoint/wp/2016/12/16/defense-official-chinese-naval-ship-seized-an-unmanned-u-s-ocean-glider/.

the seizure; therefore, it was under the control of the U.S. vessel. Thus, it can be argued that this incident did not raise any question regarding the legal status of the glider or of the rights and obligations attached to it. Still, a question may be asked as to whether the UUV would have enjoyed sovereign immunity as an item of equipment operating independently from a ship that was entitled to such status.[52] In any event, the UUV was the property of the U.S. government. On that basis alone, China had no right to seize or retain the UUV, as regardless of the legal characterization of LAMS, the UUV would receive sovereign immunity when owned or operated by a government.[53]

However, whether remotely controlled from a ship or operating autonomously, there is a need to consider the wider legal implications of a vehicle's status rather than simply its entitlement to sovereign immunity. As such, the following analysis considers LAMS's entitlement to navigational rights in peacetime and belligerent rights during an armed conflict.

A. Navigational Rights

The choice between characterizing LAMS as warships or other means of naval warfare, such as torpedoes or naval mines, has significant implications for asserting navigational rights. The navigational rights of ships originate in medieval notions of the freedom of passage; today these rights are recognized in UNCLOS and under customary international law.[54]

Depending on the maritime zone in which the passage is occurring, varying conditions attach to the right: innocent passage in the territorial sea and archipelagic waters of foreign States, transit passage through straits used for international navigation, archipelagic sea lanes passage, and freedom of navigation on the high seas.[55] According LAMS the legal status of ships, even that of warships, means that they would be entitled to exercise those navigational rights. For example, Articles 17, 18, 19, and 52 of UNCLOS recognize the right of innocent passage, defined as a continuous and

52. McLaughlin, *supra* note 24, at 240; von Heinegg, *supra* note 8, at 122.

53. United Nations Convention on Jurisdictional Immunities of States and Their Property art. 16, G.A. Res. 59/38, Annex (Dec. 2, 2004), 44 INTERNATIONAL LEGAL MATERIALS 803 (2005) (not in force); International Convention for the Unification of Certain Rules relating to the Immunity of State-Owned Vessels art. 3, Apr. 10, 1926, 176 L.N.T.S. 199.

54. U.S. COMMANDER'S HANDBOOK, *supra* note 35, §1.2; *see also* DONALD R. ROTHWELL & TIM STEPHENS, THE INTERNATIONAL LAW OF THE SEA 222–25 (2d ed. 2016).

55. UNCLOS, *supra* note 11, arts. 17–19, 38, 52–53, 87.

expeditious traversing of the territorial sea or archipelagic waters in a manner not prejudicial to the peace, good order, or security of the coastal or archipelagic State.[56] Here, when LAMS are exercising this right in compliance with the applicable law of the sea requirements, the coastal State may not prevent or interfere with their passage through its territorial or archipelagic waters.

The entitlement to navigational rights appears strategically advantageous for those States with the capability to build and deploy LAMS on a large scale. However, each of the navigation regimes, particularly that of innocent passage as articulated in Article 19 of UNCLOS,[57] is an outcome of negotiated compromises striking a balance between the navigational interest of the maritime State and the protective interest of the coastal State.[58] The notion that LAMS are entitled to the right of innocent passage as a warship may not serve the interest of the coastal State and risks destabilizing the innocent passage regime. In this respect, consideration should be given to the fact that the claim of innocent passage by warships remains a contentious issue, with some States seeking to require prior notification or permission for the passage of warships.[59] A unilateral attempt to expand the definition of warship to confer that status upon LAMS may trigger a

---

56. *Id.* arts. 17–19, 52.

57. *Id.* art. 19.

58. *See* Yoshifumi Tanaka, *Navigational Rights and Freedoms*, *in* THE OXFORD HANDBOOK OF THE LAW OF THE SEA 536 (Donald R. Rothwell, Alex G. Oude Elferink, Karen Scott & Tim Stephens eds., 2015); William K. Agyebeng, *Theory in Search of Practice: The Right of Innocent Passage in the Territorial Sea*, 39 CORNELL INTERNATIONAL LAW JOURNAL 371 (2006); 1 E.D. BROWN, THE INTERNATIONAL LAW OF THE SEA 43–76 (1994); Tullio Treves, *Navigation*, *in* A HANDBOOK ON THE NEW LAW OF THE SEA 835, 906–40 (René-Jean Dupuy & Daniel Vignes eds., 1991); FRANCIS NGANTCHA, THE RIGHT OF INNOCENT PASSAGE AND THE EVOLUTION OF THE INTERNATIONAL LAW OF THE SEA (1990); Jin Zu Guang, *Conflicts between Foreign Ships' Innocent Passage and National Security of the Coastal States*, *in* INTERNATIONAL NAVIGATION: ROCKS AND SHOALS AHEAD? 111 (John M. van Dyke, Lewis M. Alexander & Joseph R. Morgan eds., 1988); MYRES S. MCDOUGAL & WILLIAM T. BURKE, THE PUBLIC ORDER OF THE OCEANS: A CONTEMPORARY INTERNATIONAL LAW OF THE SEA 174–79 (1987); Karin M. Burke & Deborah A. DeLeo, *Innocent Passage and Transit Passage in the United Nations Convention on the Law of the Sea*, 9 YALE JOURNAL OF INTERNATIONAL LAW 389 (1983); Brian Smith, *Innocent Passage as a Rule of Decision: Navigation v. Environmental Protection*, 21 COLUMBIA JOURNAL OF TRANSNATIONAL LAW 48 (1982); Shekhar Ghosh, *The Legal Regime of Innocent Passage through the Territorial Sea*, 20 INDIAN JOURNAL OF INTERNATIONAL LAW 216 (1980); GEORGE P. SMITH II, RESTRICTING THE CONCEPT OF FREE SEAS: MODERN MARITIME LAW RE-EVALUATED 31–54 (1980).

59. *See, e.g.*, K. Hakapää & E.J. Molenaar, *Innocent Passage – Past and Present*, 23 MARINE POLICY 131, 143 (1999).

protective reaction by a greater number of coastal States, thus challenging navigational rights asserted by even those warships that fall squarely within the definition set forth in UNCLOS.

In contrast, other means of warfare, such as torpedoes and naval mines, have no navigational rights. Quite the contrary, the presence of those weapons in the territorial sea without the consent of the coastal State would constitute a violation that State's sovereignty. It could even constitute an unlawful use of force if naval mines are present in such large numbers that the presence of these weapons becomes a mining operation.[60]

The extent to which those weapon systems may enjoy freedom of navigation on the high seas is also restricted by the requirement to exercise due regard for the interests of other States.[61] The duty to notify other States, and therefore potentially affected shipping, of the presence of naval mines that creates a danger zone is compatible with the requirement of due regard, but it does not bode well for the right of innocent passage.

Disputes will arise when the coastal State does not accept the premise that LAMS are a type of warship, or indeed a ship of any description entitled to the right of innocent passage. Given that LAMS are unmanned, the coastal State may decide to seize LAMS as a countermeasure against the infringement of their sovereignty. A State may even choose to destroy a particular system, justifying the action as a lawful exercise of self-defense.

Finally, even if the legal characterization of LAMS as warships received widespread recognition, a coastal State might regard the passage of LAMS, due to their autonomous capability of initiating lethal attacks, as inherently prejudicial to its peace, good order, or security.[62] In that situation, the coastal State may seek to invoke its right under Article 25 of UNCLOS to "take the necessary steps in its territorial sea to prevent passage which is not innocent."[63] This response may be even more likely if the coastal State does not agree with the characterization of LAMS as warships.

---

60. Military and Paramilitary Activities in and against Nicaragua (Nicar. v. U.S), Judgment, 1986 I.C.J. Rep. 14, ¶¶ 227, 251 (June 27).

61. UNCLOS, *supra* note 11, art. 87.

62. *Id.* art. 19(2)(b). The same position may apply even in relation to unarmed unmanned maritime systems if their sole function is limited to intelligence, surveillance, and reconnaissance, insofar as the passage of such systems is aimed at collecting information to the prejudice of the defense or security of the coastal State. *See id.* art. 19(2)(c).

63. *Id.* art. 25(1).

B. Belligerent Rights

Beyond the strategic advantages of characterizing LAMS as warships, naval powers may also see tactical advantages to this characterization, as it would enable LAMS to exercise belligerent rights during an armed conflict. Belligerent rights are derived from the legal status of a warship, as a form of the principle of distinction that distinguishes warships from other governmental and non-governmental vessels. In naval warfare, only warships are legally entitled to commit acts of violence against legitimate military targets, conduct visit and search of merchant vessels, and establish and enforce a naval blockade.[64] LAMS could be an effective force multiplier in performing these functions, while providing these benefits at a reduced cost.[65] Moreover, deployed in large numbers, and because of their relatively small size, LAMS could provide commanders with the additional benefit of the element of surprise. Finally, characterizing LAMS as warships could exponentially increase the number of maritime platforms legally entitled to exercise the full range of belligerent rights.

Even if characterized as warships, the exercise of belligerent rights by LAMS presents unique challenges. For example, LAMS could be required to determine the enemy character of merchant vessels that would make these vessels subject to attack or capture outside neutral waters. However, as a merchant vessel may not be an object of attack unless the vessel makes an effective contribution to military action, refuses an order to stop, or actively resists visit, search, or capture,[66] questions arise regarding how LAMS would make these determinations or carry out those actions.

Visit and search is also required before seizing an enemy merchant vessel as prize when its nationality is uncertain.[67] From a practical perspective, how do LAMS, which are, by definition, unmanned, conduct physical inspections of a ship? This requires LAMS be equipped with the capabilities necessary to engage in visit and search operations that go beyond autonomous detection and identification of legitimate military objectives based on

64. *See generally* David Letts & Rob McLaughlin, *The Law of Naval Warfare*, *in* ROUTLEDGE HANDBOOK OF THE LAW OF ARMED CONFLICT 264, 277–79 (Rain Liivoja & Tim McCormack eds., 2016); *see also* SAN REMO MANUAL, *supra* note 23, rr. 118–24 (visit and search of merchant vessels), rr. 93–104 (blockade).

65. *See* Schmitt & Goddard, *supra* note 8, at 570–75; U.S. DEPARTMENT OF THE NAVY, THE NAVY UNMANNED SURFACE VEHICLE (USV) MASTER PLAN 11–49 (2007), https://www.navy.mil/navydata/technology/usvmppr.pdf.

66. SAN REMO MANUAL, *supra* note 23, r. 60.

67. *Id.* rr. 114, 116–18.

the characteristics of the vessel. When a physical inspection of a vessel is necessary, practical difficulties may preclude LAMS from characterization as warships or as vessels operating as such.

On the other hand, if classified as a means of warfare, belligerent parties may employ LAMS as they would any other weapon, that is, in conformity with the applicable rules of naval warfare. For example, employing LAMS to monitor shipping lanes used by both civilian vessels and enemy warships would be unlawful if the LAMS are incapable of directing attacks only against legitimate military objectives.[68]

The establishment and enforcement of a naval blockade by LAMS alone may also be prohibited unless they can be employed in a manner that does not endanger legitimate commercial shipping.[69] In contrast, warships are lawful maritime platforms for the launching of attacks or enforcing a naval blockade. Thus, unlike warships, the ability to lawfully employ LAMS characterized as a means of warfare would be more restricted since they would have no legal entitlement to exercise belligerent rights.

The definitional uncertainty of the term warship is likely to lead to disputes regarding the entitlement of LAMS to exercise belligerent rights. Belligerent parties that do not possess the capability to develop or deploy LAMS, as well as neutral States, may oppose the use of LAMS as independent military platforms for the exercise of belligerent rights. Neutrals that take this position may deny passage of LAMS through their territorial sea, while allowing such passage for manned belligerent warships.[70]

The strategic decision to characterize LAMS as warships will require States to contemplate the potential legal reaction of other States, as well as the availability of the technological capability necessary to implement the various legal obligations associated with that characterization. These concerns will need to be weighed against the tactical advantages expected from the use of LAMS in place or in further support of traditional warships.

IV. CONCLUSION

The legal regime governing the use of maritime platforms in peacetime and during armed conflict is premised on the functional distinction between warships as the means to project naval power and other naval weapons as

68. Schmitt & Goddard, *supra* note 8, at 587.

69. SAN REMO MANUAL, *supra* note 23, ¶ 97.1.

70. Convention XIII concerning the Rights and Duties of Neutral Powers in Naval War art. 9, Oct. 18, 1907, 36 Stat. 2415, TS No. 545.

the means of warfare. However, the rapid development of autonomous navigation and artificial intelligence is likely to challenge this regime.

Long-settled understandings of key legal concepts, such as the manned warship exercising navigational and belligerent rights, must now accommodate the new reality that naval technology will merge multiple functions in the form of LAMS. For example, LAMS will have the dual ability to navigate autonomously and to self-detonate as an explosive device. The emergence of LAMS as a *sui generis* hybrid weapon system will likely generate disagreement on their legal status and may fuel existing controversies, such as the entitlement of warships to exercise the right of innocent passage and the manner in which the effectiveness of a naval blockade is maintained.

As this article has demonstrated, the designation of LAMS as a warship, torpedo, or naval mine is inevitably associated with particular legal implications for the exercise of navigational rights in peacetime and belligerent rights in the conduct of hostilities during armed conflict. These considerations should guide each State in assessing the strategic and national interests served by characterizing LAMS according to their primary function, bearing in mind the potential risks of their misuse and unintended consequences. Moreover, the disagreement over the legal characterization of LAMS, particularly between naval powers and coastal States, will almost certainly demand a broader compromised solution at some future point.

In our view, the key to that resolution is the identification of how LAMS may be employed without prejudice to the peace, good order, or security of coastal States and in conformity with the normative rationale underpinning the rules of naval warfare. For instance, coastal States may accept the innocent passage of LAMS if their autonomous targeting systems are inoperative. States with commercial shipping interests may accept the use of LAMS for visit and search if they can gather the information necessary to determine the belligerent nexus of merchant vessels and there are appropriate restrictions on the circumstances in which their targeting system can be engaged and their destructiveness.

Reaching consensus on the legal characterization of LAMS is a pressing concern that State policymakers should treat as an urgent priority. Once LAMS have been developed and deployed, reaching agreement on restricting their use will be exceedingly more difficult. In addition to the costs associated with procurement, reconfiguration, and replacement, States have shown little appetite for refraining from using a weapon once its military value has been shown. Given the alarming pace at which autonomous navigation and artificial intelligence technology are advancing, there is little

moment to spare in settling this pressing legal debate. The significance of strategic and operational implications of this debate is far too great to leave the issue unattended.