3-26-2024

China Maritime Report No. 36: China's T-AGOS: The Dongjian Class Ocean Surveillance Ship

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March 2024

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Summary

Since 2017, the People's Liberation Army Navy (PLAN) has commissioned a new class of ocean surveillance vessel into its order of battle: the Type 927. Similar in design and function to the U.S. Navy's *Victorious* and *Impeccable* class T-AGOS ships, the Type 927 was introduced to help remedy the PLAN's longstanding weakness in anti-submarine warfare. The PLAN has likely built six Type 927 ships to date, most based for easy access to the South China Sea. In peacetime, these ships use their towed array sonar to collect acoustic data on foreign submarines and track their movements within and beyond the first island chain. In wartime, Type 927 vessels could contribute to PLAN anti-submarine warfare operations in support of a range of different maritime campaigns. However, their lack of self-defense capabilities would make them extremely vulnerable to attack.

Introduction

Since 2017, Chinese shipyards have launched, and the People's Liberation Army Navy (PLAN) has likely commissioned, six new ocean surveillance ships. These ships—designated the Type 927 or Type 816[1] by the PLAN and the Dongjian class by the U.S. Office of Naval Intelligence (ONI)[2]—provide the PLAN an improved capability for acoustic detection of undersea threats. In peacetime, they will collect acoustic signatures and monitor the activities of foreign submarines operating in China's claimed maritime spaces, strengthening the PLAN's ability to seize the initiative if war erupts.[3] In wartime scenarios, Type 927 ships will very likely support a range of offensive and defensive campaigns with an anti-submarine warfare (ASW) component, in coordination with other surface, air, undersea, and shore-based systems, sensors, and platforms. The Type 927's helipad likely enables it to work directly with an ASW helicopter to precisely detect, localize, identify, and attack enemy submarines.[4]

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[1] During the research period, most sources, including Chinese defense industry sources, used Type 927 to refer to these ships. However, some sources disputed this designation or attributed Type 927 to other PLAN ships. Since research concluded, the use of Type 816 to describe these ships appears to have become more prominent in public sources. See 苏文 [Su Wen], 核潜艇的"克星"——中国水声测量船 ["Nuclear Submarine's 'Nemesis'—China's Hydroacoustic Measurement Ships"], 兵工科技 [*Ordnance Industry Science Technology*], no. 13 (2022), p. 52; xx 笑而不语 xx [xxSmile but Say Nothingxx], 不对 ["Not correct"], 微博 [Weibo], 7 January 2023, 4:59 a.m., https://m.weibo.cn/status/MnbeMf5is?type=repost&jumpfrom=weibocom (https://archive.ph/7JKlA); 水雷屋 [Naval Mine House], 新型综合援潜救生船正侧图，927 型? ["New-type comprehensive submarine assistance and rescue ship front view, Type 927?"], 微博 [Weibo], 25 February 2023, 3:23 p.m., https://weibo.com/5119793209/MuHAhgBmU?from=page_1005055119793209_profile&wvr=6&mod=weibotime (https://archive.ph/qlphl); East Pendulum (@HenriKenhmann), Le nouveau navire école 83 Qi Ji Guang de classe Type 927 ["The new training vessel 83 Qi Ji Guang of the Type 927 class"], Twitter, 12 June 2017, 2:18 p.m., https://twitter.com/HenriKenhmann/status/874330091706363904 (https://archive.ph/Vka1R); 水雷屋 [Naval Mine House], 816 型双体水声监视船 781 钱塘江船 ["Type 816 catamaran acoustic surveillance ship 781 Qiantangjiang"], 微博 [Weibo], 10 January 2023, 2:14 a.m., https://weibo.com/5119793209/MnCL32SCK?type=repost (https://archive.ph/HJnWy); Manfred Meyer, *Modern Chinese Maritime Forces: A Compilation of Ships and Boats of the Chinese Navy, Coast Guard, Maritime Militia, and Other State Authorities*, 2nd ed. (Admiralty Trilogy Group, July 2023), p. 38.

[2] "China People's Liberation Army Navy (PLAN), Coast Guard, and Government Maritime Forces 2022-2023 Recognition and Identification Guide," Office of Naval Intelligence, December 2022, https://www.oni.navy.mil/Portals/12/2022_PLAN_Recognition_Poster_UNCLASSIFIED.pdf.

[3] In this context, "seizing the initiative" means establishing an advantageous force disposition and creating conditions for winning a conflict by, for example, quickly eliminating all threats in a given sea area at the very start of a war.

[4] "Classify" is the standard term in western parlance, but "identify" (识别) is used in this paper as the translation of the Chinese term often used in reference to this activity.

Like the ocean surveillance ships of other modern navies, Type 927 ships almost certainly have both a passive and low-frequency active (LFA) sonar capability. The PLAN's new ocean surveillance fleet will likely create challenges for the undersea operations of the United States (U.S.), Japan, and others in the Asia-Pacific region, imposing new obstacles to their stealthy navigation and security. The challenges will likely be greatest within, and along the periphery of, the first island chain, where the activities of Type 927 ships will likely concentrate.[5]

This report is divided into three sections. Section one discusses the strategic and operational environment informing China's investment in ocean surveillance ships and how they will likely be used. Section two examines what is known (and unknown) about the Type 927 class, including vessel identifiers, basing, layout, and sonar capabilities, as well as the PLAN's previous generation of ocean surveillance ships. Section three analyzes the likely peacetime and wartime roles of Type 927 ships as well as the likely geographic focus of their operations.

Strategic and Operational Environment

The sea is a source of great concern for China's strategic analysts, who assess a limited maritime conflict as the most likely threat to the nation.[6] They worry about a future in which the regional proliferation of submarines and other undersea platforms threatens China's security both at sea and on land.[7] As they look to defend China's interests in the undersea domain, however, military planners are faced with a disadvantageous geography that favors potential adversaries. This section briefly surveys the PLAN's strategic and operational environment, including the threats posed by enemy submarines, trends in regional undersea military capabilities, and geographical challenges that China must overcome in using sonar to detect undersea threats within the first island chain.

The Strategic Environment

The 2020 edition of *Science of Military Strategy* (SMS 2020), a textbook for senior PLA officers, assesses that military struggle in the deep sea is intensifying.[8] "Deep-sea military struggle" primarily includes activities in deep waters, but also those in adjacent shallow waters and the seabed, as well as space and other domains in which capabilities for countering undersea forces operate.[9] Deep-sea military struggle is, according to SMS 2020, a means through which "major countries of the world seize strategic initiative."[10] In particular, submarines operating in China's maritime periphery pose a potent threat to the country's national security. Used by the U.S. in the Pacific theater during World War II to cripple Japan's access to seaborne trade, submarines can threaten China's regional (and

[5] This will likely remain the case until China is confident that other systems—seabed sensors and unmanned platforms, for example—can provide near complete and reliable threat detection within China's peripheral waters. After other detection means are adequately strengthened, Type 927 ships could venture farther afield.

[6] 军事科学院军事战略研究部 [Academy of Military Science Military Strategy Studies Department], 战略学 [*Science of Military Strategy*] (Beijing: Military Sciences Press, 2013), p. 100.

[7] 肖天亮 [Xiao Tianliang], ed., 战略学 [*Science of Military Strategy*] (Beijing: National Defense University Press, 2020), pp. 155-162; Michael A. McDevitt, *China as a Twenty First Century Naval Power: Theory, Practice, and Implications* (Annapolis: Naval Institute Press, 2020), pp. 9-10, 47-50.

[8] Joel Wuthnow, "What I Learned From the PLA's Latest Strategy Textbook," *China Brief*, 25 May 2021, https://jamestown.org/program/what-i-learned-from-the-plas-latest-strategy-textbook/; 肖天亮 [Xiao Tianliang], ed., 战略学 [*Science of Military Strategy*] (Beijing: National Defense University Press, 2020), p. 155.

[9] Xiao, *Science of Military Strategy* (2020), p. 158.

[10] Ibid., p. 155.

global) sea lines of communication (SLOCs).[11] Being capable, as SMS 2020 highlights, of exerting control over the sea as well as the land—as seen during the Gulf War and Kosovo War—enemy submarines can also hold China's mainland interests at risk.[12]

As of 2022, at least 15 countries along China's periphery and important SLOCs possess submarines (see Table 1 below). Of particular concern to Chinese strategists and analysts are the activities of the U.S., which Chinese experts believe is strengthening Asia-Pacific military alliances and partnerships to encircle China and constrain its "strategic space," in part through improved ASW capabilities in strategic locations.[13]

Looking to the future, the Asia-Pacific's undersea domain is becoming more complex. The Australia–United Kingdom–United States (AUKUS) partnership and Taiwan's "Indigenous Defense Submarine" program will bring new undersea forces to the region.[14] Moreover, by 2030, China could face a U.S. naval strategy supported by unmanned air, surface, and underwater platforms that enable U.S. undersea forces to enter China's coastal waters, neutralize Chinese defenses, and strike land targets, according to a 2020 study by analysts affiliated with the PLAN Naval Research Academy (海军研究院).[15]

[11] Frank Hoffman, "Talkin' World War II: Blockades & Subs in the Pacific," *War on the Rocks*, 7 October 2013, https://warontherocks.com/2013/10/talkin-world-war-ii-blockades-and-submarines-in-the-pacific/; David Vergun, "Submarine Warfare Played Major Role in World War II Victory, *U.S. Department of Defense*, 16 March 2020, https://www.defense.gov/News/Feature-Stories/Story/Article/2114035/submarine-warfare-played-major-role-in-world-war-ii-victory/; Xiao, *Science of Military Strategy* (2020), p. 156; McDevitt, *China as a Twenty First Century Naval Power*, p. 48.

[12] Xiao, *Science of Military Strategy* (2020), p. 157.

[13] 新时代的中国国防 [*China's National Defense in the New Era*] (Beijing: Office of the State Council, 2019), http://www.gov.cn/zhengce/2019-07/24/content_5414325.htm (https://archive.ph/oeV6H); 史常勇 [Shi Changyong] and 陈炎 [Chen Yan], 试论新时代海军战略定位 ["On the Navy's Strategic Positioning in the New Era"] 国防 [*National Defense*], no. 5 (2018), p. 35; Xiao, *Science of Military Strategy* (2020), p. 159.

[14] "Fact Sheet: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS)," *White House*, 5 April 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/04/05/fact-sheet-implementation-of-the-australia-united-kingdom-united-states-partnership-aukus/; Keoni Everington, "Taiwan to launch 1st indigenous submarine in September 2023," *Taiwan News*, 27 December 2022, https://www.taiwannews.com.tw/en/news/4763111 (https://archive.ph/BZfYg).

[15] Wang Wei [王玮]，Jin Wenchao [晋文超], and Lu Li [鲁利], 美国海军 2030 年典型作战概念及舰队体系结构研究 ["Research on the operation concept and fleet architecture of U.S. Navy"], 舰船科学技术 [*Ship Science and Technology*], vol. 42, no. 7 (July 2020), pp. 171-172.

Table 1. Submarine Forces in the Indo-Pacific and Along China's Major SLOCs[16]

Country	SSBN	SSGN	SSN	SSB	SSK	Other
Australia 248	--	--	--	--	6	--
Bangladesh 250	--	--	--	--	2	--
Brunei 252	--	--	--	--	--	--
Cambodia 254	--	--	--	--	--	--
India 267	1	--	--	--	16	--
Indonesia 273	--	--	--	--	4	--
Japan 277	--	--	--	--	22	--
Malaysia 289	--	--	--	--	2	--
Myanmar 293	--	--	--	--	1	--
North Korea 281	--	--	--	1	20	50
Pakistan 298	--	--	--	--	5	3
Philippines 301-302	--	--	--	--	--	--
Russia 195-196	11	8	10	--	20	--
Singapore 304	--	--	--	--	4	--
Sri Lanka 306-307	--	--	--	--	--	--
South Korea 284	--	--	--	1	18	--
Taiwan 309	--	--	--	--	4	--
Note: The U.S. Department of Defense counts 2 Taiwanese subs when judging the balance of power in the Taiwan Strait.[17]						
Thailand 312	--	--	--	--	--	--
United States 51	14	51	2	--	--	--
Note: 8-12 nuclear-powered subs are typically assigned to 7th Fleet, whose area of responsibility covers the Indo-Pacific.[18]						
Vietnam 316	--	--	--	--	6	2
China 257-258	6	--	6	1	46	--

[16] The International Institute for Strategic Studies, *The Military Balance 2022: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2022), pp. 51, 195-196, 248, 250, 252, 254, 257-258, 267, 273, 277, 281, 284, 289, 293, 298, 301-302, 304, 306-307, 309, 312, 316.

[17] *Military and Security Developments Involving the People's Republic of China* (Washington, DC: Department of Defense, 2020), p. 166, https://media.defense.gov/2022/Nov/29/2003122279/-1/-1/1/2022-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF.

[18] "The United States Seventh Fleet," *Commander, U.S. 7th* Fleet, undated, https://www.c7f.navy.mil/About-Us/Facts-Sheet/.

The Operational Environment

Geography is not on China's side as it seeks to mitigate current and future undersea threats. The first island chain—extending from Japan's Kyushu Island, through Taiwan, the Philippines, and the island of Borneo—creates chokepoints that facilitate the discovery of Chinese submarines moving into the Western Pacific.[19] SMS 2020 specifically notes the ASW advantages afforded to the U.S. and Japan by the Ryukyu Islands.[20] Being outside of China's control, the same chokepoints become potential entryways for enemy submarines approaching the mainland. Indeed, a longstanding concern highlighted by Chinese analysts is that the "underwater gateways to the nation are wide open" (水下国门洞开).[21]

The largely shallow water environment inside the first island chain complicates the use of passive and active sonar to detect enemy submarines (see Table 2 below). That most of China's claimed maritime spaces also serve as major thoroughfares for ocean-going commerce only increases the challenge.[22] In these shallow waters, noise from wind, surface waves, and the movement of surface ships interfere with passive sonar detection, which requires discriminating sounds emitted by a submarine from environmental noise.[23]

Active sonar systems, especially LFA capabilities, were developed to detect increasingly stealthy submarines at greater distances.[24] However, in addition to the challenges above, active sonar becomes less effective in shallow water because its ping refracts and scatters off both the seafloor and surface, causing reverberations that can overwhelm and limit the ability to detect echoes generated by contact with a target submarine.[25] Improved system design, better data processing, and

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[19] Ken Moriyasu, "US eyes using Japan's submarines to 'choke' Chinese navy," *Nikkei Asia*, 5 May 2021, https://asia.nikkei.com/Politics/International-relations/Indo-Pacific/US-eyes-using-Japan-s-submarines-to-choke-Chinese-navy.

[20] Xiao, *Science of Military Strategy*, p. 159.

[21] 罗云虎 [Luo Yunhu], 面向体系作战的水下无人攻防装备发展构想 ["Concept for the Development of Underwater Unmanned Attack and Defense Equipment Oriented Toward System of Systems Operations"], 数字海洋与水下攻防 [*Digital Ocean & Underwater Warfare*], no. 3 (2020), pp. 212-218, https://web.archive.org/web/20230225221304/http://shuixiagf710.ijournals.cn/szhyysxgf/article/html/20200306.

[22] Between 2010 and 2016, 23.62 trillion USD in trade passed through the South China Sea. In 2019, 40 percent of global shipped goods (by tonnage) passed through the South and East China Seas. In just the first seven months of 2022, for instance, 48 percent of the world's container ships transited the Taiwan Strait. See Power China Team, "How Much Trade Transits the South China Sea?," *Center for Strategic and International Studies*, Updated 25 January 2021, https://chinapower.csis.org/much-trade-transits-south-china-sea/; Lincoln F. Pratson, "Assessing impacts to maritime shipping from marine chokepoint closures," *Communications in Transportation Research*, 3 (2023), p. 12, https://www.sciencedirect.com/science/article/pii/S2772424722000336; Kevin Varley, "Taiwan Tensions Raise Risks in One of Busiest Shipping Lanes," *Bloomberg*, 2 August 2022, https://www.bloomberg.com/news/articles/2022-08-02/taiwan-tensions-raise-risks-in-one-of-busiest-shipping-lanes.

[23] Tom Stefanick, *Strategic Antisubmarine Warfare and Naval Strategy* (Cambridge: Institute for Defense & Disarmament Studies, 1987), pp. 8-15, 241-244.

[24] 郑君杰 [Zheng Junjie], 尹路 [Yin Lu], 李延斌 [Li Yanbin], 马金钢 [Ma Jingang], and 姚春富 [Yao Chunfu], 外军水下侦察技术现状与发展趋势 ["Current Situation and Development Trend of Underwater Reconnaissance Technology for Foreign Army"], 舰船电子工程 [*Ship Electronic Engineering*], vol. 33, no. 8 (August 2013), p. 17; Gordon D. Tyler, Jr., "The Emergence of Low-Frequency Active Acoustics as a Critical Antisubmarine Warfare Technology," *Johns Hopkins APL Technical Digest*, vol. 13, no. 1 (1992), pp. 145-146, https://www.jhuapl.edu/Content/techdigest/pdf/V13-N01/13-01-Tyler.pdf.

[25] 石万山 [Shi Wanshan], 舰艇声纳技术的发展动向与分析 ["Development Trend and Analysis of the Ships Sonar Technical"], 舰船电子工程 [*Ship Electronic Engineering*], vol. 33, no. 12 (2013), p. 140; Wang, "Low Frequency Active

other measures can likely overcome these challenges to passive and active systems, but the requirements are stringent.[26]

Table 2. Characteristics of China's Claimed Maritime Spaces[27]

Sea Space	Avg. Temp. (°C)	Surface Salinity (ppt[28])	Avg. Depth (m)	Greatest Depth (m)
Bohai Sea	0.5°C (winter)/ 26°C (summer)	29-30‰	18m	86m
Liaodong Bay			--	Over 30m
Bohai Bay			Under 20m	--
Laizhou Bay			10-15m	--
Central Shallow Basin			20-25m	--
Yellow Sea	12.36°C (annual)	31.27‰	44m	Over 100m
Northern Portion			38m	--
Southern Portion			46m	--
Central/Southeastern Portion			Over 80m	Over 100m
Yellow Sea Trough			60-80m	--
East China Sea	17.5°C (winter)/ 28°C (summer)	33.27‰	370m	2,719m
Western Portion			130-200m	--
Eastern Portion			--	2,719m[29]
South China Sea	23.3°C (annual)	33.72‰	--	--
Continental Shelves			150-200m	--
Stepped Continental Slope			3,600m[30]	
Deep Sea Basin			1,212m	5,559m

The deepest waters claimed by China are in the South China Sea. In some ways, these waters are likely more conducive to the use of passive and active sonar. However, these spaces pose their own challenges as well, including a complex undersea geography marked by features like seamounts that

Towed Sonar Abroad," p. 198; *Defense Acquisitions: Testing Needed to Prove SURTASS/LFA Effectiveness in Littoral Waters (GAO-02-692)* (Washington, DC: United States General Accounting Office, 2002), p. 8, https://www.gao.gov/assets/gao-02-692.pdf; "How does sound travel in shallow water?," *Discovery of Sound in the Sea*, undated, https://dosits.org/science/advanced-topics/shallow-water-propagation/; "Reverberation," *Discovery of Sound in the Sea*, undated, https://dosits.org/science/movement/how-does-sound-move/reverberation.

[26] Shi, "Ships Sonar Technical," pp. 140-141; *GAO-02-692*, p. 12.

[27] Stated in, or calculated from, 周碧松 [Zhou Bisong], 深监海洋的激烈争夺 [*Fierce Competition in the Deep Blue Ocean*] (Beijing: Military Science Press, 2014), pp. 135-152.

[28] Parts per thousand (‰).

[29] At the southern end of the East Sea (Okinawa) Trough.

[30] Source does not specify if this is the average or greatest depth.

can create shadow zones.[31] Like other areas in China's maritime periphery, the South China Sea also sees high levels of ambient noise cause by heavy commercial traffic.[32]

The Type 927 Ocean Surveillance Ship

Faced with intensifying undersea challenges in a complex environment, China has begun investing heavily to improve the PLAN's ASW capability as part of efforts to prepare for "high-end naval war" (高端海战).[33] The launch of a new generation of six new ocean surveillance ships since 2017 is a testament to this. Conventionally referred to as the Type 927, a portion of these ships is almost certainly stationed at Zhanjiang Naval Base in Guangdong, adjacent to the South China Sea, with at least one ship likely stationed at Zhoushan Naval Base in Zhejiang on the East China Sea. Type 927 ships are almost certainly equipped with both passive and active towed array sonar. They feature a small-waterplane-area twin hull (SWATH) catamaran design, incorporate a helipad large enough for a PLAN ASW helicopter, and employ an electrical propulsion system. This section reviews what is known and unknown about the identifiers, basing, layout, and capabilities of the current Type 927 ships based on publicly available information.

Type 927 Vessel Identifiers and Basing

The PLAN's new ocean surveillance fleet is highly secretive. There are no mentions of these ships in authoritative media such as *PLA Daily*, and academic and defense industry studies on undersea warfare that focus on hydroacoustic submarine detection very rarely mention these ships directly. ONI's 2022-2023 China maritime forces recognition guide only acknowledges three Type 927 ships (pennant numbers 780, 781, and 782), using the reporting name Dongjian.[34] However, a review of all publicly available materials—from government, military, industry, military enthusiast/hobbyist sources, and satellite imagery—finds there are almost certainly six Type 927 ocean surveillance ships as of March 2023. Aggregated data for the current Type 927 ships are presented in Table 3, largely drawn from *Modern Chinese Maritime Forces* by Manfred Meyer. The data presented below can be treated as likely accurate, but generally unconfirmed by authoritative sources.

[31] Shenghao Li, Zhenglin Li, Wen Li, and Yanxin Yu, "Three-Dimensional Sound Propagation in the South China Sea with the Presence of Seamount," *Journal of Marine Science and Engineering*, vol. 9, no. 10 (2021), https://www.mdpi.com/2077-1312/9/10/1078 (https://archive.ph/jDrQz). A shadow zone is an area "of low sound intensity that sound waves traveling away from a source… do not reach, usually because the sound waves are refracted away from" the area. See "Shadow Zone," *Discovery of Sound in the Sea*, undated, https://dosits.org/glossary/shadow-zone/.

[32] Power China Team, "How Much Trade."

[33] Ryan D. Martinson, "Winning High-End War at Sea: Insights into the PLA Navy's New Strategic Concept," Center for International Maritime Security, 18 May 2023, https://cimsec.org/winning-high-end-war-at-sea-insights-into-the-pla-navys-new-strategic-concept/.

[34] "China People's Liberation Army Navy (PLAN), Coast Guard, and Government Maritime Forces 2022-2023".

Table 3. China's Type 927 Ocean Surveillance Fleet.[35]

Pennant Number	Ship Name	Launch Date	Commission Date	Photo Evidence	Crest Avail.
780	*Tianxuanxing* (天旋星)	Jun. 21, 2017	Feb. 20, 2019	Yes	No
781	*Qiantangjiang* (钱塘江) / *Tianjixing* (天玑星)[36]	Mar. 21, 2018	2018	Yes	No
782	*Yaoguangxing* (摇光星)	Jun. 27, 2018	2020	Yes	No
783	*Wanquanhe* (万泉河) / *Muxing* (木星)	May 2020	2021	Yes	No
784	*Huangpujiang* (黄浦江) / *Xingle* (兴乐)	2021	2022	No	Yes
785	*Liuyanghe* (浏阳河)	Oct. 2021	2022	Yes	Yes

Where these ships are homeported is an open question, though several Type 927 ships are almost certainly stationed at Zhanjiang Naval Base. Positioning at least one ship at Zhoushan Naval Base would also be logical if China's sonar detection and data processing capabilities can overcome the challenges of operating in noisy, shallow waters. Assuming the basing locations suggested above are accurate, these vessels are presumably assigned to the operational support flotillas of the respective theater navies—the 3rd Operational Support Flotilla (OSF; 作战支援舰第三支队) under the Southern Theater Navy (STN) and the 2nd OSF (作战支援舰第二支队) under the Eastern Theater Navy (ETN).

This basing pattern—positioning several ships in Zhanjiang and at least one ship in Zhoushan—would accord with China's likely assessment that the greatest threats are found in the east and south, given the activities of the U.S., its allies, and partners.[37] Taiwan also falls within the Eastern Theater

[35] Meyer, *Chinese Maritime Forces*, 2nd ed., p. 38; author's correspondence with Manfred Meyer (18 January 2023); author's research.

[36] The names of Type 927 ships were originally stars in the Big Dipper constellation and other celestial bodies, but newer ships are named after rivers. The names of at least two of these ships have likely been changed from the former to the current pattern. See Meyer, *Chinese Maritime Forces*, 2nd ed., p. 38.

[37] In addition to the indications elsewhere in this report that this is the case, in 2019 researchers affiliated with the PLAN Naval Command College warned that due to deficiencies in China's undersea target detection technology, it is "conceivable that… the advanced submarines and unmanned submersibles of countries like the U.S. and Japan can secretly trail and track our ships, sneak into our coastal waters, or even get close to our important ports and bases to collect intelligence and conduct reconnaissance and surveillance." According to another report from a Beijing-based think tank, the South China Sea Probing Initiative, "at least 11 nuclear-powered attack submarines (SSNs) deployed to the South China Sea and its surrounding waters throughout" 2021. Confirming America's presence in the South China Sea, in October 2021 the USS *Connecticut* nuclear-powered attack submarine hit an uncharted seamount, possibly near the Paracel Islands. See 陈明 [Chen Ming] and 尹晓飞 [Yin Xiaofei], 提升我水下攻防作战能力的对策措施 ["Measures to Improve Undersea Warfare Capabilities"], 数字海洋与水下攻防 [*Digital Ocean & Underwater Warfare*], no. 1 (March 2019), pp. 1-3; "An Incomplete Report on U.S. Military Activities in the South China Sea in 2021," *South China Sea Probing Initiative*, March 2022, https://web.archive.org/web/20230312171801/http://www.scspi.org/sites/default/files/an_incomplete_report_on_us_military_activities_in_the_south_china_sea_in_2021_2.pdf; Sam LaGrone, "Investigation Concludes USS Connecticut Grounded on Uncharted Seamount in South China Sea," *USNI News*, 1 November 2021, https://news.usni.org/2021/11/01/investigation-concludes-uss-connecticut-grounded-on-uncharted-sea-mount-in-south-china-sea; South China Sea Probing Initiative (@SCS_PI), "Investigation concludes that USS Connecticut (SSN 22) hit an

Command's area of responsibility.[38] In contrast, the Bohai and Yellow Seas are very shallow and offer almost no access to the open ocean, from which adversary submarines are most likely to originate.[39] Instead, the deeper waters around the Ryukyu Islands and in the South China Sea offer hostile submarines ample space to hide and approach the mainland.

Photographs and satellite imagery circumstantially support this argument. Several of the publicly available photos and videos capturing Type 927 ships come from Zhanjiang, where the 3rd OSF is located, and satellite imagery accessible via Google Earth from this location frequently shows between one and three Type 927 ships at berth.[40] For example, imagery from October 2022 shows the *Tianxuanxing* (pennant number 780), *Wanquanhe* (783), and *Liuyanghe* (785) at Zhanjiang (see Figure 1 below). Although Google Earth satellite imagery cannot serve as definitive evidence of where these ships are based,[41] in a review of ten Chinese naval facilities from 2017 through 2022, the only other location where fully painted and numbed Type 927 ships were repeatedly captured in satellite imagery is the 2nd OSF's homeport of Zhoushan (four instances showing a single ship in May, July, and August 2019). Satellite imagery from other sources and shared online has also shown two Type 927 ships at Sanya Naval Base in Hainan on at least one occasion in December 2022.[42]

Furthermore, one of the only public reports on the activities of a Type 927 ship depicts its operations off the east coast of Taiwan—Eastern Theater Command's area of responsibility, as noted above.[43] More detail on this sighting is provided in section three. Of course, it is also possible the six Type 927 ships are evenly distributed among the three coastal theater commands. Based on PLAN ship naming conventions, the navy's previous generation of ocean surveillance ships, which were later converted for hydrographic survey, are likely currently distributed this way—two assigned to the Northern Theater Navy (NTN), two to the ETN, and two to the STN.[44]

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uncharted seamount in #SouthChinaSea. The bathymetry map and the satellite image via @planet might," *Twitter*, 3 November 2021, 3:20 a.m., https://twitter.com/scs_pi/status/1455797012880707587 (https://archive.ph/ZhOaR).

[38] Joel Wuthnow, "What Do China's Military Reforms Mean for Taiwan?," *Joint Force Quarterly*, 83, vol. no. 4 (2016), p. 65, https://apps.dtic.mil/sti/pdfs/AD1020037.pdf.

[39] The exception here is the Korea Strait, which connects the Sea of Japan with the northern East China Sea and southern Yellow Sea. South Korean submarine forces are homeported at Jinhae Naval Base in the strait.

[40] H I Sutton (@CovertShores), "#Chinese Navy in Zhanjiang," *Twitter*, 20 September 2022, 10:22 a.m., https://twitter.com/CovertShores/status/1572229691402076163 (https://archive.ph/u8cEg); 連海ミネユキ [Renkai Mineyuki] (@Renkai_Mineyuki), 中国海軍 927 型音響測定艦:瀏陽河 785 ["China Navy Type 927 acoustic detection ship: Liuyanghe 785"], *Twitter*, 6 February 2023, 4:16 a.m., https://twitter.com/Renkai_Mineyuki/status/1622524506467364864 (https://archive.ph/HlpIe).

[41] This is because Google Earth imagery is biased toward locations of high interest and not all locations are updated at the same frequency. For example, there are many more, and more frequent, images of well-known locations like Zhanjiang Naval Base than there are of lesser-known naval facilities.

[42] 連海ミネユキ [Renkai Mineyuki] (@Renkai_Mineyuki), 12/1 に撮影された海南島:海軍三亜基地楡林港空母ベースの衛星画像。空母山東/強襲揚陸艦海南 ["Hainan Island: A satellite image of the aircraft carrier base at Naval Base Sanya Yulin Port taken on 12/1"], *Twitter*, 19 December 2022, 8:57 a.m., https://twitter.com/Renkai_Mineyuki/status/1604762916628344834 (https://archive.ph/8krKr).

[43] 汉光演习第 2 天 中国水声监听船、飞弹护卫舰现踪 ["On Day 2 of the Han Kuang Exercise, a Chinese Underwater Acoustic Monitoring Ship and Missile Frigate are Appears"], 中央通訊社 [*Central News Agency*], 26 July 2022, https://www.cna.com.tw/news/aipl/202207260174.aspx (https://archive.ph/HOnwR).

[44] "China People's Liberation Army Navy (PLAN), Coast Guard, and Government Maritime Forces 2022-2023;" Meyer, *Chinese Maritime Forces*, 2nd ed., pp. 6, 59.

Figure 1. Type 927 Ships with Pennant Nos. 780, 783, and 785 at the Zhanjiang Naval Base (October 2022)[45]

Type 927 Design and Layout

The Type 927 ships are believed to be broadly similar in size and configuration to the U.S. Navy's T-AGOS ships,[46] which collect underwater acoustic data and hunt for enemy submarines at great distances using a passive Surveillance Towed Array Sensor System (SURTASS) plus LFA capability.[47] The Type 927 and T-AGOS ships both feature a SWATH catamaran design. This reduces their waterline and provides stability and maneuverability on the water, including in rough seas and at the slow speeds used during long-range towed-sonar operations.[48] Based on satellite imagery from Google Earth, the Type 927 is just under 90 meters long, has a beam of 30 meters, and incorporates a helipad. It has an estimated displacement of 5,500 tons, and its top speed is reportedly 12 knots.[49]

The most credible publicly available descriptions of the internal layout and capabilities of Type 927 ships are found in a 2019 issue of *Shipborne Weapons* (舰载武器) and a 2022 issue of *Ordnance Industry Science Technology* (兵工科技), two defense industry magazines. The physical features described in the *Shipborne Weapons* article are summarized in Figure 2 below.

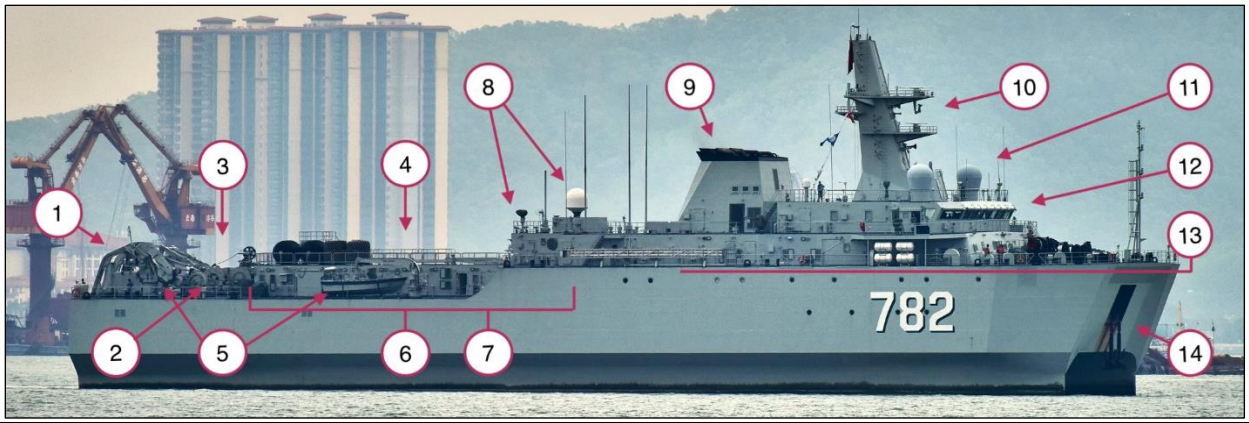
[45] Maxar Technologies, "21°13'34.83" N, 110°26'20.73" E," *Google Earth Pro*, 7 October 2022.

[46] Rick Joe, "Chinese Anti-Submarine Warfare: Aviation Platforms, Strategy, and Doctrine," *The Diplomat*, 16 October 2018, https://thediplomat.com/2018/10/chinese-anti-submarine-warfare-aviation-platforms-strategy-and-doctrine/.

[47] *GAO-02-692*, p. 1; "Surveillance Towed Array Sensor System (SURTASS) and Compact Low Frequency Active (CLFA) Sonar," *Office of the Director, Operational Test and Evaluation*, undated, https://www.dote.osd.mil/Portals/97/pub/reports/FY2015/navy/2015surtass_clfa.pdf?ver=2019-08-22-105646-647.

[48] "Ocean Surveillance Ships - T-AGOS," *U.S. Navy Office of Information*, 13 October 2021, https://www.navy.mil/Resources/Fact-Files/Display-FactFiles/Article/2222990/ocean-surveillance-ships-t-agos/; Stefanick, *Strategic Antisubmarine Warfare*, p. 39.

[49] 蓝箭 [Lan Jian], 浅析中国海军水声探测尖兵: 780 船 ["Ship 780: Chinese Navy's Underwater Acoustic Detection Vessel"], 舰载武器 [*Shipborne Weapons*], no. 6 (2019), p. 20; Su, "Nuclear Submarine's 'Nemesis,'" p. 52.



Aft Section	Forward Section
1 - Two tracks (轨道), port and starboard, each with a different suspension arm (吊臂; or "jib") for placing equipment in the water. **2 -** Two steel cable winches, port and starboard, for lowering a towed sonar array along the two tracks. **3 -** Marine detection equipment work area and temporary (open air) storage. **4 -** Helicopter landing pad capable of supporting 10-tons, enough to accommodate a Ka-28 or Z-9. **5 -** Speed boats and auxiliary cranes on the port and starboard sides of the helipad and building beneath it. **6 -** One-story structure (under the helipad), containing cabins for detection equipment work, audio-visual analysis and data processing, computer materials compilation and intelligence (微机资料汇编情报), soundwave signal monitoring and analysis, marine intelligence materials collection, and electronic equipment work. **7 -** Quartermaster (军需官) cabin, sick bay, cafeteria, galley, water tank, and detection equipment work room, among other facilities.	**8 -** Satellite data link radome, the area under which is bifurcated, with the port side serving as the helicopter take-off and landing dispatch work cabin; this cabin has a 180-degree view; below this area is a propulsion cabin (动力舱室). **9 -** Smokestack and propulsion equipment cabin (动力设备舱). **10 -** Main mast, containing navigation radar; antennas for satellite, meteorology, communication, and other purposes; and lighting equipment. **11 -** Two radomes, port and starboard, atop the control tower cabin. **12 -** Second story of the forward superstructure, which is the control tower cabin; contains the bridge, command center, and cabins for navigation, observation and early warning (观通), sonar, communication, confidential, and radio work. **13 -** First story of the forward superstructure, containing non-commissioned officer, officer, and crew cabins, many ensuite toilets and washrooms, and one or more large meeting rooms. **14 -** Two anchors.

Figure 2. Layout of the Type 927, According to *Shipborne Weapons*[50]

[50] Lan, "Ship 780," pp. 20-21.

According to *Shipborne Weapons*, the Type 927's helipad can support a helicopter weighing up to 10 tons.[51] Based on Google Earth imagery, the helipad is approximately 14 meters wide and 18 meters long. Corroborating *Shipborne Weapons*, these dimensions suggest the Type 927 can accommodate one Ka-28 or Z-9[52] equipped for an ASW mission.[53] The *Shipborne Weapons* article also says the PLAN's newer Z-20 ASW helicopters could land on the Type 927, but with a length of 20 meters, this appears unlikely.[54] Incorporation of this helipad—assuming it will be used by ASW helicopters, which *Ordnance Industry Science Technology* also suggests[55]—is a notable indicator of how Type 927 ships could fit into the Chinese military's ASW system of systems (discussed further in the next section).

Type 927 ships use China's Integrated Electrical Propulsion System (IEPS; 综合全电力推进系统), according to *Ordnance Industry Science Technology*.[56] IEPS is already installed on other PLAN warships, including submarines.[57] It is quieter than mechanical systems,[58] which would help limit the detrimental impact of a Type 927 ship's own noise on the detection of sound from an enemy submarine—controlling for such noise is one reason that ocean surveillance ships operate at very slow speeds.[59] Circumstantial evidence supporting *Ordnance Industry Science Technology*'s assertion is found in a 2020 study on predicting and controlling for the propeller noise of SWATH ships operating at slow speeds written by researchers at the China Ship Scientific Research Center (中国船舶科学研究中心) and Key Laboratory of Ship Vibration and Noise (船舶振动噪声重点实验室).[60] The 3D computer model of a SWATH ship used for this research is very similar to the Type 927 in shape, and the researchers assume the model uses IEPS.

[51] Lan, "Ship 780," p. 21.

[52] Z-9C is the ASW variant. See "Z-9 Harbin (WZ-9) Chinese Medium Multi-Role Helicopter," *OE Data Integration Network*, undated, https://odin.tradoc.army.mil/mediawiki/index.php/Z-9_Harbin_(WZ-9)_Chinese_Medium_Multi-Role_Helicopter.

[53] "Z-9 Harbin (WZ-9) Chinese Medium Multi-Role Helicopter"; "Ka-28 (Helix) Russian Anti-Submarine Helicopter," *OE Data Integration Network*, undated, https://odin.tradoc.army.mil/mediawiki/index.php/Ka-28_(Helix)_Russian_Anti-Submarine_Helicopter.

[54] "Z-20 Chinese Medium Transport Helicopter," *OE Data Integration Network*, undated, https://odin.tradoc.army.mil/mediawiki/index.php/Z-20_Chinese_Medium_Transport_Helicopter.

[55] Su, "Nuclear Submarine's 'Nemesis,'" p. 53.

[56] Ibid., p. 52.

[57] Liu Zhen, "China adds turbo generators to warships to power high-energy weapons, state media says," *South China Morning Post*, 30 July 2020, https://www.scmp.com/news/china/military/article/3095390/china-adds-turbo-generators-warships-power-high-energy-weapons; Jeffrey Lin and P.W. Singer, "China's new submarine engine is poised to revolutionize underwater warfare," *Popular Science*, 2 June 2017, https://www.popsci.com/china-new-submarine-engine-revolutionize-underwater-warfare/.

[58] Lin and Singer, "China's new submarine engine."

[59] 徐雅倩 [Xu Yaqian], 郭高峰 [Guo Gaofeng], and 刘方正 [Lui Fangzheng], 拖线阵声纳探测技术研究现状及发展趋势 ["Current Status and Development Trend of Detection Technology of Towed Linear Array Sonar"], 价值工程 [*Value Engineering*], no. 9 (2017), p. 240.

[60] 刘哲 [Liu Zhe], 吴帅 [Wu Shuai], and 李广 [Li Guang], SWATH 船螺旋桨脉动压力引起的辐射噪声计算分析 ["Calculation and Analysis of Radiated Noise Caused by Propeller-Induced Pressure Fluctuations for SWATH Ship"], 中国舰船研究 [*Chinese Journal of Ship Research*], vol. 15, no. 3 (2020), pp. 95-96.

Type 927 Sonar Capabilities

Type 927 ships are almost certainly equipped with long-range passive and LFA sonar technology. Publicly available materials refence an H/SJG-208 towed passive "surveillance array" as being aboard the Type 927,[61] as well as a towed array sonar called "Sea Eye" (海眼).[62] According to the 2022 article in *Ordnance Industry Science Technology*, Type 927 ships are capable of using a "very low frequency" sonar mode (i.e., an LFA capability). [63] This is presumably enabled by Sea Eye, which the article references. Sea Eye's towed cable is between 1,500 and 1,800 meters in length.[64] Sea Eye was developed by the 715th Research Institute of China Shipbuilding Industry Corporation between approximately 2014-2019.[65] The relationship between Sea Eye and H/SJG-208, and whether Sea Eye may have replaced the older H/SJG-208 technology, is unknown.

That Type 927 ships have LFA technology is further circumstantially corroborated by PLA-affiliated research into how to effectively use LFA sonar in deep and shallow-water environments.[66] In 2020, for example, researchers from the Chinese Academy of Sciences (中国科学院), PLA Unit 92578 (92578 部队), and Northwestern Polytechnical University (西北工业大学) published a paper on optimizing LFA sonar detection in deep water acoustic shadow zones through bottom bouncing (海底反射) techniques.[67] If, as this research strongly suggests, China possesses LFA technology, Type 927 ships are the ideal platform for it.

According to *Shipborne Weapons*, the Type 927's equipment has a detection range of hundreds of nautical miles and a detection depth of up to 450 meters.[68] *Ordnance Industry Science Technology* asserts that when using "very low frequency sonar", the Type 927's equipment can detect submarines

[61] Meyer, *Chinese Maritime Forces*, 2nd ed., p. 38; Christopher Carlson, "PLAN Acoustic Decoy and Towed Array Deployment Options," *Admiralty Trilogy Group*, 20 October 2012, https://www.admiraltytrilogy.com/cic/HarpoonAnalysis/PLAN_Towed_Array_and_Acoustic_Decoy.pdf.

[62] Su, "Nuclear Submarine's 'Nemesis,'" p. 52; 中国国产水下撒手锏曝光 美核潜艇今后难靠近我门口 ["China's Domestic Underwater Assassin's Mace Exposed, It Will Be Difficult for U.S. Nuclear Submarines to Approach My Door After Today"], 新浪军事 [*Sina Military*], 5 May 2019, https://mil.news.sina.com.cn/jssd/2019-05-05/doc-ihvhiewr9863769.shtml (https://archive.ph/tXcYJ).

[63] Su, "Nuclear Submarine's 'Nemesis,'" pp. 52-23.

[64] Ibid.

[65] 俞海萍 [Yu Haiping] and 曾冰 [Zeng Bing], 【光明日报】中国船舶重工集团有限公司第七一五研究所"海眼"系统项目组：大海深处的千里眼和顺风耳 ["(Guangming Daily) China Shipbuilding Industry Corporation's 715th Research Institute's 'Sea Eye' Systems Project Group: Clairvoyance and Extraordinary Hearing in the Ocean Depths"], 中国船舶集团第七一五研究所 [*China State Shipbuilding Corporation 715th Research Institute*], 23 May 2019, http://121.40.234.149/InfoShow.aspx?InfoID=511&ModuleID=4&PageID=1 (https://archive.ph/D33nK).

[66] 林诗尧 [Lin Shipyao], 主动拖线阵声纳浅海发现概率仿真研究 ["Simulation Study on Shallow Sea Discovery Probability of Active Towed Line Array Sonar"], 舰船电子工程 [*Ship Electronic Engineering*], vol. 40, no. 6 (2020), pp. 84-88.

[67] 韩志斌 [Han Zhibin], 彭朝晖 [Peng Zhaohui], and 刘雄厚 [Liu Xionghou], 深海海底反射区声场角谱域分布结构分析及在声纳波束俯仰上的应用 ["Analysis of Sound Field Distribution of Angle Dimension in Deep Ocean Bottom Bounce Area and Its Application to Active Sonar Vertical Beam Pitch"], 物理学报 [*Acta Physica Sinica*] vol. 69, no. 11 (2020), article 114301.

[68] Lan, "Ship 780," p. 21.

at ranges greater than 300-700 kilometers (162-378 nautical miles) without relying on convergence zones.[69]

While Sea Eye may narrow the gap, the PLAN's technology likely remains relatively poor in comparison to other modern navies. As late as 2017, analysts affiliated with the PLAN Equipment Department Equipment Procurement Center (海军装备部装备采购中心) noted that China cannot manufacture high-performance towed-line arrays and has significant challenges related to the performance, reliability, and level of automation of its towed sonar systems.[70] Research published in 2019 by PLA-affiliated analysts similarly argues that China's undersea and hydroacoustic detection capabilities remain weak, including in long-range detection and target identification.[71]

PLAN Ocean Surveillance Before the Type 927

Prior to the Type 927, the PLAN's ocean surveillance fleet likely primarily comprised the Kanhai class ships quipped with tactical towed array sonar less powerful than the Type 927's surveillance array.[72] These are SWATH catamaran vessels with an estimated displacement of 1,500 tons. [73] Kanhai class ships may have been built with the designation Type 639 as ocean surveillance ships between 2006-2013, but were reportedly later modified (likely becoming known as the Type 639A) for charting undersea geography (hydrographic survey) and collecting information on various hydroacoustic properties of the sea areas in which they operate.[74] Today, there are six Kanhai class ships—the Bei Ce 901 (北测 901), Bei Ce 902 (北测 902), Dong Ce 232 (东测 232), Dong Ce 233 (东测 233), Nan Ce 429 (南测 429), and Nan Ce 430 (南测 430)—likely assigned to NTN, ETN, and STN as stated above.[75] Various Chinese sources suggest at least some of them could still play a role in collecting the acoustic signatures of enemy submarines (an activity discussed below) and support a Type 927 in the search for undersea adversaries.[76]

[69] Su, "Nuclear Submarine's 'Nemesis,'" pp. 52-53. Convergence zones are areas near the surface in which sound created by a distant target converge and amplify. See "SONAR Performance I" in "ES310: Introduction to Naval Weapons Engineering (Course Syllabus)," Federation of American Scientists, undated, https://man.fas.org/dod-101/navy/docs/es310/SNR_PROP/snr_prop.htm?.

[70] Xu, Guo, and Liu, "Detection Technology of Towed Linear Array Sonar," p. 239.

[71] Chen and Yin, "Undersea Warfare Capabilities," pp. 1-3.

[72] Su, "Nuclear Submarine's 'Nemesis,'" pp. 50-51; Lan, "Ship 780," p. 21.

[73] Su, "Nuclear Submarine's 'Nemesis,'" pp. 50-51.

[74] Further research is needed to confirm the exact history of this fleet. Not all sources agree with the Type 639 designation. Some assert the Kanhai class is the Type 936. Others use Type 639 for either the Bei Diao 991 or Bei Diao 992, which themselves are other hydroacoustic measurement and monitoring catamaran ships used by the PLAN. See H I Sutton, "Chinese-Navy-Type-927-Anti-Submarine-Sonar-Ship," *Covert Shores*, 30 March 2021, http://www.hisutton.com/Chinese-Navy-Type-927-Anti-Submarine-Sonar-Ship.html; Su, "Nuclear Submarine's 'Nemesis,'" pp. 50-51; Peter A. Dutton and Ryan D. Martinson, *China's Evolving Surface Fleet*, (Newport, RI: China Maritime Studies Institute, 2017), p. 97, https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1013&context=cmsi-red-books; Meyer, *Chinese Maritime Forces*, 2nd ed., p. 59; Manfred Meyer, *Modern Chinese Maritime Forces: A Compilation of Ships and Boats of the Chinese Navy, Coast Guard, Maritime* (Admiralty Trilogy Group, January 2023), p. 63.

[75] "China People's Liberation Army Navy (PLAN), Coast Guard, and Government Maritime Forces 2022-2023;" Meyer, *Chinese Maritime Forces*, 2nd ed., p. 6, 58.

[76] Su, "Nuclear Submarine's 'Nemesis,'" pp. 50-51; Lan, "Ship 780," p. 22.

Applications of the Type 927 in Peace and War

Fundamentally, the Type 927 is a reconnaissance and surveillance platform to facilitate the PLAN's pursuit of information superiority (信息优势) and battlefield initiative in the undersea domain. These ships are almost certainly intended to strengthen persistent weaknesses in China's ability to detect, identify, and track undersea threats. Given the complexities of undersea acoustic detection discussed in section one, China's relative technological weaknesses noted in section two, and the PLAN submarine force's concentration on anti-surface warfare,[77] China will very likely rely on Type 927 ships to strengthen surveillance of strategically important sea areas, conduct close-in reconnaissance of adversarial forces, and support wartime naval operations. This section explores each of these peacetime and wartime activities, as well as how Type 927 ships will likely coordinate with other PLAN sensors and platforms.

The Type 927's Tasks in Peacetime

One of the peacetime tasks of the Type 927 is to collect acoustic data emitted by the submarines of potential adversaries. Acoustic data, such as the mechanical, propeller, and hydrodynamic noises radiated or created by submarines,[78] can be used to identify them and their activities, enabling an assessment of their capabilities and intentions.[79] Acoustic data and acoustic signatures can be stored long-term to facilitate future reconnaissance, surveillance, and combat operations. According to PLAN Naval Command College-affiliated researchers writing in 2019:

> [China should] take advantage of the opportunities in joint military exercises, escorts and visits, and far-seas training missions to gather information on various ship sonar and propeller noise [and] collect data on the acoustic signatures of the main adversary's boats to provide effective support for underwater target identification.[80]

The *Qiantangjiang* (pennant number 781) was likely spotted collecting acoustic data (among other possible activities) off the coast of Taiwan during the Republic of China's (ROC) 38th Han Kuang military exercise in July 2022.[81] In what is one of the only public reports on a Type 927 ship's activities, ROC military personnel told journalists that on the first day of the exercise, the *Qiantangjiang* was seen loitering at approximately 1600 local time, 55 nautical miles northeast of Green Island (绿岛乡), which is southeast of Taiwan. On the second day, the ship was seen at 0800 local time, 45 nautical miles northeast of the island and traveling southeast. Photos in Taiwanese and foreign press confirm that at least two Taiwanese submarines (pennant numbers 793 and 794) participated in the 38th Han Kuang exercise.[82]

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[77] "The PLA Navy: Capabilities and Missions for the 21st Century," Office of Naval Intelligence, 1 January 2015, p. 14, https://apps.dtic.mil/sti/citations/ADA616040.

[78] 汤晓迪 [Tang Xiaodi] and 程一超 [Cheng Yichao], 外军舰船声磁监测主要做法及启示 ["Main Practices and Implications of Foreign Acoustic Monitoring"], 舰船电子工程 [*Ship Electronic Engineering*], vol. 36, no. 9 (September 2016), p. 15.

[79] Stefanick, *Strategic Antisubmarine Warfare*, pp. 5, 358; Lan, "Ship 780," p. 20.

[80] Chen and Yin, "Undersea Warfare Capabilities," pp. 1-3.

[81] "Day 2 of the Han Kuang Exercise."

[82] Eric Cheung, "Taiwan holds massive Han Kuang military drills as tensions with China build," *CNN*, 29 July 2022, https://amp.cnn.com/cnn/2022/07/28/asia/taiwan-military-drills-han-kuang-china-threat-intl-hnk-ml/index.html; 郑豪 [Zheng Hao],「汉光 38 号」实兵演习 今日展开 ["The 38th Han Kuang Military Drill Begins Today"], 青年日报 [*Youth*

Another peacetime task will almost certainly be tracking and monitoring the activities of adversarial forces within the first island chain, filling gaps or strengthening detection in areas also covered by undersea sensor networks. According to *Science of Campaigns*, a Chinese military textbook,[83] seizing campaign dominance requires a peacetime-wartime continuity in information gathering.[84] Awareness of an enemy's positions and movements at the start of a conflict is central to seizing the initiative. As SMS 2020 warns, the deep-sea forces of "hostile countries" are collecting intelligence on China's military ports and sea areas "to create conditions for seizing the opportunity to win in wartime."[85] In light of this assessment, SMS 2020 emphasizes the need to "strengthen detection, perception, and surveillance of enemy deep-sea military activities."[86]

Regarding the geographic scope of China's anti-submarine surveillance efforts, SMS 2020, writings by PLA analysts, and other sources commonly point to important military bases and ports, key underwater passages into the first island, and China's near seas generally as important focus areas for undersea military struggle.[87] Specific sea areas of concern likely include all of the South China Sea, including the deep sea basin, submarine routes through dangerous ground in the Spratly Islands, [88] and areas approaching Yulin Naval Base in Hainan; the Bashi Channel between Taiwan and the Philippines; and passages through the Ryukyu Islands, such as the Miyako Strait.[89] From an offensive perspective, China is likely to learn from the U.S. Navy's T-AGOS program and use Type 927 ships to surveil adversary bases and ports within, or just outside of, the first island chain, with the goals of tracking enemy submarines as they arrive and depart and collecting the acoustic data discussed above.[90]

It is also possible that China will deploy Type 927 ships further afield. The PLAN's naval strategy of "near seas defense, far seas protection" (近海防御、远海护卫) is focused on securing China's

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Daily News], 25 July 2022, https://web.archive.org/web/20230123211015/https:/www.ydn.com.tw/news/newsInsidePage?chapterID=1520747.

[83] *In Their Own Words: Foreign Military Thought: Science of Campaigns (2006)* (China Aerospace Studies Institute and Project Everest, 2020), p. 729, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Translations/2020-12-02%20In%20Their%20Own%20Words-%20Science%20of%20Campaigns%20(2006).pdf?ver=hma387iK8lQcZQ1x9ktt-Q%3d%3d.

[84] *In Their Own Words: Science of Campaigns (2006)*, pp. 337-338.

[85] Xiao, *Science of Military Strategy* (2020), p. 161.

[86] Ibid.

[87] For example, Xiao, *Science of Military Strategy* (2020), pp. 156-161; 王天忠 [Wang Tianzhong], 张东俊 [Zhang Dongjun], and 江莲 [Jiang Lian], 美国海军水下作战概念的发展分析及思考 ["On the Development of the U.S. Navy's Undersea Warfare Concepts: Analysis and Reflections"], 舰船科学技术 [*Ship Science and Technology*], vol. 43, no. 6 (June 2021), pp. 7-8; Chen and Yin, "Undersea Warfare Capabilities," pp. 1-3; 蒋圣功 [Jiang Shenggong], 反潜战 ["Anti-Submarine Warfare"] in 中国海军百科全书编审委员会 [China Navy Encyclopedia Editor Committee], 中国海军百科全书 [*China Navy Encyclopedia*] (Beijing: Haichao Press, 1998), p. 265.

[88] François-Xavier Bonnet, "Charting submarine routes in Southeast Asia," *Hérodote*, vol. 176, no. 1 (January 2020), p. 10.

[89] See "Fig. 1-3-2-8 PLA's Recent Activities in the Surrounding Sea Area and Airspace of Japan [image]" in *Defense of Japan 2022* (Tokyo: Japan Ministry of Defense, 2022), p. 49.

[90] Notable submarine bases in, or just outside of, the first island chain include Tsoying Naval Base (左營海軍基地), where the ROC Navy bases two Chien Lung-Class submarines and two (much older) Hai Shih-class submarines; Kure, where Japan's Submarine Flotilla 1 is based; Yokosuka, where Japan's Submarine Flotilla 2 is located; Jinhae Naval Base in South Korea; and Cam Ranh Naval Base in Vietnam. Guam, where Submarine Group 7 under U.S. 7th Fleet is homeported, would be a tempting target as well, though farther afield.

maritime periphery, but emphasizes safeguarding SLOCs in more distant waters.[91] Researchers at PLA-affiliated academic institutions specifically highlight a growing need to strengthen intelligence collection in the Indian Ocean, for example, to support the expanding far seas activities of China's submarines.[92] China's civilian research vessels already routinely operate in waters outside of the first island chain.[93] If the security of the near seas can be sufficiently ensured in peacetime through undersea sensor networks and unmanned platforms, China will likely begin to deploy its new ocean surveillance ships to more distant locations.

The Type 927's Tasks in Wartime

The Type 927's long-range detection capabilities will very likely support a variety of offensive and defensive campaigns during conflict. However, the ability of Type 927 ships to support ASW operations during a particular scenario likely depends on where exactly a conflict unfolds and against which adversaries, given the ship's apparent lack of capabilities for self-defense. These ships are unlikely to survive in a contested environment unless other Chinese forces are able to defend them, such as might be achievable using shore-based systems and aircraft when these ships are operating within the first island chain. Still, six types of military operations (see Table 4 below) identified in *Science of Campaigns* offer an indication of how these new ships could be used to advance wartime objectives.

[91] Jennifer Rice and Erik Robb, "The Origins of 'Near Seas Defense and Far Seas Protection,'" China Maritime Studies Institute, China Maritime Report No. 13, February 2021, p. 1, https://digital-commons.usnwc.edu/cmsi-maritime-reports/13/.

[92] Chen and Yin, "Undersea Warfare Capabilities," pp. 1-3; 胡冬英 [Hu Dongying], 黄锐 [Huang Rui], 蔡广友 [Cai Guangyou], 推进潜艇兵力走向远洋的几点思考 ["Some Thoughts on Pushing Submarine Forces into Distant Oceans"], 舰船电子工程 [*Ship Electronic Engineering*], vol. 37, no. 1 (January 2017), p. 3.

[93] Ryan D. Martinson and Peter A. Dutton, "China's Distant-Ocean Survey Activities: Implications for U.S. National Security," China Maritime Studies Institute, China Maritime Report No. 3, January 2019, https://digital-commons.usnwc.edu/cmsi-maritime-reports/3/; Devin Thorne (@D_Thorne), "Using @WindwardOceans AIS data @C4ADS, I mapped the 2019-2020 voyages of Chinese research vessels," *Twitter*, 28 September 2020, 9:42 a.m., https://twitter.com/D_Thorne/status/1310575735363567616 (https://archive.ph/KVPmM).

Table 4. The Type 927's Potential Offensive and Defensive Roles, by Campaign Type[94]

Campaign Type	Potential Type 927 Role
Joint Blockade Campaign	Support discovery of combat opportunities during "ocean-based search and destroy operations" aimed at enemy submarines countering China's blockade.
Landing Campaign	Support achievement of command of the sea (制海权) to ensure the security of campaign activities such as force assembly, sea crossing, and assault onto land.
Naval Base Defense Campaign	Support location of enemy submarines to aid Chinese forces in breaking an enemy blockade and ensuring freedom of movement into, out of, and around a naval base.
Sea-Force Group Campaign to Eliminate the Enemy	Support real-time battlefield sensing and the "correct selection" of undersea strike targets, location, and timing to destroy enemy sea-force groups.
Sea-Line Guarding Campaign	Support detection, identification, and monitoring of enemy submarines over a wide geographic area to defend China's supply lines.
Sea-Line Interdiction Campaign	Support discovery of enemy submarines defending a SLOC, supply line, or seaborne military and economic strengths targeted by Chinese forces

At the tactical level, greater coordination between sensors and platforms is a common theme in PLA and defense industry writings about undersea warfare that mention ocean surveillance ships. In 2020, for instance, analysts affiliated with the 1st OSF (作战支援舰第一支队) under the NTN (PLA Unit 92001) argued that reconnaissance ships (including ocean surveillance ships) should coordinate more robustly with other platforms to position, identify, and surveil undersea targets.[95] In their view, these ships "must deeply integrate into the reconnaissance early warning system of systems." Further, these ships should coordinate with shore-based stations to guide target identification and strengthen target positioning; with aircraft to expand the early warning range and verify target characteristics; and with surface ships to carry out "double ship positioning"[96] and surveillance.[97] They also advocate for deploying more than one reconnaissance ship at a time, to expand area coverage and increase the precision of target positioning.[98]

[94] *In Their Own Words: Science of Campaigns (2006)*, pp. 332, 342, 345-346, 351-352, 355, 362, 593-594, 599-600, 602, 613-614, 616, 623, 630-631.

[95] 马振飞 [Ma Zhenfei], 张世伟 [Zhang Shiwei], and 闫 飞 [Yan Fei], 各国侦察船应用情况分析及发展使用建议 ["Analysis of the Application of Reconnaissance Ships in Various Countries and Suggestions for Their Development and Use"], 舰船电子工程 [*Ship Electronic Engineering*], vol. 40, no. 11 (2020), p. 15.

[96] In this context, "double ship positioning" refers to two ships working collaboratively identify the location of an undersea target.

[97] Ma, Zhang, and Yan, "Reconnaissance Ships in Various Countries," p. 15.

[98] Ibid.

Moreover, the PLA Unit 92001 analysts argue that reconnaissance ships should be directly integrated with combat ship formations (作战舰艇编队).[99] The advantage would be to provide the formation with longer-range, more precise undersea target intelligence.[100] Addressing the obvious problem that many reconnaissance ships do not have robust defensive capabilities, they assert the formation will be able to protect these ships.[101] Notably, other analysts believe the U.S. uses T-AGOS ships to support aircraft carrier defense, deploying them forward of the carrier to provide long-range early warning and help pre-clear threats from sea areas through which the carrier may navigate.[102]

The Type 927's helipad further indicates how these ships could be used in a conflict. Although the helipad will almost certainly be primarily used for logistical support tasks, it is also likely that a Ka-28 or Z-9 equipped for ASW missions will be deployed to a Type 927 ship to support wartime operations in certain circumstances. The emphasis on platform coordination in PLA and defense industry-affiliated sources discussed above and below, as well as explicit references to this possibility in *Shipborne Weapons* and *Ordnance Industry Science Technology* (see section two, above), are the foundations of this assessment. An ASW aircraft aboard a Type 927 ship could assist with longer-range, more precise detection of hostile submarines in unfavorable acoustic environments, particularly if China's long-range sonar and data processing capabilities continue to suffer from relatively weak performance. The aircraft could also rapidly support subsequent tasks following an initial detection, including localization, identification, tracking, and, potentially, strikes against an enemy submarine, without waiting for data transmission to, and the response of, more distant forces.

A state-funded 2019 study by researchers affiliated with the China Ship Development and Design Center (中国舰船研究设计中心) that describes a model of underwater combat operations (see Figure 3 below) envisions the following scenario. [103] Reconnaissance satellites are used to analyze and predict enemy submarine disposition (部署)[104] at the strategic level. Underwater surveillance systems and ocean surveillance ships implement "campaign reconnaissance"[105] to ascertain the rough area and bearing (方位) of enemy underwater platforms over a wide area. ASW aircraft then carry

[99] Ibid.

[100] Ibid.

[101] Ibid.

[102] 张杰 [Zhang Jie] and 王传波 [Wang Chuanbo], 美军特种监测船为何频频现身南海 ["Why Do Special Detection Ships of the U.S. Military Frequently Appear in the South China Sea"], 世界态势 [*World Affairs*], no. 23 (2021), pp. 37-38.

[103] 谢伟 [Xie Wei], 杨萌 [Yang Meng], and 龚俊斌 [Gong Junbin], 水下攻防对抗体系及其未来发展 ["Underwater Attack-Defense Confrontation System and Its Future Development"], 中国工程科学 [*Engineering Sciences*], vol. 21, no. 6 (2019), p. 072.

[104] 部署 (*bushu*) refers to the "positioning of participating force-strengths for a fixed time and space on the basis of mission differentiation and the organized grouping of campaign and in accordance with operational conditions and the enemy's possible activities." See "Translator's Notes," in *In Their Own Words: Science of Campaigns (2006)*.

[105] *Science of Campaigns* defines "campaign reconnaissance and intelligence support" as "promptly, accurately, and continuously" acquiring and providing intelligence "on the enemy situation" as well as the "political, economic, military, geographical, meteorological, [and] hydrological… conditions of the region of operation." Hydrological conditions include factors that affect hydroacoustic detection. See *In Their Own Words: Science of Campaigns (2006)*, pp. 42-43, 241-242.

out targeted searches using sonobuoys and other methods to identify and position the enemy. Finally, ASW aircraft and other platforms track or attack the enemy as required by mission parameters.[106]

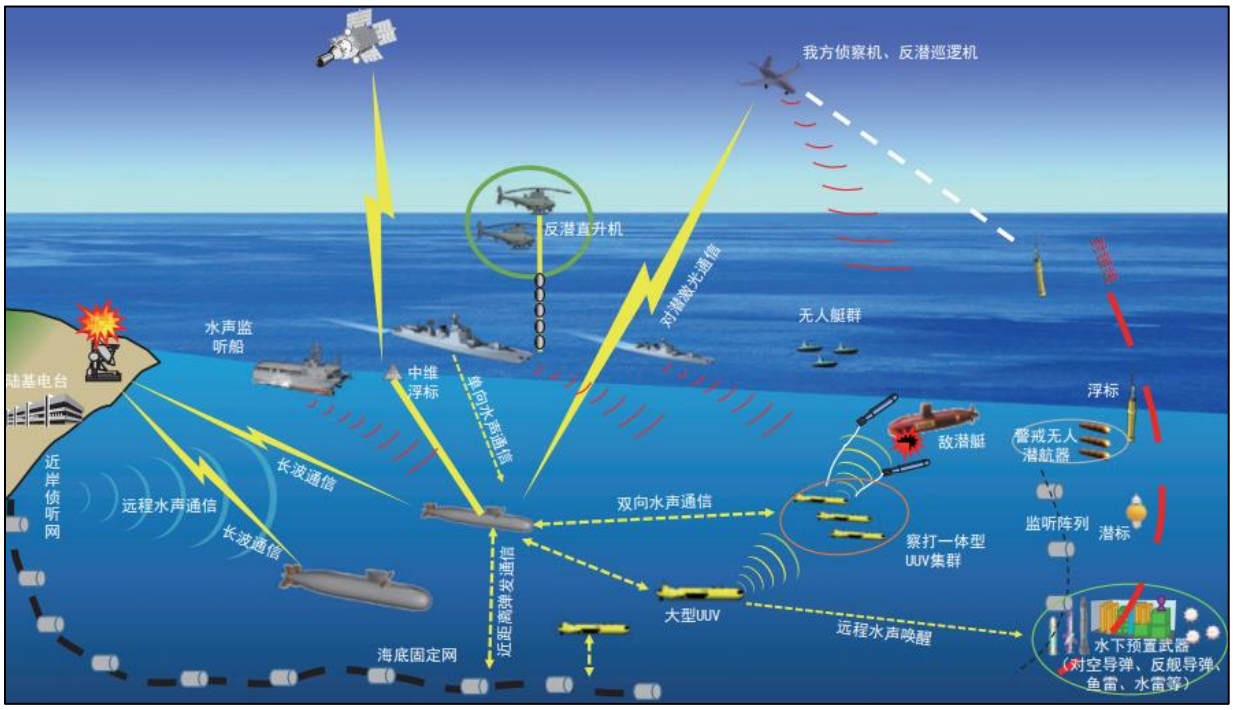

Figure 3. "Schematic of the Future Model of Underwater Combat Operations" [107]

Note: The yellow lines are channels of communication. The red dashed line is the "blockade line." The graphic uses a U.S. T-AGOS ship in place of the Type 927.

How deeply and effectively the Type 927 ships have been integrated into broader PLAN information transmission and C4ISR[108] networks to enable early warning and combat coordination is unconfirmed in public sources. *Shipborne Weapons* asserts that information collected by Type 927 ships can be transmitted via China's Beidou Navigation Satellite System[109] to a shore-based anti-submarine information processing center (反潜信息处理中心).[110] *Ordnance Industry Science Technology* also notes that Type 927 ships can transmit information directly to surface combatants.[111] However, based on the forward-looking proposals of PLA-affiliated analysts, there are likely weaknesses in China's current ability to synthesize and effectively act on information received from disparate units and sensors. In 2020, for example, researchers from PLAN Naval Aviation University (海军航空大学) proposed creating a "joint anti-submarine operations command department" (联合反潜作战指挥部) to address this issue and make more effective use of undersea sensors.[112] Other

[106] Xie, Yang, and Gong, "Underwater Confrontation System," p. 074.

[107] Ibid.

[108] Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance.

[109] Beidou is China's indigenous alternative to GPS.

[110] Lan, "Ship 780," p. 21.

[111] Su, "Nuclear Submarine's 'Nemesis,'" p. 53.

[112] 李居伟 [Li Juwei], 汪晓雨 [Wang Xiaoyu], and 王汉昌 [Wang Hanchang], 水下预警探测声呐基阵与反潜兵力的融合运用初探 ["Research on Application of Underwater Early Warning Detection Sonar Array and Anti-submarine Force"], 数字海洋与水下攻防 [*Digital Ocean & Underwater Warfare*], vol. 3, no. 6 (December 2020), p. 530.

PLA analysts have emphasized the need to empower reconnaissance ships (including ocean surveillance ships) to produce and distribute high-quality intelligence themselves,[113] possibly to save the time it takes for shore commands to issue orders after receiving information—a lag that still other PLA-affiliated researchers have assumed to be 10 minutes.[114]

Conclusion

China's new-generation of ocean surveillance ships is almost certainly designed to help (in coordination with other sensors and platforms) alleviate longstanding weaknesses in the PLAN's ASW capability and in China's undersea security more broadly. That so many Type 927 ships have been built so fast—six were likely delivered between 2017 and 2022—underscores the importance that Chinese military leaders place on the undersea domain and on addressing shortcomings in long-range undersea detection and target identification. The pace of construction also suggests China has successfully developed adequate long-range passive and (almost certainly) LFA sonar technologies, as well as acoustic data processing techniques. However, the PLAN's sonar systems likely remain behind those of the U.S. and others in performance and reliability.

While strengthening China's national defense posture is the primary motivation for building the Type 927 fleet, these ships further the PLAN's offensive ambitions as well. SMS 2020, for example, calls for developing the ability to establish "comprehensive sea area control" on the basis of "all-weather, omni-directional, multi-dimensional, multi-band battlefield perception, target recognition, tracking, and positioning capabilities."[115] Type 927 ships will very likely, in certain scenarios, contribute to this and related goals, such as exercising command of the sea during a conflict.

Thus, in peacetime and wartime, the operations of Type 927 ships will likely create new challenges for American, Japanese, and other submarines operating regionally. Some Chinese sources express that American ocean surveillance ships have an "interfering" effect on China's submarine operations and other undersea military activities.[116] Along similar lines, other Chinese sources suggest that Type 927 ships can help China interfere in, and thwart, the "harassing" activities of U.S. submarines operating in the South China Sea.[117] Should China deploy these ships to surveil waters near foreign naval bases, for instance, they will likely become obstacles to free, stealthy movement into and out of those ports. The Type 927 may also make stealthy navigation of China's maritime periphery more difficult in general as part of the PLAN's likely desire to impose a buffer zone between foreign submarines and China's strategic naval ports. As China's undersea detection capabilities continue to improve and these ships are further integrated into maturing PLA C4ISR networks, Type 927 ships will likely increase the threats to foreign submarines.

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[113] Ma, Zhang, and Yan, "Reconnaissance Ships in Various Countries," p. 15.

[114] 冷兆龙 [Leng Zhaolong] and 刘高峰 [Liu Gaofeng], 远程反潜作战系统构建与关键技术研究 ["Research on Construction of Long-Range Antisubmarine Warfare System and Key Technologies"], 指挥控制与仿真 [*Command Control & Simulation*], (August 2019), p. 4.

[115] Xiao, *Science of Military Strategy* (2020), p. 363.

[116] 王凯 [Wang Kai], 许昭霞 [Xu Zhaoxia], 李岳阳 [Li Yueyang], and 张孟琨 [Zhang Mengkun], 美国海军海洋测量船发展及使用研究 ["Research on the development and use of the U.S. navy oceanographic research ships"], 舰船科学技术 [*Ship Science and Technology*], vol. 42, no. 10 (2020), p. 189.

[117] Lan, "Ship 780," p. 22.

With its new fleet of ocean surveillance ships, the PLAN has moved closer to its goal of being prepared to win a "high-end naval war" and improved its chances of detecting, tracking, and even attacking potential future adversaries in the undersea domain. [118]

[118] Martinson, "Winning High-End War."

About the Author

Mr. Devin Thorne is a Principal Threat Intelligence Analyst with Recorded Future. He specializes in the use of publicly available Chinese-language sources to explain China's security strategies and their implementation, with a focus on maritime security, national defense mobilization, military-civil fusion, and propaganda. He was previously a Senior Analyst with the Center for Advanced Defense Studies (C4ADS) and has also conducted research on behalf of the Korea Institute for Maritime Strategy, Hudson Institute, and U.S. Department of State. Devin holds a B.A. from the University of Alabama at Birmingham and an M.A. from the Johns Hopkins University–Nanjing University Center for Chinese and American Studies. He lived, studied, and worked in China for multiple years. He speaks Mandarin.