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Summary

China's naval modernization, a process that has been underway in earnest for three decades, is now hitting its stride. The advent of the Type 055 cruiser firmly places the PLAN among the world's very top naval services. This study, which draws upon a unique set of Chinese-language writings, offers the first comprehensive look at this new, large surface combatant. It reveals a ship that has a stealthy design, along with a potent and seemingly well-integrated sensor suite. With 112 VLS cells, moreover, China's new cruiser represents a large magazine capacity increase over legacy surface combatants. Its lethality might also be augmented as new, cutting edge weaponry could later be added to the accommodating design. This vessel, therefore, provides very substantial naval capability to escort Chinese carrier groups, protect Beijing's long sea lanes, and take Chinese naval diplomacy to an entirely new and daunting level. Even more significant perhaps, the Type 055 will markedly expand the range and firepower of the PLAN and this could substantially impact myriad potential conflict scenarios, from the Indian Ocean to the Korean Peninsula and many in between. This study of Type 055 development, moreover, does yield evidence that Chinese naval strategists are acutely aware of major dilemmas confronting the U.S. Navy surface fleet.

Introduction

Just over a decade ago, the naval studies community marveled when the People's Liberation Army Navy (PLAN) deployed a rather innovative mosquito-like missile catamaran—the Type 022 fast-attack craft—in significant numbers.¹ Shortly thereafter, the PLAN began to deploy a new class of frigate (Type 054A) to the Gulf of Aden. That ship has proven its reliability for blue water operations. Then, Chinese shipyards moved on to speed the development of a corvette (Type 056), which was intended to fill the near seas with a workhorse vessel. More than fifty are now in service.² The above programs implied, at least to a certain extent, that Beijing was opting for the classic *jeune école* naval strategy that favored smaller, lethal vessels for combat missions in the “near seas,” while the growing submarine force could be deployed for commerce raiding.

For years, Chinese shipyard seemed to neglect large surface combatants. Only in 2014 did the first large, capable destroyer (Type 052D) go to sea. But now the situation suddenly looks very different, since a rapid push has 14 of these vessels in service with at least another 11 or more anticipated.³ That would be well enough to cause a major stir for sailors worldwide. However, in mid-2017 Chinese shipyards launched an even larger surface combat, the “Type 055 10,000-ton class destroyer” (055 型万吨级驱逐舰).⁴ This ship, which is best classified as a cruiser, appears to represent a major qualitative leap for the Chinese Navy into the forefront of surface combatant

¹ John Patch, “A Thoroughbred Ship-Killer,” U.S. Naval Institute *Proceedings*, (April 2010), pp. 49-53. On this capability, see also 天鹰 [Tian Ying], 中国海军近海作战体系中的轻小型作战舰艇 [“Light Warships of the Chinese Navy's Near Seas Operational System”], 舰载武器 [Shipborne Weapons], (July 2016), pp. 35-42.

² Liu Zhen, “China to Stop Building Type 056 Corvettes as Navy Shifts Focus to Larger Vessels” *South China Morning Post*, January 14, 2020, www.scmp.com/news/china/military/article/3046056/chinese-shipyards-call-time-corvettes-switch-larger-vessels.

³ 银河 [Yin He], 人民海军全驱舰队的建设 [“The Building of the PLA Navy's Complete Destroyer Fleet”], 舰载武器 [Shipborne Weapons], (July 2019), p. 20.

⁴ 樊永强, 李唐 [Fan Yongqiang and Li Tang], 海军 055 型驱逐舰南昌舰入列 [“Navy's Type 055 Destroyer Nanchang is Commissioned”], 新华 [Xinhua], January 12, 2020, www.xinhuanet.com/2020-01/12/c_1125451631.htm.

design.⁵ Nor does the Type 055 appear to be a playful experiment, since seven more are said to be in various stages of fitting out.⁶

With a displacement exceeding 12,000 tons, Type 055 is nearly double the tonnage of its Chinese destroyer predecessor and 23 meters longer.⁷ In an age when naval strategists had generally considered large surface combatants to be excessively vulnerable to torpedoes and anti-ship cruise missiles, the Chinese Navy appears to be turning conventional wisdom on its head. Instead, Chinese strategists assert that a close reading of recent naval history reveals the advantage of “going large” (大型化) when it comes to warship design.⁸ The program amounts to a bold assertion that China intends to wield a large and capable fleet across the world’s oceans. In a military sense, this assertion also indicates a certain faith prevailing in Beijing that China has mastered the requisite technologies to guard such prized capital ships. For naval strategists, therefore, the commissioning of the first Type 055 in January 2020 may represent a *Dreadnought* (1906) or even *Bismarck* (1939) type moment.⁹ The launching of these two famous ships dramatically altered the naval strategy landscape in their day. The same might well be said a few decades hence regarding the advent of Type 055.



Image 1. The Type 055 cruiser is significantly larger than its predecessors and reveals a new confidence in Chinese warship design. Source: *Modern Ships* 2018-16.

⁵ The U.S. Department of Defense classifies the Type 055—which it calls the *Renhai*-class—as a guided-missile cruiser (CG). See Office of the Secretary of Defense, *Military and Security Developments Involving the People’s Republic of China 2019*, U.S. Department of Defense, May 2019, p. 36, https://media.defense.gov/2019/May/02/2002127082/-1/-1/1/2019_CHINA_MILITARY_POWER_REPORT.pdf.

⁶ Yin He, “The Building of the PLA Navy’s Complete Destroyer Fleet,” p. 20.

⁷ For displacement, see 人民海军 [Official Weibo Account of the PLAN] January 25, 2020, 10:35pm, <https://m.weibo.cn/status/4464946849392220?>. For ship length, see Office of Naval Intelligence, “China People’s Liberation Army Navy (PLAN), Coast Guard, and Government Maritime Forces 2018 Recognition and Identification Guide,” July 2018, www.oni.navy.mil/Portals/12/Intel%20agencies/PLANavy.jpg?ver=2018-07-16-090249-333.

⁸ 曾庆, 赵东, 陆文强 [Zeng Qing, Zhao Dong, and Lu Wenqiang], 导弹驱逐舰--称雄大洋的海上多面手 [“The Missile Destroyer: Considered as the All-purpose Ocean Tool”], 人民海军 [People’s Navy], March 28, 2014, p. 4.

⁹ When the battleship *HMS Dreadnought* was commissioned in December of 1906, it was considered a revolutionary moment in naval affairs. The *Dreadnought*’s design incorporated such advances in armament, fire control, propulsion, and defensive armor that all pre-existing battleships were afterwards classified as “pre-Dreadnoughts” and a naval arms race to build more *Dreadnought*-class ships quickly ensued. It is not the authors’ contention that the Type 055’s appearance will have the same impact on naval affairs as did the great British battleship. Rather, it is proposed here that the new Chinese vessel’s expanded size, offensive firepower, integrated electronics and command and control capabilities represent a watershed moment in the evolution of Chinese naval capabilities. Thus, it may come to pass that the world historic importance of this ship class proves quite significant for the naval balance of power going forward.

Viewing this ship as a possible inflection point in Chinese naval development, this report will employ extensive and unique Chinese-language materials to closely describe its characteristics and discuss possible implications for contemporary naval strategy. Part 1 will examine its evolution and fabrication. Part 2 provides a summary of its capabilities and distinctive features, including propulsion, sensors, and weaponry. In part 3, the ship is briefly compared to its peers in the PLAN, the U.S. Navy, and the Japan Maritime Self-Defense Force. Part 4 assesses the strategic meaning of Type 055 for the Chinese Navy and discusses implications for the U.S. Navy.

Evolution and Fabrication

The history of Chinese large surface combatants is not a long and glorious one. Putting aside the sad tale of China's imported battleships ignominiously sunk in the Sino-Japanese War of 1894-95, the origins of the PLAN surface fleet are to be found in the Soviet transfer to the PRC of four old surface combatants in 1954. The Chinese Navy viewed these ships as "the four big diamonds" (四大金刚).¹⁰ At that time, the new Chinese Navy's focus was instead generally on aircraft, submarines and small fast boats. The exploits of the latter "mosquito fleet" have not been forgotten in today's PLA, apparently.¹¹ It was not until the early 1970s that China attempted to build its own destroyer. Its first credible surface combatants, the *Qingdao* and *Harbin*, were completed in the mid-1990s. Notably, both relied on U.S.-made General Electric LM-2500 gas turbines. In the decade that followed, China again borrowed from Russia and imported four *Sovremenny*-class destroyers to further strengthen its growing surface fleet.

However, it was the advent of two Type 052C destroyers in the PLAN's South Sea Fleet in 2004-2005 that truly launched China into the realm of modern surface combatant design and fabrication. Quickly dubbed "Red Aegis" by the Western media, these new ships were equipped with phased array radars, vertical launching systems (VLS), and long-range air defense and anti-ship missiles.¹² According to one Chinese analysis, their commissioning meant that China had "entered the leading group of countries for destroyer technology."¹³ After the completion of the first two hulls, the *Lanzhou* and the *Haikou*, there was an eight-year pause in production of Type 052C destroyers as China's historic *Jiangnan* shipyard was moved from central Shanghai to the massive, new fabrication facility at Changxing Island. The PLAN currently operates six Type 052C destroyers.

The 052D successor to the original "Red Aegis" has been produced quite rapidly since 2012. One American naval expert described this ship as a "more handsome Chinese cousin of the U.S. Navy's *Arleigh Burke*-class."¹⁴ A 2019 Chinese overview on the evolution of the PLAN destroyer fleet expects about 24 such ships to be in service by 2025. While allowing that the 052D is an

¹⁰ 立文 [Li Wen], 中国蓝水海军希望--055型驱逐舰 ["The Chinese Navy's Hope for Blue Water—the Type 055 Destroyer"], 中国经贸导刊 [*China Economic and Trade Guide*], (July 2017), p. 77.

¹¹ 赵传金 [Zhao Chuanjin], "八二四"海战: 隐蔽突然见奇效 ["The 8.24 Naval Battle: Stealth and Surprise Yield Miraculous Results"], 解放军报 [*PLA Daily*], December 10, 2019, www.81.cn/jfjbmap/content/2019-12/10/content_249560.htm.

¹² Dominic Desciscio, "Red Aegis," U.S. Naval Institute *Proceedings*, (July 2004), www.usni.org/magazines/proceedings/2004/july/red-aegis.

¹³ 卫天 [Wei Tian], 055是中国海军的目标舰吗: 从陆上模型看中国新一代驱逐舰的发展特点 ["Is the 055 the Benchmark Warship for the Chinese Navy? Development Prospects for the Chinese Navy's New Generation of Destroyer from the Perspective of the Ground-based Model"], 舰载武器 [*Shipborne Weapons*], (November 2014), p. 37.

¹⁴ Michael McDevitt, "The Modern PLA Navy Destroyer Force: Impressive Progress in Achieving a 'Far Seas' Capability," in Peter A. Dutton and Ryan D. Martinson (eds.) *China's Evolving Surface Fleet*, China Maritime Studies No. 14 (Newport, RI: Naval War College Press, 2017), p. 62.

“outstanding warship with high capabilities,” the overview candidly states that the “its technological level is certainly not the most advanced” (其技术水平却不是最先进的).¹⁵

The PLAN’s determination to go larger was apparently in part due to its reading of contemporary naval history. Chinese observers noted how America’s large destroyers provided significant additional firepower during recent conflicts, such as the 2003 Iraq War. Going back a couple of decades earlier, PLAN strategists also took a lesson from the Falklands War that smaller surface combatants could prove less capable and therefore more vulnerable to attack in modern naval warfare. The same source explains: “Today, all the world’s navies are making painstaking efforts in manufacturing capabilities for the design concept, internal layout, and propulsion systems that will enable them to become members of the ‘super destroyer’ club” (如今，世界各国海军都在设计思想、舱室布局和动力设备制造能力方面下苦功，拼命跻身成为‘超级驱逐舰’俱乐部成员).¹⁶

Evidently quite aware of significant turmoil in U.S. surface warship building plans, Chinese naval architects set out on an ambitious project.¹⁷ At the end of 2009, the Type 055 project received official approval and fabrication of the initial prototype began at the new Jiangnan shipyard outside Shanghai in 2014.¹⁸ Early in that same year, a distinctive 1:1 scale model of the superstructure of a new large surface combatant “appeared suddenly” in Wuhan—a somewhat shocking development since the Type 052D had just made its debut. This apparently reflects the PLAN’s approach to warship design, i.e., to simultaneously “fit out a generation, build a generation, and design a generation” (装备一代，生产一代，预研一代).¹⁹



Image 2. The Type 055 is being built simultaneously at shipyards in Shanghai and Dalian. The rate of fabrication is noteworthy, given that eight vessels are either complete or in build. Source: *Modern Ships* 2017-16.

¹⁵ Yin He, “The Building the PLA Navy’s Complete Destroyer Fleet,” p. 36.

¹⁶ This whole paragraph is drawn from Zeng Qing et al, “The Missile Destroyer,” p. 4.

¹⁷ *Ibid.*, p. 20.

¹⁸ 刘纾骅 [Liu Shuhua], 重装上阵南昌舰 [“The Heavily Armed Warship *Nanchang* is Ready for Battle”], 技术新知 [Technology and Knowledge], no. 10 (2019), p. 80.

¹⁹ Wei Tian, “Is the 055 the Benchmark Warship for the Chinese Navy?” pp. 38-38.

The first ship of the class was built in just 29 months, at a price estimated by one Chinese source to be US \$852 million (6 billion RMB).²⁰ This was a testament to the advanced facilities at the Jiangnan shipyard that most certainly realize efficiencies through modular shipbuilding. A Chinese analysis explains the significance of this fabrication process: “The start time of the first ship of the new large destroyer was in December 2014, and the construction period from start to launch is about 29 months. An interesting comparison is that the corresponding period for the 4000-ton 052 took about 24 months, and the 6000-ton 052B took about 27 months. Considering that the displacement of the large destroyer is almost the sum of the previous two, and the technical complexity is very considerable, we can probably have a more comprehensive understanding of a few key technologies such as ‘breakthrough in the design and building of large ships’ mentioned in the sparse official statements, with respect to assembly and construction” (考虑到大型驱逐舰的排水量几乎为前两者之和, 而技术复杂程度又犹有过之, 我们大概可以对为数不多的官方消息中提及的 ‘先后突破大型舰艇总体设计’ 总装建造等一系列关键技术这寥寥数语有一个更为观的认识).²¹

The *Nanchang*, first of the Type 055-class, was launched on 28 June 2017. While not a city commonly known to Westerners, Nanchang, capital of Jiangxi Province, has special meaning as the birthplace of the PLA. Thus, the name of this vessel can indeed be said to evoke a certain resonance for Chinese military officers and related officialdom.²² Not surprisingly, the current Commander of the Chinese Navy Admiral Shen Jinlong attended the launch of this new generation of warship.²³ According to a 2019 Chinese analysis, eight different Type 055 hulls are now at various stages of completion and these are expected to join the fleet by 2025. In addition to the Jiangnan facility near Shanghai, they are also being built in Dalian.²⁴

Ship Capabilities

The vessel’s large size is its most distinctive feature. More space allows it to be equipped with myriad advanced weapons and sensors. However, the ship also represents a revolutionary leap in sensor coordination, as represented by the single integrated mast. This section discusses each of these qualities in turn, beginning with propulsion, then turning to sensors, and finally rounding out the capabilities discussion with an examination of the ship’s armaments.

Propulsion

At over 12,000 tons displacement, the Type 055 is pushed through the water by four gas turbine engines capable of giving it a top speed of over 32 knots, according to a 2019 Chinese appraisal. Purportedly, 20 percent of the power generation in the Type 055 is currently “redundant,” due to “superior equipment and greater efficiency.” This suggests that the ship could accommodate upgraded systems.²⁵

An earlier Chinese description of the Type 055 notes that the indigenous gas turbines are the QC-280, giving the ship a combined 130,000 horsepower.²⁶ According to this analysis, Chinese scientists

²⁰ The same source estimated that this was double the cost of the 052D. Yin He, “The Building of the PLA Navy’s Complete Destroyer Fleet,” p. 38.

²¹ 徐辉 [Xu Hui], 新一代万吨导弹驱逐舰 [“The New Generation 10,000 Ton Missile Destroyer”], 现代舰船 [*Modern Ships*], no. 17 (2017), p. 37.

²² Liu Shuhua, “The Heavily Armed Warship *Nanchang* is Ready for Battle,” p. 78.

²³ Li Wen, “The Chinese Navy’s Hope for Blue Water—the Type 055 Destroyer,” p. 76.

²⁴ Yin He, “The Building of the PLA Navy’s Complete Destroyer Fleet,” p. 20.

²⁵ *Ibid.*, p. 36.

²⁶ Wei Tian, “Is the 055 the Benchmark Warship for the Chinese Navy?” pp. 39-40.

accomplished an “historic breakthrough” (历史性的突破) in 2008 that led to the indigenization of the Ukrainian-built GT25000. The QC-280 was apparently used in later 052C and also in the 052D destroyers. This analysis asserts “... even more advanced all electric drive has become the trend for all countries.”²⁷ It likewise explains that electric drive can reduce both fuel consumption by 10 percent and the ship size (5-10 percent), while increasing speed by one half knot.²⁸ Noise is also said to be significantly reduced. The same piece elaborates on a series of experiments carried out by the Institute 712 in Wuhan that yielded a 20 megawatt test in early 2011 and that is evaluated to be “sufficient to power a large warship.” Moreover, this source states that such propulsion systems were then tested aboard large coast guard vessels. Thus, it concludes that “... given China’s technological and development capabilities, it cannot be excluded that this ship uses such advanced technology.”²⁹

Other Chinese sources are a bit more guarded on this point. At the time of the first launch, one Chinese appraisal said “the new destroyer still possibly uses traditional means of propulsion.”³⁰ Likewise, another evaluation also contends that an “upgraded version 055” (改进型 055) will feature all-electric drive.³¹ In any case, the power generation results directly affect both the vessel’s handling, as well as the operation of sensors and weapons.

²⁷ *Ibid.*, p. 40.

²⁸ *Ibid.*

²⁹ *Ibid.*, p. 41.

³⁰ Xu Hui, “The New Generation 10,000 Ton Missile Destroyer,” p. 37.

³¹ Li Wen, “The Chinese Navy’s Hope for Blue Water—the Type 055 Destroyer,” p. 79.

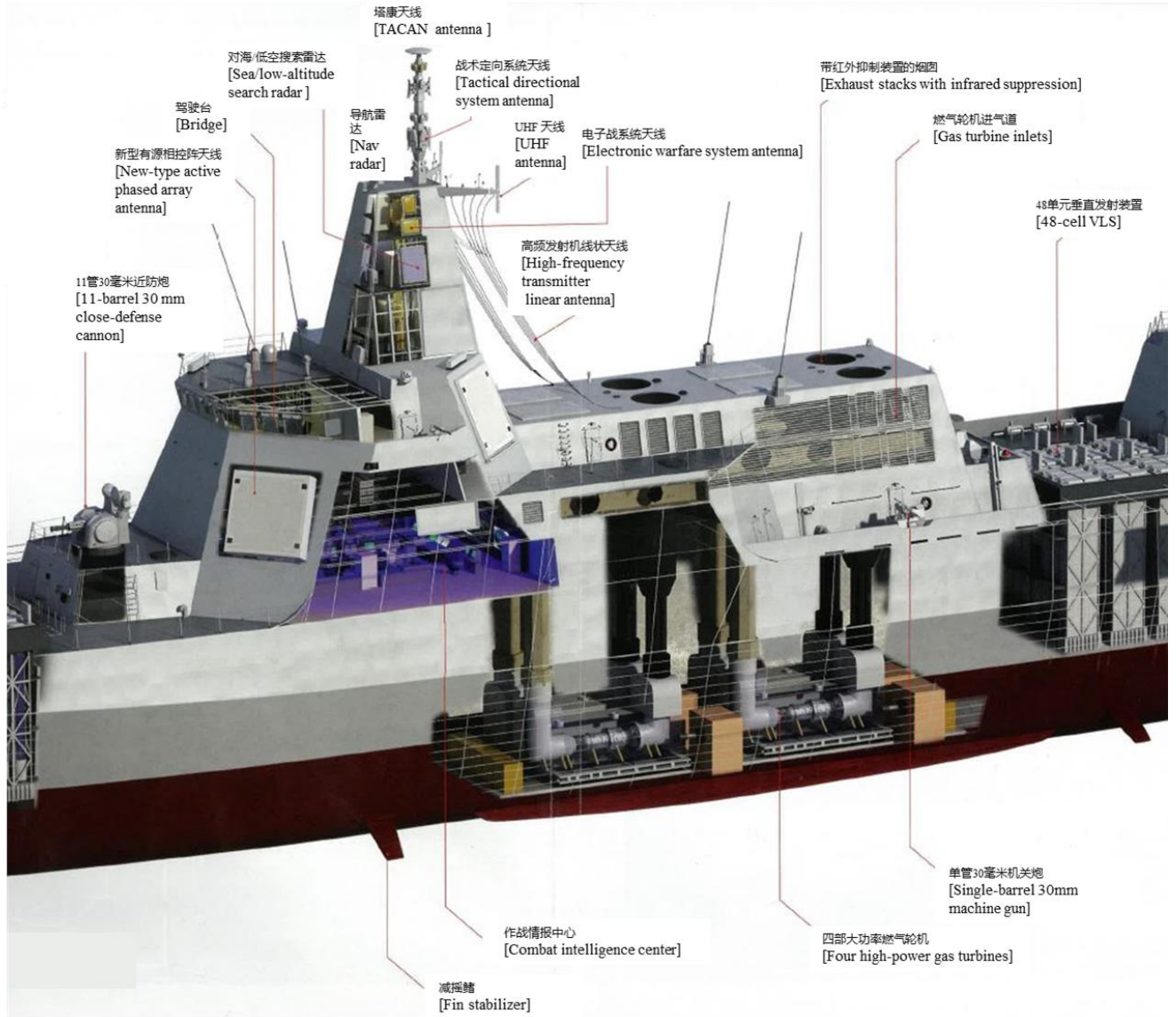


Image 3. A cutaway reveals attributes of the new vessel's design. Source: *Modern Ships* 2017-5.

Sensors

The Type 055 is most striking for the consolidation of its sensors within one single integrated mast, marking a major improvement for the ship's stealth characteristics.³² Notably, this degree of mast integration has not been achieved for the U.S. Navy's front-line destroyer, the *Burke* III, due to cost considerations. In contrast to its predecessors, the Type 052C and D, the new Chinese cruiser does not have major early warning radars on the rear half of the ship. By enclosing the four exhaust stacks within part of the superstructure and installing "infrared suppression devices" (红外抑制装置), the ship's designers have given the Type 055 significantly cleaner lines and lower observability.³³ Of course, this also implies much greater confidence in the sensors on the main mast of the ship. The ship's "small radar reflectivity" along with its low acoustic, electro-magnetic, and

³² Xu Hui, "The New Generation 10,000 Ton Missile Destroyer," p. 37.

³³ 中国海军大型驱逐舰想象图 ["Schematic of the Chinese Navy's Large Type Destroyer"], 现代舰船 [Modern Ships], no. 5 (2017), insert.

infrared signatures mean that “stealth and survivability have increased.”³⁴ Notably, a similar integrated mast may well form part of the design for the PLAN’s next generation frigate.³⁵

The 055 is reported to be the PLAN’s first warship to combine dual band planar radar arrays.³⁶ The S-band planar arrays located below the bridge and on the reverse side of the superstructure are reported to be 40 percent larger than those fitted to the 052D. This is said to afford a gain in sensing distance of 60 percent, including for “stealthy targets.”³⁷ The Type 052D planar arrays, Type 364A, were said to have a detection range of no less than 400km.³⁸ The Type 364B planar arrays on the 055 are expected to be even more capable.³⁹ The X-band radar for tracking low-flying targets is high on the mast. While having just 1/6 of the planar area of the S-band radar, the X-band sensing can apparently “make up for any inadequacies in the S-band radars.”⁴⁰ The other parts of the integrated mast are taken up with a navigation radar, tactical link, and ultra-high frequency (UHF) antennae. Above the X-band radar is an electronic warfare system.⁴¹ Another diagram labels large panels on either side of the bridge (below the mast) as intended for electronic warfare.⁴² The dual-band radar capability is said by this Chinese analysis to afford the Type 055 with an “exceptional capability to detect anti-ship missiles.”⁴³

For anti-submarine warfare (ASW) sensors, this vessel has both a bow-mounted sonar and a towed array system. It can also accommodate a pair of ASW helicopters.⁴⁴



Image 4. The integrated mast of the Type 055 cruiser increases stealth and also incorporate an X-band radar. In combination with S-band planar arrays, the dual band radar sensor system could be on par with the most advanced U.S. shipboard tracking systems. Source: *Modern Ships*, 2017-7.

³⁴ Li Wen, “The Chinese Navy’s Hope for Blue Water—the Type 055 Destroyer,” p. 76.

³⁵ 建造中国 5000 吨级护卫舰 [“Building China’s 5,000-ton Frigate”], 舰载武器 [*Shipborne Weapons*], (May 2018), insert.

³⁶ Yin He, “The Building of the PLA Navy’s Complete Destroyer Fleet,” p. 36.

³⁷ *Ibid.*, p. 37.

³⁸ Wei Tian, “Is the 055 the Benchmark Warship for the Chinese Navy?” p. 41.

³⁹ Li Wen, “The Chinese Navy’s Hope for Blue Water—the Type 055 Destroyer,” p. 78.

⁴⁰ Yin He, “The Building the PLA Navy’s Complete Destroyer Fleet,” p. 37.

⁴¹ “Schematic of the Chinese Navy’s Large Type Destroyer.”

⁴² 大型导弹驱逐舰 [“Large Type Missile Destroyer”] 现代舰船 [*Modern Ships*], no. 11 (2018), insert.

⁴³ Wei Tian, “Is the 055 the Benchmark Warship for the Chinese Navy?” p. 42.

⁴⁴ “Schematic of the Chinese Navy’s Large Type Destroyer.”

The Chinese Navy only began intensive work on developing command-and-control systems during the 1960s, and it was immediately apparent that the PLAN required much larger ships for harmonizing battle management in the missile age.⁴⁵ Limited information is available at present regarding the command-and-control system aboard Type 055. One detailed diagram places the large control space, labeled the “combat intelligence center” (作战情报中心), within the superstructure’s planar arrays on the main deck.⁴⁶ [see image 3] One description posits that the most modern Chinese command-and-control systems feature a high degree of automation. Combining sensors and weapons into one seamless digital display, it can facilitate command management of a battle group and supporting elements with voice, characters or imagery. Logically, the cruiser’s battle management system is said to link with AEW aircraft, submarines, satellites and other sources of intelligence.⁴⁷ It is claimed to approach the U.S. Navy’s *Aegis* system in its capabilities.⁴⁸ One survey of contemporary Chinese surface combatant command-and-control says the trend has been to “modularize, connect, standardize, and routinize” (模块化, 通用化, 标准化和系列化), in striving for the “comprehensive digitization of the battle space” (整个战略区数字化战场). That survey describes, not surprisingly, a command center with air combat, surface combat, and anti-submarine stations, wherein sensor operators are closely linked to the ship’s commander. Reliability, accuracy, and timeliness are emphasized. The new Chinese command systems are said to be capable of tracking hundreds of targets simultaneously. The survey presents a friend/foe identification scenario and relates that “rapid battle group air defense reaction is extremely urgent.” Finally, there is an emphasis on using “different nodes [to execute] a distributed type attack” (不同的节点分散式攻击).⁴⁹ As one expert on the PLA observes, information integration has been a top priority for the Chinese Navy over the last decade.⁵⁰

⁴⁵ 天鹰 [Tian Ying], 中国海军水面舰艇的信息化协同作战 [“Informatized Cooperative Engagement of the PLA Navy’s Surface Combatants”], 舰载武器 [Shipborne Weapons], no. 9 (2016), pp. 24-25. A similar argument is made in G. Graham Van Hook, “Air Warfare Commanders Need Large Surface Combatants,” U.S. Naval Institute *Proceedings* (December 2019), pp. 80-81.

⁴⁶ “Schematic of the Chinese Navy’s Large Type Destroyer.”

⁴⁷ There is little doubt that the PLA is focused on increasing the quality and variety of its intelligence sources queuing for targeting purposes. AEW aircraft are a particular focus of this effort. See, for example, 无预警机的中国航母如何作战 [“How an Aircraft Carrier Fight without Early Warning Aircraft”], 现代舰船 [Modern Ships], no. 10 (2018), pp. 32-37.

⁴⁸ Xu Hui, “The New Generation 10,000 Ton Missile Destroyer,” p. 37.

⁴⁹ Tian Ying, “Informatized Cooperative Engagement of the PLA Navy’s Surface Combatants,” pp. 26-27, 30.

⁵⁰ Nan Li, “Why is the Surface Fleet Gaining in Importance? Insights from PLA Doctrinal Writings,” in Peter A. Dutton and Ryan D. Martinson (eds.) *China’s Evolving Surface Fleet*, China Maritime Studies No. 14 (Newport, RI: Naval War College Press, 2017), p.50-52.

建造中国5000吨级护卫舰

LOOKING FORWARD TO THE PLAN'S NEW GENERATION FRIGATE

中国海军新一代5000吨级新型护卫舰设想图

★ 天一制图

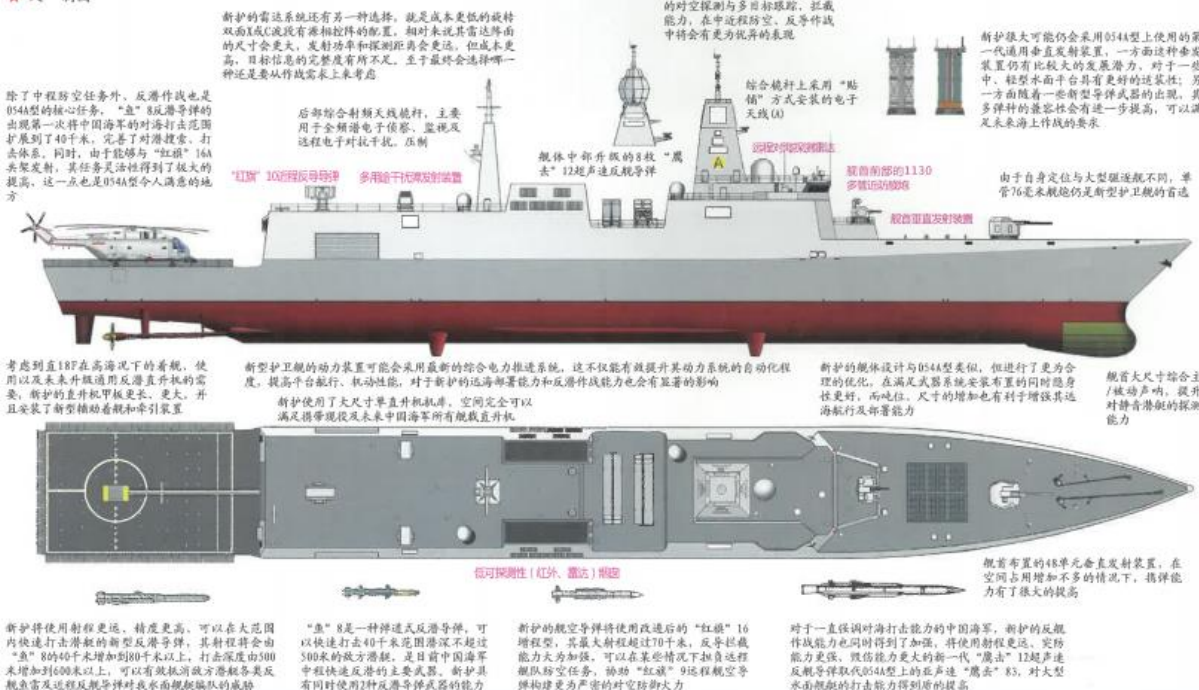


Image 5. The PLAN's next generation 5,000-ton frigate may replace the Type 054A, which is currently a workhorse for the Chinese Navy. Notably, its sensor suite resembles the Type 055, including especially the integrated mast. Source: *Shipborne Weapons* 2018 – 05.

Weapons

The Type 055 has been built with enough room to accommodate upgrades in weapons, self-defense systems, and other technologies of the future. This vessel has a beam of 20 meters (66 feet), length of 180 meters (591 feet) and a full displacement of over 12,000 tons.⁵¹ The enlarged cabins provide space for more armament and electronics, leading to a more comprehensive functionality and improved crew habitability.⁵² Therefore, the ship's overall volume should be significantly greater than that of a *Burke* IIA or *Ticonderoga*.⁵³

⁵¹ Liu Xuanzun, "China's New Type 055 Destroyer among Best in the World: Experts," *Global Times*, June 4, 2019, <http://www.globaltimes.cn/content/1153087.shtml>. The displacement remains somewhat debatable, with some sources suggesting that ship could displace 13,000 tons. See, for instance, "First public appearance of the Chinese Nanchang Type 055 destroyer," *Navy Recognition*, April 24, 2019, <https://navyrecognition.com/index.php/news/defence-news/2019/april/7014-first-public-appearance-of-the-chinese-nanchang-type-055-destroyer.html>.

⁵² Yin Xiaoyang, "Type 055 destroyer: Symbol of Chinese Navy's development," CGTN, April 21, 2019, <https://news.cgtn.com/news/3d3d674d354d544d34457a6333566d54/index.html>.

⁵³ Rick Joe, "All You Need to Know About China's New Stealth Destroyer." *The Diplomat*, June 8, 2018, <https://thediplomat.com/2018/06/all-you-need-to-know-about-chinas-new-stealth-destroyer/>.



Image 6. This graphic illustrates seven different missile types compatible with the vertical launch system (VLS) aboard the Type 055. These include two types of anti-ship cruise missiles, three types of anti-air missiles, an anti-submarine rocket-torpedo system, as well as a land-attack cruise missile. Source: *Modern Ships* 2017-17.

The universal VLS for Type 055 might well be larger and more advanced, with a width of .85m (2'9") and a depth of 9m (29'6") per cell.⁵⁴ It incorporates surface to air missiles (SAM), anti-submarine rocket (ASROC), land attack cruise missiles (LACM), anti-ballistic missile (ABM) interceptors and advanced anti-ship cruise missiles (ASCM).⁵⁵ It possesses a total of 112 VLS cells, 64 forward and 48 aft. The large number of VLS cells "shows the combat and rapid-reaction capability" of the new ship, according to military expert Song Zhongping. "Since recharging a VLS is relatively difficult, the more VLS cells a vessel takes, the stronger and quicker its reaction," he said.⁵⁶ Chinese analyses show a keen awareness that "the consumption of ship-to-air missiles in an actual engagement is very large" (实际交战中舰空导弹的消耗量是非常巨大的), and this recognition could have influenced the decision to equip the 055 with a very large missile magazine.⁵⁷

The VLS design aboard Type 055 includes both hot and cold cell ignition.⁵⁸ The cells are also bigger than those found on U.S. Navy ships, yielding perhaps 60 percent more volume than American variants, according to one analysis.⁵⁹ Potentially, this larger size may give the cells the ability to

⁵⁴ 银河 [Yin He], 龙之剑匣: 中国海军舰载垂直发射装置的研制与技术发展 ["The Dragon's Sword Chest: Development of the Chinese Navy's Shipborne Vertical Launch Systems"], 舰载武器 [Shipborne Weapons], (February 2016), p. 29. This source does not make a definitive claim with respect to the VLS system on Type 055, but these measurements match those cited by Du Wenlong. 杜文龙 [Du Wenlong], *Weibo*, April 10, 2018, 7:48pm, <https://m.weibo.cn/status/4227525691367078>.

⁵⁵ "Type 055," *Deagel*, June 28, 2017, www.deagel.com/Fighting-Ships/Type-055_a002885001.aspx.

⁵⁶ "China Launches First Type 055 10,000-ton-class Guided-Missile Destroyer," *Deagel*, June 28, 2017, www.deagel.com/news/China-Launches-First-Type-055-10000-ton-class-Guided-Missile-Destroyer_n000016716.aspx.

⁵⁷ Wei Tian, "Is the 055 the Benchmark Warship for the Chinese Navy?" p. 44.

⁵⁸ Liu Xuanzun, "China's New Type 055 Destroyer among Best in the World: Experts."

⁵⁹ Jeffrey Lin and P.W. Singer, "China Launched Two More Massive Type 055 Warships," *Popular Science*, July 17, 2018, <https://www.popsci.com/china-type-055-warships-launch/>.

deploy an anti-ship ballistic missile (ASBM) weapon, but that possibility was notably not broached in any of the detailed Chinese naval surveys examined for this study.⁶⁰ Still, this possibility was suggested by the well-informed military analyst Du Wenlong, a retired PLA officer, who commented that capability aboard Type 055 would constitute a “nightmare” for American aircraft carriers.⁶¹ Official U.S. military assessments seem to confirm Du’s claims in this regard.⁶² The universal VLS comes in three lengths and the beam and draft of the vessel is likely sufficient for all 112 VLS to accommodate the largest sizes.⁶³

For the Type 055, the air and missile defense mission is described as “top priority” (重中之重).⁶⁴ SAMs for air defense include the HHQ-9B long-range surface to air missile and the HQ-16B mid-range air defense missile. It was additionally reported that Type 055 could be equipped with a type of mid-close-range surface-to-air missile developed from the DK-10 missile.⁶⁵

For strike missiles, the Type 055 will be equipped with the CJ-10 land-attack cruise missile.⁶⁶ Since the 1990-91 Persian Gulf War, Chinese strategists have been convinced of the importance of employing ships for the land-attack role.⁶⁷ That mission could well increase in salience as Beijing believes that Washington intends to employ land-based missiles “to block the Chinese Navy’s entry into the Pacific” (阻止中国海军深入太平洋) during wartime.⁶⁸

The Type 055 would carry several different ASW weapons and launch mechanisms, to include an ASW weapon that could be launched from the VLS farm,⁶⁹ the Yu-8 anti-submarine rockets (ASROC), and Yu-7 torpedoes launched from two sets of torpedo tubes.⁷⁰

Anti-surface warfare (ASuW) weapons include the YJ-18 anti-ship missile, with a range of 290 nautical miles.⁷¹ The weapon has been described as a “dual speed control ASCM” (双速制反舰导弹), since it enjoys certain advantages of both subsonic missiles (e.g. longer range,

⁶⁰ See, for example, “Schematic of the Chinese Navy’s Large Type Destroyer,” Wei Tian, “Is the 055 the Benchmark Warship for the Chinese Navy?” pp. 37-45; or Xu Hui, “The New Generation 10,000 Ton Missile Destroyer,” pp. 35-42.

⁶¹ Du Wenlong, *Weibo*.

⁶² *Military and Security Developments Involving the People’s Republic of China 2019* p. 59.

⁶³ Rick Joe, “All You Need to Know about China’s New Stealth Destroyer.”

⁶⁴ Li Wen, “The Chinese Navy’s Hope for Blue Water—the Type 055 Destroyer,” p. 78.

⁶⁵ Liu Xuanzun, “China’s New Type 055 Destroyer among Best in the World: Experts.”

⁶⁶ Ryan Pickrell, “China Shows Off Its New Destroyer During Massive Display of Naval Power,” *Business Insider*, April 23, 2019, www.businessinsider.nl/china-shows-off-new-type-055-destroyer-during-massive-naval-parade-2019-4/?jwsourc=cl.

⁶⁷ Li Wen, “The Chinese Navy’s Hope for Blue Water—the Type 055 Destroyer,” p. 79.

⁶⁸ 张雪松, 雨如啸 [Zhang Xuesong and Yu Ruxiao], 美国大陆军重建中导打击体系设想 [“A Concept for a U.S. Ground-based Attack System”], 舰船知识 [*Naval & Merchant Ships*], no. 8 (2019), p. 69.

⁶⁹ Liu Zhen, “Five Things to Know About China’s Home-Built Type 055 Destroyer, Guardian of the Next-Generation Aircraft Carrier,” *South China Morning Post*, August 5, 2018, www.scmp.com/news/china/diplomacy-defence/article/2158059/five-things-know-about-home-built-destroyer-will-guard. Regarding the Yu-8 rocket-torpedo, see also 中国海军新型飞航式反潜导弹 [“The Chinese Navy’s New Cruise-missile Type Anti-submarine Missile”], 舰载武器 [*Shipborne Weapons*], (February 2018), pp. 36-37.

⁷⁰ “Type 055 Class Destroyers,” *Naval Technology*, www.naval-technology.com/projects/type-055-class-destroyers/.

⁷¹ *Military and Security Developments Involving the People’s Republic of China 2019*, p. 37

lighter design) and supersonic missiles (e.g. penetration capability).⁷² It has a light design and heavy explosive warhead that can severely damage a warship with just one strike.⁷³

The forward deck gun is an improved 130 millimeter single-barreled H/PJ-38. It is also found on Type 052D and can fire 40 shells a minute out to a trajectory of 30 km.⁷⁴



Image 7. A graphic image portrays the launch of a YJ-18 ASCM, a lethal missile based on the Russian SSN-27. The cruiser boasts a large magazine of 112 VLS cells. In addition to strong air and missile defense armament, therefore, the vessel is also a potent strike platform. Source: *Modern Ships* 2017-05.

The Type 055 can protect itself with an array of advanced defense measures. These weapons include the H/PJ-11 30 mm close-in weapon system, which can fire tens of thousands of rounds per minute. It also possesses the HHQ-10 close-range anti-missile system, which includes 24 units to intercept supersonic anti-ship missiles.⁷⁵ Chinese strategists are indeed concerned with the American LRASM system, and they are focused on how to defeat its anti-jamming and autonomous targeting systems.⁷⁶ The Type 055 cruiser likely includes 324mm torpedo tubes located amidships to protect from short-range ASW threats.⁷⁷ Future variants may well include missiles to knock out hypersonic vehicles and

⁷² 施展 [Shi Zhan], “鹰击”18: “俱乐部”导弹中国版 [“YJ-18”: the Chinese Version of the ‘Klub’ Missile?”], 舰船知识 [Naval and Merchant Ships] (February 2015), pp. 72-76.

⁷³ Liu Xuanzun, “China’s New Type 055 Destroyer Among Best in the World: Experts.”

⁷⁴ Ibid.

⁷⁵ Ibid.

⁷⁶ See, for example, 张传华 [Zhang Chuanhua], LRASM 为什么难以防御 [“Why the LRASM Is Difficult to Defend Against?”], 现代舰船 [Modern Ships], no. 11 (2018), pp. 71-75.

⁷⁷ Rick Joe, “All You Need to Know About China’s New Stealth Destroyer.”

mid-course ballistic missiles defense interceptors. These systems will rely on the dual-band radar, advanced combat systems, and large VLS farm to combat such attacks.⁷⁸

There are reports of different advanced weapon systems that are in developing stages to be incorporated into this vessel. They could include an electromagnetic rail gun, the anti-ship ballistic missile (ASBM) discussed above, high energy lasers, and high-energy radio-frequency equipment. Military observers state that the PLAN is striving to develop an electromagnetic railgun, which, if it becomes operational, could possibly shoot hypersonic projectiles at Mach 7.⁷⁹ Some suggest that the PLAN could have this technology by 2025.⁸⁰ Among existing Chinese surface combatants, only the Type 055 has the space for the electrical generators needed to power this weapon.⁸¹ "Though the U.S. has been openly developing electromagnetic guns for years, it doesn't mean that China is far behind in this field, as the latter [usually] keeps quiet about its progress due to secrecy concerns," Chen Shuoren, a Chinese military commentator, told the *Science and Technology Daily*.⁸² The *Global Times* quoted military commentator Song Zhongping as saying the new ships will be armed with the new weapons. He also said, "The Type 055 is the best fit for China's future electromagnetic gun, since the all-electric warship could meet the weapon's huge power supply demand."⁸³ During 2018, an older Chinese amphibious landing craft was reported to be on sea trials, serving as a test bed for the Chinese rail gun project.⁸⁴ There is ample evidence, moreover, in Chinese research sources that the rail gun is a high priority for the Chinese Navy.⁸⁵ It is also reported that future Type 055 cruiser variants will have ABM capability, stated an anonymous expert,⁸⁶ high energy laser equipment⁸⁷, and given its size, it could also serve as a platform to develop the next generation of weapons, such as high-energy radio-frequency equipment, analyst Zhou Chenming offered.⁸⁸

⁷⁸ Tyler Rogoway, "China's Type 055 Super Destroyer Is A Reality Check for the U.S. and Its Allies," *The Drive*, June 28, 2017, www.thedrive.com/the-war-zone/11941/chinas-type-055-super-destroyer-is-a-reality-check-for-the-us-and-its-allies.

⁷⁹ Liu Xuanzun, "China's New Type 055 Destroyer Among Best in the World: Experts."

⁸⁰ Jeffrey Lin and P.W. Singer, "China Launched Two More Massive Type 055 Warships."

⁸¹ Ibid.

⁸² "Chinese Electromagnetic Rail Gun May Be Intended for Type 055 Destroyer," *Deagel*, February 5, 2018, www.deagel.com/news/Chinese-Electromagnetic-Rail-Gun-May-Be-Intended-for-Type-055-Destroyer_n000017401.aspx.

⁸³ Jamie Seidel, "China's 'supergun' to be fitted to new destroyers," *News Corp Australia Network*, July 5, 2018, www.news.com.au/technology/innovation/military/chinas-supergun-to-be-fitted-to-new-destroyers/news-story/ab4866259d8321ef9525819fc6c8ddb8.

⁸⁴ Kyle Mizokami, "China's Railgun Has Reportedly Gone to Sea," *Popular Mechanics*, December 31, 2018, www.popularmechanics.com/military/research/a25714579/chinas-railgun-gone-to-sea/.

⁸⁵ See, for example, 马新科, 邱群先, 何行, 高博, 耿昊, 贺旭光 [Ma Xingke, Qiu Qunxian He Hang, Gao Bo, Geng Hao, and He Xuguang], 螺栓紧固式轨道炮后坐规律研究 ["Research on the Recoil Law of Bolt-fastened Railgun"] 兵工学报 [Acta Armamentarii], no. 6 (June 2019), pp. 1297-1303; 马伟明, 鲁军勇, 李湘平 [Ma Weiming, Lu Junyong, and Li Xiangping], 电磁发射超高速一体化弹丸 ["Electromagnetic Launch Hypervelocity Integrated Projectile"], 国防科技大学学报 [Journal of National University of Defense Technology], no. 4 (2019), pp. 1-10; 熊诗成, 鲁军勇, 郑宇锋, 曾德林 [Xiong Shicheng, Lu Junyong, Zheng Yufeng, and Zheng Delin], 电磁发射用脉冲功率电源放电建模分析 ["Modeling and Analysis of Discharge of Pulsed Power Supply for Electromagnetic Launch"], 国防科技大学学报 [Journal of National University of Defense Technology], no. 4 (2019), pp. 53-59.

⁸⁶ Liu Xuanzun, "China's New Type 055 Destroyer Among Best in the World: Experts."

⁸⁷ Liu Zhen, "Five Things to Know About China's Home-Built Type 055 Destroyer;" See also Yin He, "The Building the PLA Navy's Complete Destroyer Fleet," p. 38.

⁸⁸ David Axe, "Naval Deathmatch: America's Zumwalt Stealth Destroyer vs. China's New Type 55 Warship," *The National Interest*, May 28, 2017, <https://nationalinterest.org/blog/the-buzz/naval-deathmatch-americas-zumwalt-stealth-destroyer-vs-20891>.

If the Type 055 is to conduct extended ASW missions, the ship will benefit from having two aircraft onboard. Type 055 is equipped with a single spot flight deck, a RAST (Recovery, Assist, Secure, and Traverse) system, and two hangar bay doors. The flight deck is designed for medium size rotorcraft: either the Z-9 or the much larger Z-18.⁸⁹ With the Z-20F coming on-line as the new airborne ASW platform, the flight deck and hangar are intended to accommodate two of these aircraft. [see image 10] The Z-20F will have a larger footprint than its predecessor, but the smaller *Burke* IIA/III have made room for this size aircraft.⁹⁰ The Z-20 first flew in 2013 and a graphic image of this helicopter graced the cover of the Chinese naval magazine *Modern Ships* in early 2014, implying the importance of this program. The graphics and accompanying text are not shy about the close relationship of the Z-20 to the U.S. Navy's SH-60, including its very prominent chin-mounted "sea search radar."⁹¹ [see image 9 below] Accompanying articles make clear that Russian ASW helicopters are not able to deliver the detection capabilities that the PLAN desires for its new surface combatants. It is also conceivable that the new Z-18F will fit aboard the Type 055.⁹²

Comparing the Type 055 to Its Contemporaries

The Type 055 cruiser might be described as a cross blend of the American *Ticonderoga* and *Zumwalt* ship classes.⁹³ The Type 055 meets and likely exceeds the capabilities of the U.S. *Arleigh Burke*-class, the Japanese *Atago*-class, and just about any other large surface combatant in service in the world today, at least according to some assessments.⁹⁴ "In some respects—such as the size, radar system, missile capacity and the multi-functionality in use—the Type 055 has now caught up with, or at least it is on the same level as, the United States' main destroyer," Li Jie, a leading Beijing-based naval expert, observed.⁹⁵ The capabilities of the Type 055 surpass South Korea's DDG-991 and Japan's *Atago*-class destroyer, which each displace 10,000 tons. Not surprisingly, Chinese naval analysts have followed the South Korean and Japanese large surface combatant programs with great interest. They have noted the apparent victory of the so-called "blue-water faction" (藍水派) in Seoul, but also see a number of warship development obstacles there—often related to mixing non-indigenous weapons and sensors.⁹⁶ Nevertheless, it is certainly worth noting that the South Korean *Sejong-the-Great*-class wields an even larger missile battery (128 VLS cells) than the Type 055 (112). Appraising Japan's latest large destroyers, there is a sense they "can challenge China's newest" cruiser. It is supposed that the Type 055 sensors could be superior, but that the Japanese vessel likely has better integration for command-and-control.⁹⁷

⁸⁹ "Type 055 Class Destroyers."

⁹⁰ Ibid.

⁹¹ 李丰 [Li Feng], 中国直-20 新型直升机 ["China's New Z-20 Helicopter"], 现代舰船 [Modern Ships], no. 2 (2014), insert.

⁹² 王瀚 [Wang Han], 直-20 新型直升机的舰载应用前景分析 ["Analysis of the Prospects for Shipborne Employment of the New Type Z-20 Helicopter"], 现代舰船 [Modern Ships], no. 2 (2014), p. 48.

⁹³ Tyler Rogoway, "China's Type 055 Super Destroyer Is A Reality Check."

⁹⁴ Brian Kalman, "China Launches First Type 055 Destroyer," *South Front*, June 29, 2017, <https://southfront.org/china-launches-first-type-055-destroyer-first-step-shifting-naval-balance-power-pacific/>.

⁹⁵ David Axe, "Naval Deathmatch."

⁹⁶ See, for example, 江南 [Jiang Nan], '吃撑了'的 KDX-II ["The KDX-II Has Been 'Swallowed Up'"], 现代舰船 [Modern Ships], no. 19 (2019), p. 23; and 金琉璃 [Jin Liuli], 韩国新一代主力驱逐舰 KDDX 评析 ["An Evaluation of South Korea's New Generation Destroyer KDDX"], 现代舰船 [Modern Ships], no. 6 (2019), p. 62.

⁹⁷ '摩耶' 挑战中国海军最新驱逐舰 ["'Maya' Will Challenge China's Newest Destroyer"], 现代舰船 [Modern Ships], no. 18 (2019), pp. 45-49.

China's Type 055 makes extensive use of technologies pioneered by China's Type 052D destroyer, and some contend that the new cruiser considerably surpasses all rival destroyers currently in service in its capabilities.⁹⁸ Others said the Type 055 was the world's second most powerful surface combatant—after the U.S. Navy's DDG-1000, or the *Zumwalt*-class. For example, the Type 055 is evolutionary in form and function, with the major innovation being its size. *Zumwalt*, on the other hand, is revolutionary for its stealth and could be deployed close to enemy shores for the purposes of bombarding targets on land.⁹⁹ *Zumwalt* carries just 80 VLS cells. These are lined up along the edges of *Zumwalt*'s hull—the idea being that missile cells can also function as “armor,” partially absorbing the force of a missile or gun strike. Thus, *Zumwalt*'s designers traded missile capacity for durability. The Type 055's builders, by contrast, stuck to traditional design principles, maximizing firepower at the cost of damage-resistance.¹⁰⁰ As related above, the new cruiser relies on a dual-band radar system, which is actually similar in concept to the one that was supposed to be deployed on the *Zumwalt*-class. Notably, that system is currently equipping only the *Ford*-class aircraft carrier, in so far as concerns the U.S. Navy.¹⁰¹ Some maintain, nevertheless, that the quality of China's shipbuilding remains unproven, including the level of integration between their ships' sensors and weapons, the reliability of the missiles, and these missiles' overall performance abilities.¹⁰²

	Type 055	Type 052D	Arleigh Burke	Zumwalt	Atago Class
Tonnage	12,000 ¹⁰³	8,500 ¹⁰⁴	9,100	15,000 ¹⁰⁵	10,000 ¹⁰⁶
Length	180 m	157	155	183 ¹⁰⁷	167 ¹⁰⁸
Beam	20 m	17	20	25	21
Speed	30 knots	30	31	30	30
VLS	112	64	96	80	96
Radar	X-, S- band	Type 346A phased array	Aegis SPY-1D(V)	SPY-3 X-, S- band	AEGIS
Propulsion	COGAG 4xQC-280 *future IEPS ¹⁰⁹	CODOG 2xQC-280	Gas Turbines 4xGE LM 2500	IPS 2xMTG 2xATG	COGLAG 4xGT GE system
Range	5,000 NM	4,000	4,400 NM	NA	5,000
Helicopter	2xZ-20	1xZ-9	FLT IIA: 2xH-60	2xH-60	1xH-60

⁹⁸ "China's Elite Type 055 Destroyers—Not its Aircraft Carriers—Are the PLA's Key to Naval Primacy in the Pacific," *Military Watch Magazine*, February 9, 2019, <https://militarywatchmagazine.com/article/destroyers-not-carriers-are-china-s-key-to-naval-primacy-in-the-pacific>.

⁹⁹ David Axe, "Naval Deathmatch."

¹⁰⁰ Ibid.

¹⁰¹ Tyler Rogoway, "China's Type 055 Super Destroyer Is A Reality Check."

¹⁰² Ibid.

¹⁰³ "Type 055."

¹⁰⁴ "China's Elite Type 055 Destroyers—Not its Aircraft Carriers—Are the PLA's Key to Naval Primacy in the Pacific."

¹⁰⁵ Liu Zhen, "Five Things to Know About China's Home-Built Type 055 Destroyer."

¹⁰⁶ David Axe, "Naval Deathmatch."

¹⁰⁷ Liu Zhen, "China Boosts Naval Power with Asia's Most Advanced Warship," *South China Morning Post*, June 28, 2017, www.scmp.com/news/china/diplomacy-defence/article/2100335/china-launches-its-best-and-biggest-warship-push-build.

¹⁰⁸ David Axe, "Naval Deathmatch."

¹⁰⁹ Rick Joe, "All You Need to Know About China's New Stealth Destroyer."

Type 055 and Chinese Naval Strategy

As illustrated in the sections above, the Type 055 cruiser not only represents a significant departure from historical Chinese warship design but its formidable size is in direct opposition to most current warship construction around the world. That global trend seeks to incorporate high technology weapons and sensors into relatively smaller hull forms. Even some of China's premier strategy documents emphasize the tendencies toward unmanned and "ever smaller" (小型化) platforms in contemporary naval warfare.¹¹⁰ Yet, the new Chinese cruiser and its high build rate go against that trend. Three questions, therefore, remain to be answered. Why is the Type 055 being built? How will it fit into Beijing's evolving naval doctrine and strategy? A final question is why is China seemingly in such a hurry to build these behemoths and send them to sea?

Given the relatively large increase in expense of the new cruiser over the earlier Type 052D destroyer design, it is doubtful that the concept of the Type 055 was developed in isolation, but rather fits as a key piece into a reasonably coherent and holistic vision of China's future navy. In particular, it seems highly likely that Type 055 will be deployed along with PLAN aircraft carriers as part of Chinese carrier strike groups. In this role, the Type 055 would likely serve as the main air defense command and control platform for the battle group, much like the *Ticonderoga*-class cruisers of the U.S. Navy. The Type 055's expanded weapons magazine size, along with sophisticated sensor suite and command and control capability, would seem to make it uniquely adapted to the role of aircraft carrier escort, especially during out-of-area naval operations.

The 112 VLS cells of the Type 055 represent a significant growth in capacity over its predecessor, the Type 052D, which has just 64. Much like the *Ticonderoga*-class, which was designed with the SM-2 surface-to-air missile in mind, the Type 055 will go to sea with the HHQ-9B long-range SAM as well as the shorter range HQ-16B. These missiles give it a layered anti-air warfare capability with which to defend ships sailing in company. That is most likely the main mission of the Type 055, and it has become very common for PLAN-related literature to portray the new destroyer in close company with the Chinese carriers. For example, a 2017 graphic scheme of a "Chinese aircraft carrier strike group" (中国航母战斗群) illustrates two Type 055 around the notional carrier at a distance of approximately 15km, with one 45 degrees of the starboard bow and the other at 225 degrees off the port stern. Notably, the formation also consists of three other destroyers (Type 052C and D), three frigates (Type 054A), and a single SSN (Type 093). Thus, the total surface escort for this single Chinese carrier is comprised of 8 surface combatants, of which a quarter are Type 055. [See image 8]¹¹¹

Not surprisingly, Chinese engineers appear to be busy building the necessary software models to defend the battle group against aerial threats. Such research involves, for example, "determining the index weights of aerial targets [to enable improved] threat assessment for the warship formation" in order to undertake "cooperative combat."¹¹² Similarly, another recent Chinese research probe examines "missile fire conflict judgment" to "effectively solve the issue of formation air defense

¹¹⁰ 肖天亮 [Xiao Tianliang], ed., 战略学 [Science of Military Strategy], (Beijing: National Defense Univ. Press, 2015), p. 340.

¹¹¹ 徐辉 [Xu Hui], 走向大洋: 中国海军航母战斗群未来构想 ["Headed for the Big Ocean: The Future Structure of China's Aircraft Carrier Strike Group"], 现代舰船 [Modern Ships], no. 17 (2017), p. 44.

¹¹² 样璐, 刘付显, 张涛, 朱丰 [Yang Lu, Liu Fuxian, Zhang Tao, and Zhu Feng], 基于组合赋权 TOPSIS 法的舰艇编队空中目标威胁评估模型 ["An Aerial Target Treat Assessment Model Based on Combined-Weighting TOPSIS Method for Warship Formation"], 电光与控制 [Electronic Optics and Control], no. 8 (2019), pp. 6-11.

weapon conflict.”¹¹³ There is evidence, moreover, that Chinese naval analysts are studying American doctrine on this subject, including such delineations as the “fighter engagement zone” (FEZ), the “joint engagement zone” (JEZ) and “missile engagement zone” (MEZ).¹¹⁴



Image 8: This notional sketch of a Chinese aircraft carrier battle group features two Type 055 cruisers (designated by yellow squares inserted by authors) in close proximity to the Chinese carrier. This graphic may imply that the most important mission of the new Chinese cruiser is actually air and missile defense for the PLAN’s new carrier groups. Source: *Modern Ships* 2017-17

Although the Type 055 cruiser was not constructed specifically with anti-submarine warfare in mind, it does have significant ASW capability as discussed earlier. An official Chinese assessment indeed observed a few years ago that large combatants should form the “backbone” (骨干) of both anti-air and anti-submarine fleet defense. The new Chinese cruiser is equipped with towed array sonar, vertically launched rocket propelled torpedoes, and the ability to embark two anti-submarine warfare capable helicopters. Such ASW capability would make the Type 055 a centerpiece of the “three-layer defense web against even nuclear submarines.”¹¹⁵ One Chinese assessment of the Type 055’s ASW capabilities observes that the ship has an especially large hangar that will house China’s newest shipboard helicopters. Thus, it is concluded that “claims in the U.S. press that China’s new type

¹¹³ 张朱峰, 吴玲 [Zhang Zhufeng and Wu Ling], 编队区域防空航空导弹冲突判断与消解 [“Detection and Resolution of Conflict between Ship to Air Missiles in Formation Zone Air Defense”], 现代防御技术 [Modern Defense Technology], no. 4 (2019), p. 52.

¹¹⁴ 高树和 [Gao Shuhe (trans.)], 现代海战中的防空战 [“Air Defense in Modern Naval Warfare”], 现代舰船 [Modern Ships], no. 17 (2017), p. 28.

¹¹⁵ Liu Xuanzun, “China’s New Type 055 Destroyer Among Best in the World: Experts.”

destroyer will be easily attacked by submarines have no basis at all” (美国媒体称中国新型驱逐舰易遭潜艇攻击并没有足够的依据).¹¹⁶



Image 9. This is a graphic depiction of China’s new Z-20 shipborne helicopter – a rather close copy of the highly effective American SH-60. Shipborne helicopters have long been a weakness for the PLAN and it has relied on the Russian-imported Ka-28. However, the Z-20, along with the larger Z-18, could substantially improve the Chinese Navy’s capabilities in this crucial domain. Source *Modern Ships* 2014-2B

The proposed numbers of Type 055s being built, however, seem to suggest that other missions are being contemplated for the platform. Although suggested numbers vary, some Western sources claim up to 24 of the ships may be built.¹¹⁷ That number would seem excessive for ships designed solely for aircraft carrier escort, since preliminary indications suggest that Beijing is looking to wield four carrier groups “at the front line” over the long term.¹¹⁸ If China indeed intends to operate four aircraft carriers, then eight Type 055 cruisers seems to be the right number for the PLAN, deploying the ship to solely escort aircraft carriers. However, if the ship class is extended to even greater numbers, then one should expect to see it filling more varied roles within PLAN naval strategy.

Given the stated command and control capability of the ship, as well as its size, which should enable the embarkation of a staff, the new Chinese cruiser could be used as a flag ship for PLAN surface action groups (SAG) operating relatively far afield. To date, Type 071 LPDs have been periodically utilized as command platforms for counterpiracy task force missions in the Babel Mandeb.¹¹⁹ These task forces have been typically composed of two surface combatants and a supply ship. Once

¹¹⁶ 蓝箭 [Lan Jian], 试析美媒唱衰: 中国新型驱逐舰的反潜艇能力 [“Analysis of the Claim of the American Media: The Anti-Submarine Capability of China’s New Destroyer”], 舰载武器 [Shipborne Weapons], no. 8 (2016), pp. 10-11.

¹¹⁷ Kyle Mizokami, “Can the U.S. Navy Beat China’s New Type 055 Destroyer In a Fight?” *The National Interest*, September 19, 2019, <https://nationalinterest.org/blog/buzz/can-us-navy-beat-chinas-new-type-055-destroyer-fight-83981>

¹¹⁸ Minnie Chan and Guo Rui, “China Will Build 4 Nuclear Aircraft Carriers in Drive to Catch US Navy, Experts Say” *South China Morning Post*, February 6, 2019, www.scmp.com/news/china/military/article/2185081/china-will-build-4-nuclear-aircraft-carriers-drive-catch-us-navy.

¹¹⁹ 大国担当 中国形象: 中国海军护航档案 [“Taking Charge Like a Great Power: A Record of the Chinese Navy’s Escort Operations”], 央广军事 [China National Radio Online], December 21, 2018, http://military.cnr.cn/ycdj/20181221/t20181221_524457874.html

Type 055 cruisers become available, they may make a more suitable platform around which to build such task forces. Indeed, the PLA's official *Science of Military Strategy* emphasizes the vital importance of applying "real-time intelligence information links" (实时情报信息联络) and the Type 055 could be ideal for this battle management task.¹²⁰

The PLAN Type 055 class is close in size to a *Ticonderoga*-class cruiser. Although originally designed and intended to work in concert with and defend the carrier strike group predominately from air attack, the *Ticonderoga* class cruisers have also been utilized as the center piece of SAGs consisting of a cruiser and several destroyers. This was most recently illustrated in November of 2019, when the cruiser USS *Normandy* deployed to the Middle East independently from its assigned aircraft carrier along with the destroyers USS *Lassen* and USS *Farragut*. The expanded anti-air and anti-surface warfare capabilities inherent in the Type 055s would make it an attractive platform to lead in a similar PLAN SAG construct.

For more than a decade, various SAGs of the Chinese Navy have been detailed to the Gulf of Aden to protect shipping lanes from piracy. The PLA leadership has indicated that guarding sea lanes will be a major component of Chinese naval strategy and the most recent discussion of seapower in the official *Science of Military Strategy* raises this issue repeatedly. For example, it states: "securing maritime oil and gas, as well as other trading along sea lines of communications is extremely important to our country's economic development" (保障海上石油贸易航运通道安全对我国经济的发展极为重要).¹²¹ That concern reflects an anxiety that has been called the "Malacca Dilemma" (马六甲困局), a fear that China could be cut off from sources of energy and other raw materials by any closure of the Malacca Strait. That apprehension can be found across various Chinese-language sources, ranging from the military-technical journals,¹²² to the international relations discourse,¹²³ to the naval strategy debate,¹²⁴ to the conclusions of a Chinese Navy study team.¹²⁵ The *Science of Military Strategy* emphasizes the need for China to defend China's interests in the "far seas" by employing "large destroyers" among other assets,¹²⁶ and more recent Chinese sources explicitly link the Type 055 to the developing Belt and Road Initiative (BRI).¹²⁷

The Type 055 may also find itself conducting another mission familiar to U.S. cruiser crews. Chinese analysts have watched with great interest as the U.S. Navy has developed the ability to conduct Theater Ballistic Missile Defense (TBMD).¹²⁸ After analyzing the U.S performance in the Persian Gulf War, one Chinese source stated, "Although the threat of tactical ballistic missiles currently

¹²⁰ Xiao Tianliang, ed., *Science of Military Strategy*, p. 339.

¹²¹ *Ibid.*, p. 345, 338, and 342.

¹²² 杨理智, 张韧 [Yang Lizhi and Zhang Ren], 基于云模型的我国海上能源战略通道安全风险评估 ["A Model to Estimate the Risk to the Security of Our Country's Maritime Energy Transport"], 军事运筹于系统工程 [*Military Operations Research and Systems Engineering*], no. 1 (2014), pp. 78-79.

¹²³ 张洁 [Zhang Jie], 海上通道安全与中国战略支点的构建 ["Sea Lane Security and the Creation of Chinese Strategic Support Points"], 中国外交 [*Chinese Foreign Policy*], (July 2015), pp. 37-47

¹²⁴ 王凯, 邱贞玮 [Wang Kai and Qiu Zhenwei], 克拉运河地缘政治分析 ["A Geopolitical Analysis of the Kra Canal"], 舰船知识 [*Naval & Merchant Ships*], (September 2015), pp. 81-84.

¹²⁵ 李剑, 陈文文, 金晶 [Li Jian, Chen Wenwen, and Jin Jing], 印度海洋权格局与中国海权的印度洋拓展 ["The Sea Power Structure of the Indian Ocean and the Expansion of China's Sea Power into the Indian Ocean"], 太平洋学报 [*Pacific Journal*], (May 2014), pp. 68-76.

¹²⁶ Xiao Tianliang, ed., *Science of Military Strategy*, p. 339.

¹²⁷ Yin He, "The Building of the PLA Navy's Complete Destroyer Fleet," p. 41.

¹²⁸ Zeng Qing et al, "The Missile Destroyer," p. 4.

facing China is relatively small, it is imperative to plan and accelerate the development of sea-based antimissile combat capabilities as soon as possible in view of the long-term goals of achieving national unification and safeguarding national security and development interests” (但从实现国家统一, 保卫国家安全和发展利益的长远目标要求来看, 尽早筹划和加快推进海基反导作战能力建设势在必行).¹²⁹ If Chinese TBMD were to go to sea, it seems logical that the Type 055 would be a primary platform from which to field such a capability.

Although details are relatively scarce on engine performance, a ship of this size would have a clear endurance advantage over numerous smaller platforms currently in use by the PLAN. At the very least it should be expected that crew living conditions have been improved over smaller ships of previous classes. Such improvements are not inconsequential, as they enable crews to continue to operate at peak efficiency during long deployments distant from home port. As Bernard Cole writes regarding PLAN surface fleet development, “PLAN strategists are focused on mobile, noncontiguous, nonlinear operations that bypass the island chains to achieve specific objectives...”¹³⁰

Long endurance, coupled with the capability to deploy land attack cruise missiles, would make the Type 055 a platform of preferred choice in out-of-area power projection missions. The expanded magazine capacity of the ship likewise affords more options for potential weapons loads. It ensures, moreover, that although the load may be biased in the direction of air defense, large number of VLS cells could still be dedicated to the strike mission if required. The new Chinese cruiser, therefore, fits well into the *Science of Military Strategy*'s explicit call for developing the ability to conduct “deep strikes against land targets” (具备对陆目标的纵深打击能力).¹³¹ The same Chinese strategy document also calls for PLAN forces to prepare to execute “surprise attacks” (突然袭击) and Type 055 will significantly enhance China's long-range striking power.¹³²

Another mission that certainly cannot be discounted, especially during a time of great power competition for influence, is the utility of such a large warship in “showing the flag.” As one Chinese source stated, the Type 055 has “initiated the Chinese Navy's era of big destroyers.”¹³³ Another observed that “a destroyer forms a vital expression of a nation's combat power” (驱逐舰是一国海军战力的重要体现).¹³⁴ As one of the world's largest surface combatants currently in production, the Type 055 would make a not-so-subtle statement in regard to China's strength if it were to make a port call, especially when doing so in a nation wherein the largest surface combatant may be of frigate size or even smaller. The Chinese pride in having such a large surface combatant is evident in a statement by Senior Captain Zhang Junshe of the Naval Research Center in Beijing. During a 2017 interview, Captain Zhang stated, “The advanced nature of the new large destroyers is mainly manifested in three aspects. One is ton-force. This is the first time the Chinese navy has had a 10,000 ton destroyer. The second is a relatively high level of automation and digitization. A breakthrough in information integration has been achieved. The third is that firepower is significantly enhanced with anti-aircraft, anti-missile, anti-sea strike, anti-ship, anti-submarine capabilities. The ship has a much larger magazine than in the past. It can be said that compared with the U.S. *Burke*-class destroyers, the 10,000 ton large-scale destroyer has almost the same weaponry and firepower. In some respects it

¹²⁹ Liu Shuhua, “The Heavily Armed Warship *Nanchang* is Ready for Battle,” p. 78.

¹³⁰ Bernard Cole, “What do China's Surface Fleet Developments Suggest about Its Maritime Strategy?” in Peter A. Dutton and Ryan D. Martinson (eds.) *China's Evolving Surface Fleet*, p. 20.

¹³¹ Xiao Tianliang, ed., *Science of Military Strategy*, p. 343.

¹³² *Ibid.*, p. 342.

¹³³ Zeng Qing et al, “The Missile Destroyer,” p. 76.

¹³⁴ Li Wen, “The Chinese Navy's Hope for Blue Water—the Type 055 Destroyer,” p. 81.

is even stronger.”¹³⁵ That the first aspect of the ship Captain Zhang notes is its overall displacement should not be overlooked as his impression of the ship (and by extension China’s power) will undoubtedly be shared by many foreign officials.

Deploying such a large warship in the Indian Ocean and to ports in Africa on ‘friendship tours’ could help promote Chinese political objectives. The fact that the Indian Navy does not have an equivalent warship to the Type 055 would be quickly evident to astute observers any time the new Chinese cruisers make an appearance in the Indian Ocean. Likewise, the Chinese cruiser could be very useful in showing the Chinese flag in places further afield, such as South Africa and potentially even into the Atlantic. Such long-range sorties would be in keeping with Beijing’s new policy of extending its influence to regions outside of the Indo-Pacific in which the Chinese government has interests. As Peking University maritime strategist Hu Bo relates in a new book: “The Chinese Navy needs to demonstrate its strength at the right place at the right time” in order to “exert more influence” across “other global maritime regions.”¹³⁶



Image 10. Bow and stern views of the Type 055 reveal the large S-band planar arrays. The twin hangar doors also may be indicative of the PLAN’s new appreciation for the importance of shipborne helicopters for surface combatant operations. Source: *Modern Ships 2017-5*.

¹³⁵ Xu Hui, “The New Generation 10,000 Ton Missile Destroyer,” p. 35.

¹³⁶ Hu Bo, *Chinese Maritime Power in the 21st Century: Strategic Planning, Policy and Predictions* (New York: Routledge, 2020), pp. 13, 16.

To summarize, there should be no doubt that the Type 055 will serve as an integral part of any PLAN carrier strike group, but the ship will surely act in other roles independent of the aircraft carrier. The ship seems to have been designed to act as a kind of capital ship of the PLAN and could be expected to become the standard command platform around which any PLAN SAG operating in the “far seas” could be built. Ships of this class may also perform independent TBMD operations at some time in the future and may very well become a platform of choice for operations that require showing the flag.

The Type 055’s conception, construction, and deployment is emblematic of the greater ambitions of the PLAN and the Chinese government as a whole. While it remains unclear whether the ship is as capable as the U.S. Navy’s upgraded *Ticonderoga*-class cruisers, the Type 055 represents a leap forward in PLAN ship construction and blue water capability. Aside from the experimental *Zumwalt*-class destroyers of the U.S. Navy, the Type 055 is the largest surface combatant currently being built worldwide. As such, the vessel serves as a testament to the dedication and ambition of the PLAN to become a true blue water force, capable of protecting and if necessary enforcing Chinese interests and policies around the globe.

Conclusion

This survey of China’s new, large surface combatant yields a number of noteworthy conclusions. The ship wields very impressive firepower—both quantitatively in the number of VLS cells and qualitatively with the lethal YJ-18 ASCM, for instance. It marks dramatic improvements in traditional PLAN weaknesses, such as ASW. It possesses hangar space for two ASW helicopters, a towed array, and a long-range rocket-torpedo capability in the YU-8. However, the most prominent features of the vessel are the integrated sensor mast and the enlarged VLS tubes enabled by the ship’s large volume. There is a legitimate concern that future weaponry aboard Type 055 could make the ship even more capable. The cost of the Type 055 (perhaps US\$852 million, as suggested above) is quite considerable, but that makes the rapid pace of production in Dalian and Shanghai that much more remarkable. How to explain China’s evident surge into building large combatants?

Unquestionably, the Type 055 forms a logical and vital escort for China’s aircraft carriers. In effect, Chinese naval strategists realized that one could not have one capital ship without the other. They have studied the defeat of Japan’s carrier forces at Midway and concluded that these forces had inadequate escort capabilities and so were left vulnerable to American counter-attack.¹³⁷ Nor should one discount the very important symbolic aspect of the Type 055 destroyers. Naval diplomacy, whether for adding prestige, showing the flag or even exercising intimidation, may also help explain the urgent need for such ships. Indeed, the insertion of a few powerful surface combatants can have a clarifying effect on a crisis that a similar sortie of submarines may lack—even if that assessment is influenced by certain irrational impulses. Moreover, Beijing may well assess that nuclear deterrence will preclude a direct conflict between the U.S. and China, so that such surface forces could be employed against weaker navies, for example that of Vietnam. Then again, it should not be forgotten that the U.S. Navy has long possessed a much larger destroyer fleet than that of the PLAN, so pursuing a matching capability is not so unexpected. From that perspective, Beijing is simply seeking a remedy for a gap that has long plagued China’s maritime defenses. China’s naval nationalism—a certain pride that domestic audiences derive from these admittedly handsome vessels—also cannot be discounted as a factor. It is often forgotten that navalism has propelled the expansive growth of other fleets, not least the U.S. navy in the late 19th century, at a time when America did not face

¹³⁷ 董文静 [Dong Wenjing], 日军中途岛海战失败原因 [“The Reasons for the Defeat of the Japanese Armed Forces in the Midway Naval Campaign”], 军事历史 [Military History], no. 2 (2015), pp. 16-18.

direct threats and the new navy lacked obvious missions. One may also consider the political-economic rationale, especially with respect to employment. Thus, it is well known that China has faced some economic headwinds in recent years and this buildup has no doubt kept major Chinese shipyards, not to mention all the myriad sub-contractors and institutes, humming with activity even as global trade has slumped.

These are some rather conventional explanations for the impressive buildup of Chinese large surface combatants. Most could be considered political explanations—quite distant from warfighting considerations. However, warfighting explanations should also be taken seriously. First, there is the firepower issue to consider. With so many VLS tubes, the Type 055 is a potent offensive strike platform in its own right, and it could be deployed against crucial American targets as distant as Guam and well beyond, to include the major U.S. forward bases in Hawaii and Alaska. Moreover, its potent anti-air capabilities could make it a troublesome “blocker” when deployed to the east of Taiwan, not least by blinding the U.S. and its allies through taking down the highly valued force of American aerial drones. Showing up with such striking power in various “far seas” areas could also draw U.S. Navy assets from the main fight in the Western Pacific. In that case, the loss ratio for the ships could very well be high, but Beijing may view them as a worthwhile strategic investment if American ships are thereby pulled away from such vital areas as Taiwan to hunt for Chinese capital ships “marauding” in the eastern Pacific or even the Atlantic. *Bismarck*, *Tirpitz*, and other German “pocket battleships” played this role against the Royal Navy during the Battle of the Atlantic. When China possesses more shipbuilding capacity in Shanghai than the whole of the U.S., Western naval strategists need to be concerned that Beijing could be quite willing to lose half or more of its surface fleet in order to secure its strategic goals—in the full knowledge that another navy could rather swiftly be built to take its place. With respect to a prospective large surface combatant arms competition with the U.S., one Chinese analyst recent offered this observation: “The U.S. Navy believes that the *Zumwalt*-class cannot effectively respond to maritime threats and operational needs in the 2020s...The cost is too high...the technology is too complicated...the reliability is not high..., so in 2014 the US Navy decided to build three ships of the same class. (However, after more than 10 years of construction, only two ships are currently delivered). Therefore, the original plan for the construction of 32 ships was canceled. The type 055 has now been determined already to have reached 8 ships” (因此在 2014 年美国海军决定建造 3 艘同级舰件 (但在经过 10 多年的建造后目前也只交付 2 艘). 因此原计划的 32 艘舰的建造计划被取消. 而 055 型目前确定的建造数量已经达到 8 艘).¹³⁸ Similarly, a leading Chinese naval strategist recently declared: “the United States’ maritime hegemony, already in a state of continual decline, is destined to become an historical artifact.”¹³⁹

Another troubling scenario that U.S. Navy leaders need to contend with, moreover, is the possibility that China will calculate that American submarines can be corralled into “kill zones,” since they will be expected to relentlessly pursue Chinese capital ships, including the Type 055 cruisers. By that logic, these ships could form the “bait” for the trap. However, perhaps the most concerning scenario is one in which the Chinese Navy actually succeeds in closing the heretofore rather wide gap in undersea warfare capabilities like they have narrowed large gaps in air and surface aspects of naval warfare. In that troubling future, China is gradually developing the requisite undersea warfare capabilities to protect these new surface combatants. In full recognition that it was over 70 years ago

¹³⁸ Yin He, “The Building the PLA Navy’s Complete Destroyer Fleet,” p. 20.

¹³⁹ Hu Bo, *Chinese Maritime Power*, p. 19.

that the U.S. Navy last engaged in high-intensity fleet-on-fleet combat involving submarines, it will be helpful to approach these vexing strategy questions with a decent amount of humility.



Image 11. The PLAN's first Type 055 cruiser *Nanchang* on parade. Along with the aircraft carriers, these capable warships are symbolic of China's ambition to wield a global navy. Source: *Modern Ships* 2019-12.

The trend outlined above appropriately prompts careful scrutiny regarding future U.S. Navy force structure. The claim in this report is certainly not that the Chinese Navy is on a glide path to maritime supremacy, let alone global hegemony. By their own admission, Chinese naval analysts assess that major gaps remain in these capabilities, for example with respect to information systems aboard the Type 055 cruiser itself.¹⁴⁰ Building up a large navy rapidly, moreover, entails a certain acceptance that crews are going to lack for experience. Still, the Pentagon is certain to face some difficult questions relating to the rapid development of China's surface fleet. Does the U.S. Navy need to guard its disappearing advantage in large surface combatants? Should a new cruiser, effectively a more affordable version of the *Zumwalt*-class, be developed for this purpose alongside of FFG-X? Or is CCG-X not worth the trouble, because China's Type 055 cruiser can be countered by new innovations, such as the LRASM missile and the U.S. Navy's unmanned submarine program currently in accelerated development? Whatever the answer to these dilemmas, it is certain that large and capable Chinese warships will become a more and more common sight across the world's oceans.

¹⁴⁰ 奉碧野, 饶世钧 [Qin Biye and Rao Shijun], 舰载多功能综合射频系统应用与发展 [“Application and Development of Shipboard Multi-function Integrated RF System”], 舰船电子工程 [Ship Electronic Engineering], no. 6 (2019), p. 12.

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