



THE UNDERSEA DRAGON: CHINA'S SUBMARINE FORCE AND ITS IMPACT

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Exercise Solo Flight

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THE UNDERSEA DRAGON: CHINA'S SUBMARINE FORCE AND ITS IMPACT

The People's Republic of China's (PRC) Naval forces under the People's Liberation Army Navy (PLAN) have undergone a dramatic transformation over since the early 2000s.¹ This buildup has included developments in rocket technology, building and improving the carrier force and building a substantial number of more modern frigates.² The centerpiece of the PLAN's modernization has been the construction and employment of more advanced submarines which potentially indicates a preference towards power projection through submarines as opposed to the US model which views aircraft carriers at the center of their power projection model.³ This essay will focus on the modernization of their submarine force, the roles that the PLAN can expect each class of submarine to execute, an assessment of strategic reasoning behind the PLAN's submarine modernization, and the steps that the United States and its allies need to make in order to be prepared to reinforce deterrence of the PRC's submarine capabilities in the region in order to maintain regional security.⁴ The third component needs to be carefully considered in order to ensure that deterrence is conducted in a responsible manner to manage competition responsibility to reduce the chances of escalation in the region.⁵ The PLAN's modernization of their submarine fleet and emphasis on submarine warfare affects the maritime balance of power in the Indo-Pacific region. The Chinese emphasis on submarines in their defence strategy requires the United States to evaluate and modernize its Anti-Submarine Warfare (ASW) capabilities in the future to ensure maintain the balance of power in the region and ensure its maritime values are represented in the area.

The PLAN, on inception, was initially focused on coastal defence⁶, but has built blue water naval experience over the last 15 years through the conduct of forward deployments to the Gulf of Aden in a Counter Piracy role.⁷ As part of the 2015 Chinese Military Strategy "White Paper," the articulated strategy of the PLAN is to combine a focus on "offshore waters defence" with "open seas protection" which requires the continued production of naval assets including an increase in the number of SSNs and

¹ Christopher P. Carlson and Jack Bianchi, "Warfare Drivers Mission Needs and the Impact on Ship Design" from Andrew S. Erickson "Chinese Naval Shipbuilding: An Ambitious and Uncertain Course", *Naval Institute Press*, 2007.

² Sarah Kirchberger, "Assessing China's Naval Power: Technological Innovation, Economic Constraints, and Strategic Implications", *Heidelberg*, 2015.

³ Andrew S. Erickson, Lyle J. Goldstein, William S. Murray, and Andrew R. Wilson, "China's Future Nuclear Submarine Force.", *Naval Institute Press*, 2007, 3.

⁴ The White House, "Indo-Pacific Strategy of the United States", February 2022, <https://www.whitehouse.gov/wp-content/uploads/2022/02/U.S.-Indo-Pacific-Strategy.pdf>.

⁵ From "Indo-Pacific Strategy of the United States": "Our objective is not to change the PRC but to shape the strategic environment in which it operates, building a balance of influence in the world that is maximally favorable to the United States, our allies and partners, and the interests and values we share. We will also seek to manage competition with the PRC responsibly."

⁶ Ministry of National Defence of the People's Republic of China, "China's Military Strategy", May 2015, <http://eng.mod.gov.cn/xb/Publications/WhitePapers/4887928.html>.

⁷ CTGN, "10 years of China's Gulf of Aden journey: A global player with more responsibility", 27 December 2018, https://news.cgtn.com/news/3d3d774e32456a4e31457a6333566d54/share_p.html.

SSBNs⁸. This shift has been a result of the Chinese Communist Party's (CCP) vision of China's place in the world, which has been evolving as the country underwent substantial economic growth.⁹

PLAN SUBMARINE MODERNIZATION

2020 estimates from the US Office of Naval Intelligence (ONI) indicated the PLAN was operating 66 total submarines, including 55 conventional diesel-electric submarines (SSK), seven nuclear-powered attack submarines (SSN) and 4 ballistic missile submarines (SSBN). ONI estimates that by 2030, the total will increase to 76 submarines, as the older SSKs are replaced with a newer model and more SSNs and SSBNs are built.¹⁰ Each type of submarine provides the PLAN with a different capability.

There are currently four separate classes of SSK's in service with the PLAN, the *Yuan* Class, the *Song* Class, the *Ming* Class and the *Kilo* Class.¹¹ *Yuan*, *Song*, and *Ming* classes are all Chinese designs, while the *Kilo* Class was purchased from Russia. All four classes are in service, but it is expected that the *Ming*, *Song* and *Kilo* classes will be phased out as they reach end of life (there is OSINT that indicates the *Kilo* Class are being phased out currently).¹² The latest model of SSK produced for the PLAN is the *Yuan* Class (Type 039).¹³ China is continuing to produce multiple *Yuan* Class submarines annually.¹⁴

The *Yuan* Class's design is probably based on the *Kilo* given similarities in the upright fin design of the first variant.¹⁵ There are currently three variants of the *Yuan* Class in production; while the details of the upgrades between each variant aren't available from open-source intelligence, the design of the fin has changed each time with the latest variant incorporating what appears to be a radar deflecting fin, which is

⁸ PRC, "China's Military Strategy".

⁹ Wayne M. Morrison, "China's Economic Rise: History, Trends, Challenges, and Implications for the United States", *Current Politics and Economics of Northern and Western Asia* 28, no. 2/3, 2019, 189-242.

¹⁰ Ronald O'Rourke, "China Naval Modernization: Implications For U.S. Navy Capabilities - Background and Issues for Congress (Updated)", *Current Politics and Economics of Northern and Western Asia* 30, no. 2, 2021: 293-376.

¹¹ The International Institute for Strategic Studies, "China's submarine force: an overview," 2020, <https://www.iiss.org/online-analysis/military-balance/2017/10/china-submarine-force>

¹² H.I. Sutton, "OSINT: China Likely Scrapping Kilo Class Submarines" 28 January 2022, <http://www.hisutton.com/OSINT-China-Retires-KILO-Class-Submarines.html>

¹³ Also referred to as the Type 039 by Western Analysts; H.I. Sutton. Submarine Guide: Chinese Navy's Latest Type-039C Yuan Class. 8 July 2021. <http://www.hisutton.com/Chinese-Type-039C-Yuan-Class-Submarine.html>

¹⁴ Ronald O'Rourke, "China Naval Modernization: Implications For U.S. Navy Capabilities - Background and Issues for Congress (Updated)."

¹⁵ H.I. Sutton, "Submarine Guide: Chinese Navy's Latest Type-039C Yuan Class," 8 July 2021 <http://www.hisutton.com/Chinese-Type-039C-Yuan-Class-Submarine.html>

superficially similar to a Swedish Gotland Class.¹⁶ The most recent design appears to include a reel for a towed array, necessary for storing a towed array sonar system onboard rather than attaching it externally.¹⁷ This type of array enables passive sonar detection over a larger area compared to a bow or flank sonar array. The *Yuan* class has also incorporated an Air Independent Propulsion system into its design to allow for extended low-speed submerged endurance.¹⁸

Due to the lack of information provided by the Chinese Government on the design, there is some debate as to the purpose of the submarine. In USNI News Henry Holt argues that the *Yuan* is a small submarine (below 2,000 tons displacement) and its primary weapons system is an ASCM launched from the torpedo tubes.¹⁹ Christopher P. Carlson argues that the *Yuan* is a large SSK, similar in size to the Japanese *Soryu* Class submarine, which has a displacement of just under 2,900 tons, based on the *Yuan*'s.²⁰ He also argues that the primary weapons system is the YU-6 Torpedo.²¹ The size differentials and primary weapons systems differentials speak to different perceived purposes for the submarine, with Holt arguing that the *Yuan* is primarily designed for operations in littoral waters where it will wait hidden by large merchant noise to launch ASCMs at adversarial navies while Carson argues that the *Yuan* is for near sea deep water operations where it will use flank and towed array sonar systems to detect and prosecute adversaries using torpedoes primarily.²² Both analysts agree though that the *Yuan* is a significant upgrade from her predecessor, the *Song* and the inclusion of AIP, advanced sonar and reduced acoustics will make the new generation of PLAN SSKs difficult to detect and prosecute.²³

SSKs will primarily be employed in the defence of Chinese maritime traffic approaches in the event of an attempted invasion of China using a sea denial strategy²⁴ with torpedoes or anti-ship cruise missile (ASCM) as their primary weapons systems.²⁵

¹⁶ H.I. Sutton "The New Mystery Submarine Seen In China: What We Know" Naval News, 25 June 2021, <https://www.navalnews.com/naval-news/2021/06/new-mystery-submarine-seen-in-china-what-we-know/>.

¹⁷ H.I. Sutton, "Submarine Guide: Chinese Navy's Latest Type-039C Yuan Class"

¹⁸ Henry Holst, "Essay: China's Submarine Solution for the Taiwan Strait - USNI News", USNI News, 8 July 2015, <https://news.usni.org/2015/07/08/essay-chinas-submarine-solution-for-the-taiwan-strait>; Christopher P. Carlson, "Essay: Inside the Design of China's Yuan-class Submarine", USNI News, August 31, 2015, <https://news.usni.org/2015/08/31/essay-inside-the-design-of-chinas-yuan-class-submarine>.

¹⁹ Henry Holst, "Essay: China's Submarine Solution for the Taiwan Strait - USNI News"

²⁰ Christopher P. Carlson, USN (Retired), "Essay: Inside the Design of China's Yuan-class Submarine"

²¹ *Ibid*

²² Henry Holst, "Essay: China's Submarine Solution for the Taiwan Strait - USNI News"; Christopher P. Carlson, USN (Retired), "Essay: Inside the Design of China's Yuan-class Submarine"

²³ *Ibid*

²⁴ Cole defines sea control as "denying an adversary use of a discrete maritime area without using it oneself." from Cole, Bernard D. "China's Maritime Strategy." Hampton Roads International Security Quarterly (Jun 30, 2002): 136-184; Geoffrey Till, "Submarines, ASW and the South China Sea. A Cause for Concern." Headmark: Journal of the Australian Naval Institute, no. 144 (2012): 49-60.

²⁵ Henry Holst, "Essay: China's Submarine Solution for the Taiwan Strait - USNI News"; Christopher P. Carlson, USN (Retired), "Essay: Inside the Design of China's Yuan-class Submarine"

Due to the close proximity between Taiwan and China, they can also be deployed quickly to prevent hostile submarines from denying Chinese forces use of the straits of Taiwan.²⁶ If Taiwan was further from China, a SSK's deployment time would be much greater due to its low transit speed, which subsequently affects its ability to stay on station.

SSKs have limited speed (as an example, the *Victoria* Class, the Canadian SSK normally transits between seven and eight knots²⁷) and thus require more time to get on station. While they can maneuver quickly for a limited period of time (over 20 knots for the *Victoria* Class²⁸) the ability is limited to hours due to battery capacity and maximum recharging rates. The ability to forward deploy a conventional submarine outside of territorial waters is an option, but transit time to get to the patrol area is greater than an SSN, reducing the time available to patrol without locally resupplying.²⁹ SSKs can also be used for the covert insertion of special operating forces (SOF) insertion and for intelligence, surveillance and reconnaissance operations in both the visual and electromagnetic spectrum.³⁰ Both these capabilities provide for a better understanding of the land battle and for the ability to use SOF forces to attack specific targets prior to a maritime invasion.

In addition to modernizing their SSKs, China is also modernizing and increasing the number of SSNs they operate.³¹ They currently operate the *Shang* Class (Type 093), which has been upgraded three times (variants I, II and III) and based on open source intelligence, they are developing a replacement Class, but details are extremely limited on this class or even whether it will be a new class or an upgrade of the *Shang* Class.³² The *Shang*'s predecessor was the *Han* Class (Type 091).³³ The *Han* Class was launched in 1974, after 16 years of development on what was initially dubbed Project 09.³⁴ Project 09 faced technical delays, economic delays, and political delays stemming from the collapse of relations with the Soviet Union and the Cultural Revolution.³⁵ When finally brought into operation, the *Han* Class saw limited deployment time and as of a 1997 US report to

²⁶ Ibid

²⁷ Based on the authors experience

²⁸ Based on the authors experience

²⁹ Hugh White, "SSK vs SSN", The Interpreter, 29 September 2021 <https://www.lowyinstitute.org/the-interpreter/ssn-vs-ssk>.

³⁰ Geoffrey Till, "Seapower: A Guide for the Twenty-First Century", 4th edition, 2018;2014, 158.

³¹ Ronald O'Rourke "China Naval Modernization"

³² Also referred to as the Type 093 by Western Analysts; H.I. Sutton, "Chinese-Navy-Submarine-Construction-Bohai", 3 November 2020, <http://www.hisutton.com/Chinese-Navy-Submarine=Construction-Bohai.html>; Naval Technology, "Shang-Class Nuclear-Powered Attack Submarines, China", 17 February 2023, <https://www.naval-technology.com/projects/shang-class-nuclear-powered-attack-submarines-china/>

³³ Purser, Benjamin S., III; Chanse, Michael S. (3 August 2012). "Waypoint or Destination? The Jin-Class Submarine and China's Quest for Sea-Based Nuclear Deterrence". China Brief. Jamestown Foundation. Archived from the original on 11 November 2018.

³⁴ John Wilson Lewis, and Litai Xue. "China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age" *Stanford University Press*, 1994, Page 23.

³⁵ Lewis, Page 28-33.

Congress, it didn't sail beyond regional waters and its capability was limited compared against Russian or Western ASW capabilities.³⁶

The *Shang* Class, developed in the 1980s and 1990s and launched in 2006³⁷ represents an upgrade over the *Han* Class in terms of detectability but according to the Office of Naval Intelligence (ONI), the Russian *Victor III* (1970s era³⁸) and *Akula* (1980s era³⁹) are both quieter boats.⁴⁰ Chinese researchers have suggested that reductions to the *Shang's* acoustic levels are on par with the *Los Angeles* Class, and have reached the level of the *Akula* Class, which represents an upgrade from the open source ONI report.⁴¹ Either analysis still indicates that the *Shang* acoustic levels are not as quiet as the more modern *Seawolf* or *Virginia* Class SSNs produced by the United States.⁴² The *Shang* Class is reported to be capable of being armed with ACSMs, torpedoes, and mines.⁴³ China is reported to be developing a replacement to the *Shang* Class, currently called the Type 095.⁴⁴

SSNs can assume similar combat roles to SSKs (prosecuting ships and submarines by launching torpedoes and ASCMs, conducting covert SOF deployments, and gathering visual and electromagnetic intelligence (ISR activities)).⁴⁵ However their advantage comes from the nuclear propulsion plant, which allows for increased transit speeds and eliminates the requirement to return to periscope depth to charge the main batteries.⁴⁶ PRC writings regarding SSN have repeatedly suggested that the value of the platform is its ability to operate on long-range missions of an extended length.⁴⁷

China imports 50%, of their oil from the Persian Gulf which requires tankers to transit the straits of Malacca⁴⁸, and in the 2000 and 2010s spend more on importing semi-

³⁶ United States Department, of Defense. Report to Congress Pursuant to Section 1305 of the FY97 National Defense Authorization Act 1997.

³⁷ Naval Technology "Shang-Class Nuclear-Powered Attack Submarines, China", 17 February 2023, <https://www.naval-technology.com/projects/shang-class-nuclear-powered-attack-submarines-china/>

³⁸ Hampshire, Edward, Adam Tooby, "Cold War Attack Submarines: Nuclear Classes from November to Akula." Vol. 287. Oxford: Osprey Publishing, 2020.

³⁹ *Ibid*

⁴⁰ Eric Heginbotham, Michael Nixon, Forrest E. Morgan, Jacob L. Heim, Jeff Hagen, Sheng Tao Li, Jeffrey Engstrom, Martin C. Libicki, Paul DeLuca, David A. Shlapak, David R. Frelinger, Burgess Laird, Kyle Brady, and Lyle J. Morris, "The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power", 1996–2017. Santa Monica, CA: RAND Corporation, 2015. https://www.rand.org/pubs/research_reports/RR392.html.

⁴¹ Andrew S Erickson, "China's Future Nuclear Submarine Force.", page 195.

⁴² *Ibid*

⁴³ Naval Technology "Shang-Class Nuclear-Powered Attack Submarines, China"

⁴⁴ Eric Heginbotham, "The U.S.-China Military Scorecard"

⁴⁵ Hugh White, "SSN vs SSK", the Lowey Institute, 29 September 2021, <https://www.loweyinstitute.org/the-interpreter/ssn-vs-ssk>

⁴⁶ *Ibid*

⁴⁷ Erickson, Andrew S., , " China's Future Nuclear Submarine Force.", p. 191

⁴⁸ Emma Ashford, "Oil, The State, and War", Georgetown Press, 2022, 241-242.

conductors than oil in order to support high-end computing requirements.⁴⁹ These factors among others make the ability of free passage of goods to and from China critical to their continued economic growth (through which they are able to modernize and expand their military)⁵⁰.

As an article from *Modern Ships* on Chinese strategy indicates, “Submarines are the PLAN’s main long-distance sea force”⁵¹ An SSN’s ability to project sea control via its speed and stealth allows an SSN to ensure these commerce routes remain open from a blockade.⁵² Sea lines of communication (SLOC) defence is emphasized in both China’s most recent National Defence strategy and Military strategy white papers, with commentators noting, “Protecting China’s sea lines of communication has become an important aspect of maritime security”⁵³ Chinese analysts have noted the rapid deployment of British SSNs to the Falklands as an example of an SSNs ability to quickly deploy to distant locations to establish a level of sea control in the area.⁵⁴ SSNs may be valuable in preventing adversarial forces from leaving port in the event China decides to conduct offensive naval action in Taiwan. By assigning SSNs to patrol the approaches to Yokosuka and Guam the PLAN could both gather intelligence on departing force composition and potentially deter forces from exiting the harbor.⁵⁵

The development of the Chinese SSBN saw a similar trajectory to that of the SSN. The first SSBN, the *Xia* Class (Type 092) was launched in the late 1980s, its powerplant undergoing the same development cycle as the *Han* Class discussed above.⁵⁶ The *Xia* was plagued by maintenance and reliability issues including radiation leakage from the main reactor and high noise levels and reportedly did not conduct any patrols, rendering it ineffective as a nuclear warfare deterrent.⁵⁷⁵⁸ The PLAN’s current class of SSBN, the *Jin* Class (Type 094) was launched in July 2004.⁵⁹ There is speculation that the Chinese are developing a replacement class, currently dubbed the Type 096, with

⁴⁹ Chris Miller, “Chip War: The Fight for the World’s Most Critical Technology,” Simon and Schuster, 2022.

⁵⁰ Bernard Cole, “China’s Maritime Strategy.”

⁵¹ Shen You, “Looking Ahead at the New Century’s Nuclear Submarine Development and Innovation”, *Modern Ships* no. 5, 2005, 15–16. Originally published in Mandarin.

⁵² Cole defines sea control as “a nation’s ability to control events over a discrete ocean area” from Bernard Cole, “China’s Maritime Strategy.” Geoffrey Till provides a more nuanced analysis in chapter 6 in “Seapower: A Guide for the Twenty-First Century”

⁵³ Shen You, “Looking Ahead at the New Century’s Nuclear Submarine Development and Innovation”; Ministry of National Defence of the People’s Republic of China,, “China’s Military Strategy”; Ministry of National Defence of the People’s Republic of China, “China’s National Defense in the New Era,” July 2019, <http://eng.mod.gov.cn/xb/Publications/WhitePapers/4846452.html>.

⁵⁴ Andrew S. Erickson, “China’s Future Nuclear Submarine Force.”, p. 187

⁵⁵ Paul H.B. Goodwin “China’s Emerging Military Doctrine:” from Erickson, Andrew S., “China’s Future Nuclear Submarine Force.”

⁵⁶ Tong Zhao, “Tides of Change,” Carnegie Endowment for International Peace – Reports, 2018 https://carnegieendowment.org/files/Zhao_SSN_final.pdf

⁵⁷ Tong Zhao, “Tides of Change”

⁵⁸ Andrew S. Erickson, “China’s Future Nuclear Submarine Force.”, p. 186

⁵⁹ Christopher McConaughy, “China’s Undersea Nuclear Deterrent” from Andrew S. Erickson, “China’s Future Nuclear Submarine Force.”

open source intelligence indicating that hull construction may have commenced in the Bohai (Huluado) Shipyard, the only shipyard currently constructing nuclear submarines in China.⁶⁰⁶¹

The *Jin* Class' primary success metric is its survivability, which is measured by its ability to remain undetected from hostile ASW in order to be able to deliver its Submarine Launched Ballistic Missiles (SLBM).⁶² The primary tool an SSBN can use to increase its survivability is to remain undetected.⁶³ The nuclear propulsion plant assists with that effort by eliminating the requirement to operate the diesel engines at periscope depth or on the surface to charge the main battery, which effectively minimizes the submarine being detected by methods other than acoustic or magnetic detection.⁶⁴ Acoustic detection will be the primary detection method, as magnetic detection can be mitigated through deperming prior to operations.⁶⁵ Assessments of the *Jin* Class estimate that its noise levels are similar, or slightly higher than the *Shang* Class and are noisier than Soviet SSBNs developed in the 1970s (which are noisier than either current Russian SSBNs or US SSBNs).⁶⁶ According to Chinese analysts, there have been recent modifications to the *Jin* Class to reduce its noise signature, but the inherent design remains intact which limits the ability of the PLAN to significantly reduce its noise signature or reduce the impact of that noise signature by increasing the maximum diving depth of the submarine.⁶⁷⁶⁸ The Type 096 is expected to have a reduced noise signature and should be a significant improvement over the *Jin* Class.⁶⁹

An SSBN is designed to conduct deterrence patrols at a location that is classified only to those that need to know while carrying nuclear-armed SLBMs ready to be fired in either a preemptive or second-strike role.⁷⁰ The capabilities of the SLBM used and the SSBNs ability to remain undetected dictates their effectiveness in that role. The first SLBM developed by the Chinese for use in that role was the JL-1 (Juling-1) which had a reported range of 2,700 kilometers.⁷¹ The development process commenced in concert with the development of Chinese nuclear propulsion and took 30 years to complete, the

⁶⁰ H.I. Sutton, "Chinese-Navy-Submarine-Construction-Bohai",

⁶¹ Andrew S. Erickson, "Chinese Naval Shipbuilding: An Ambitious and Uncertain Course". Annapolis, Md: Naval Institute Press, 2016;2017;.page. 307-310

⁶² Tong Zhao, "Tides of Change"

⁶³ *Ibid*

⁶⁴ Hugh White, "SSK vs SSN"

⁶⁵ *Ibid*

⁶⁶ Tong Zhao, "Tides of Change"

⁶⁷ *Ibid*

⁶⁸ Minnie Chan, "China's New Nuclear Submarine Missiles Expand Range in US: Analysts.", South China Morning Post, 2 May 2021, <https://www.scmp.com/news/china/military/article/3131873/chinas-new-nuclear-submarine-missiles-expand-range-us-analysts>

⁶⁹ Luke Caggiano, "China Deploys New Submarine-Launched Ballistic Missiles", Arms Control Association, May 2023, <https://www.armscontrol.org/act/2023-05/news/china-deploys-new-submarine-launched-ballistic-missiles>

⁷⁰ Christopher McConaughy, "China's Undersea Nuclear Deterrent"

⁷¹ Andrew S. Erickson, "China's Future Nuclear Submarine Force.", p. 187

first launch being conducted from a *Xia* class SSBN in 1988.⁷² As with the development of nuclear propulsion the delays were both technological and political in nature.⁷³

With a range of only 2,700 kilometers and the inability to reliably deploy the *Xia* Class SSBN, the JL-1 didn't serve as an effective nuclear deterrent. Successfully tested in 2001, the JL-2 was the replacement for the JL-1.⁷⁴ The US Department of Defence estimates the JL-2 has a range of approximately 7,200 kilometers, enabling a nuclear strike as far as Eastern Europe or Northern Alaska if launched from within the East China Sea.⁷⁵ In 2018 and 2019, the PLAN conducted two test launches of the JL-3, the latest version of the Chinese SLBM.⁷⁶ Since those test launches, the South China Morning Post reported in May 2021 that the *Jin* Class has been armed with these SLBMs, which are reported to have a range of over 10,000 kilometers (bearing in mind the South China Morning Post operates within Chinese media regulations, these claim may be exaggerated).⁷⁷ As can be seen in Figure 1 on the next page, a range of 10,000 kilometers enables a second-strike capability to launch on North America from a PLAN SSBN

⁷² Christopher McConaughy, "China's Undersea Nuclear Deterrent"

⁷³ Qian Xuesen and Huang Weilu, who were in charge of the JL-1 project were forced to do manual labour, and Song Jian, lead in the R&D effort on missile guidance had his property confiscated in 1968, both of which imposed non-technical related delays to the project; Laurie Burkitt, Andrew Scobell, and Larry M. Wortzel, eds. *The lessons of history: the Chinese people's Liberation Army at 75*. Strategic Studies Institute, 2003, page. 197.

⁷⁴ *Ibid*

⁷⁵ Ronald O'Rourke, "China Naval Modernization: Implications For U.S. Navy Capabilities - Background and Issues for Congress (Updated)."

⁷⁶ Masao Dahlgren, "China Test Fires JL-3 SLBM", "Missile Threat:CSIS Missile Defense Project", 3 June 2019, <https://missilethreat.csis.org/tag/jl-3/>.

⁷⁷ Minnie Chan, "China's new nuclear submarine missiles expand range in US: analysts"

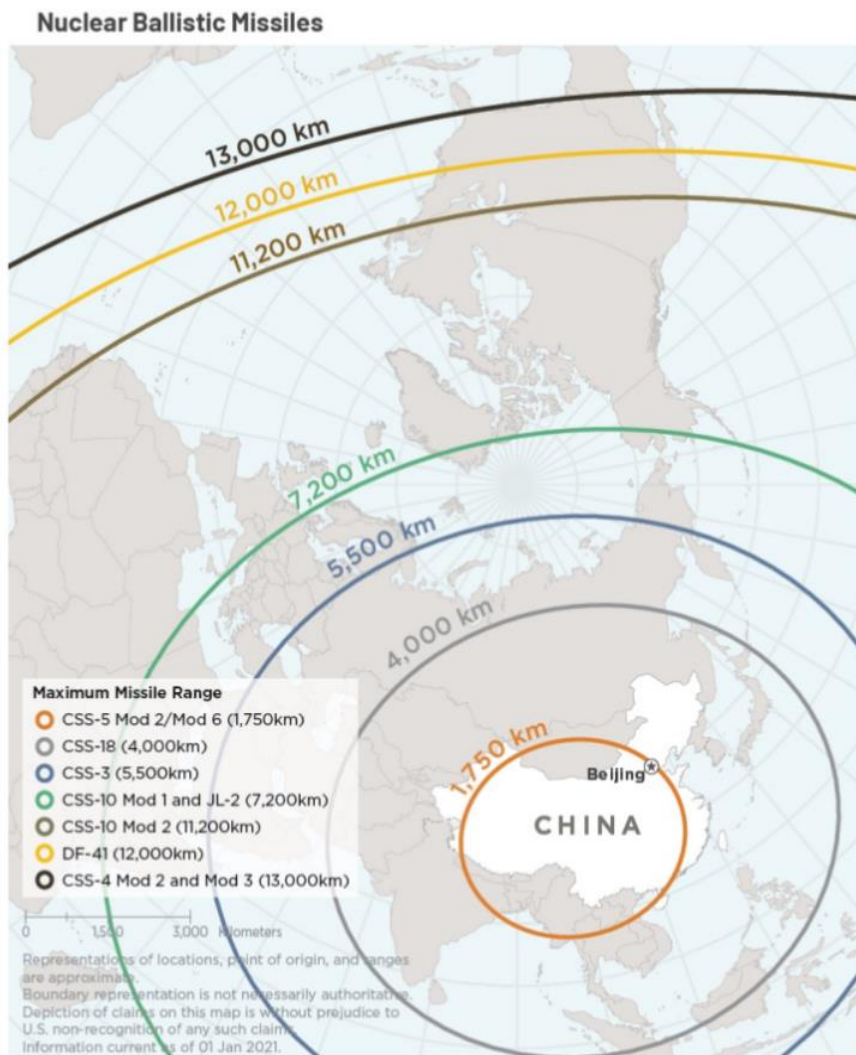


Figure 1: Chinese Nuclear Ballistic Missile Range

Source: U.S. DOD. 2022 Report on Military and Security Developments Involving the People's Republic of China

located in Chinese Territorial Waters.⁷⁸ The JL-3 is also reported to be armed with multiple independent targetable reentry vehicles (MIRV), which is when one ballistic missile is armed with multiple warheads that are able to strike different targets, which increases the impact of the weapon and makes ballistic missile defence more difficult.⁷⁹

There are multiple points of view on how the China may choose to employ their SSBNs. The first is that they may use their SSBNs in a bastion strategy, similar to that of the Soviet Union during the Cold War, where PLAN SSBNs conduct deterrence patrols

⁷⁸ U.S. Department of Defense, “2022 Report on Military and Security Developments Involving the People's Republic of China”, 29 November 2022, <https://www.defense.gov/CMPR/>.

⁷⁹ Center for Arms Control and Non-Proliferation, “Fact Sheet: Multiple Independently-targetable Reentry Vehicle (MIRV)”, March 2021, <https://armscontrolcenter.org/multiple-independently-targetable-reentry-vehicle-mirv/>

in the South China Sea Area.⁸⁰ This strategy entails establishing patrol areas close to the home country and protecting those patrol areas.⁸¹ This strategy was employed by the Soviets for a number of reasons, including close proximity command and control, resupply, and the ability to concentrate sea borne ASW forces in the area.⁸²

This strategy would seem to make sense as transit to the western Pacific Ocean would expose the submarine to choke points in the First Island Chain.⁸³ However within the First Island Chain, the JL-2 doesn't have the required range to hit North America.⁸⁴ The JL-3 range would solve this issue, but is still under development. The bastion strategy requires a significant number of forces to defend the bastions from ASW that aren't required in the open ocean strategy.⁸⁶ This would limit the flexibility to use Chinese surface and air forces for other types of operations.

The ability to deploy SSBNs to the open Pacific provides a number of benefits including reduced anti ASM resources, the ability of the current Chinese SLBM to target North America, increased flexibility in patrol areas and shorter SLBM flight times as the SSBNs are able to patrol closer to their target.⁸⁷ As discussed, China is working towards quieter SSBNs which will enable the PLAN to deploy SSBNs in open ocean patrols with a reduced risk of detection when exiting the First Island Chain. If longer range SLBMs are successfully developed either strategy is possible for the PLAN, enabling flexibility when deploying their SSBNs on patrol.

Beijing has long held a No First Use (NFU) policy when it comes to nuclear deterrents.⁸⁸ Their strategy has undergone some debate in academic literature, with it being one of "self-defensive deterrence", evolving to "minimal deterrence" and "credible minimal deterrence" with some recent Chinese writers advocating for "limited deterrence".⁸⁹ In combination with the relatively few ICBM and SLBM assets operated

⁸⁰ Tong Zhao, "Tides of Change"

⁸¹ Walter M. Kreitler, "The Close Aboard Bastion: A Soviet Ballistic Missile Submarine Deployment Strategy," Naval Postgraduate School, 1988

⁸² *Ibid*

⁸³ Tong Zhao, "Tides of Change"

⁸⁴ The "first island chain" [is the islands] running from the Kuriles through Japan, the Ryukyus, Taiwan, and the Philippines to the Indonesian archipelago (thus including the entire expanse of the South and East China Seas).....the "second island chain" [is] stretching from the Bonins through the Marianas and Guam to the Palau island group from Chris Rahman, "Defending Taiwan, and Why it Matters." Naval War College Review 54, no. 4 (2001): 69-94.

⁸⁵ Ronald O'Rourke, "China Naval Modernization: Implications For U.S. Navy Capabilities - Background and Issues for Congress (Updated)."

⁸⁶ Walter M. Kreitler, "The Close Aboard Bastion: A Soviet Ballistic Missile Submarine Deployment Strategy"

⁸⁷ Tong Zhao, "Tides of Change"

⁸⁸ Paul H.B. Goodwin "China's Emerging Military Doctrine:"

⁸⁹ "Self defensive deterrence": "China's nuclear strategy is basically characterized by a no-first-use policy, a limited but effective nuclear force, and support for nuclear disarmament." "minimal deterrence": "a nuclear doctrine of retaliatory deterrence and pledges not to use nuclear weapons first, never intends to use nuclear weapons as an offensive capability, and does not extend its own nuclear umbrella to any

by the Chinese military, these strategic approaches do not suggest large scale nuclear operations as both the US and USSR envisaged during the Cold War.⁹⁰ Beijing has determined a sea-based deterrent is worth investing in as one of the tools to maintain the deterrence required to prevent an adversarial nuclear attack, and provided a “significant and credible strategic threat”.⁹¹ A credible second-strike capability has the potential to alter China’s relationships with both nuclear armed and non-nuclear armed countries by enabling China to undertake a kinetic conflict with a regional adversary without concern that a nuclear-powered great power will use the threat of a nuclear strike to dissuade China from stopping the conflict. When the threat of nuclear war is one sided, it is much easier to use to get your way in a geopolitical situation. Despite the current survivability concerns with the *Jin* Class, a ballistic missile nuclear powered submarine is the most survivable component of a nuclear arsenal, with an extended submerged endurance that is difficult to detect in the open ocean.

To summarize, each of the three types of submarines the PLAN is currently employing fulfills a different and distinct role in China’s Maritime Strategy. Based on the western analyses studied, SSKs will primarily be employed in a sea denial strategy within local Chinese waters. The SSN is able to fulfill the same role and due to their nuclear propulsion system, they can also conduct both sea control and sea denial in an expedient manner further away from Chinese local waters. Finally, the SSBN provides China with a survivable second-strike nuclear deterrent capability. There remains the potential that the Chinese will choose to use their submarines in an entirely different method than was used before, which necessitates continued study of developments in the Chinese submarine force.

THE IMPACT OF SUBMARINES ON CHINA’S MARITIME STRATEGY

In 1985, China established a naval strategy based on “offshore waters defence” and while “offshore” wasn’t explicitly defined in the strategy, it is seen to primarily focus on the first island chain, which was the first time in Chinese Maritime Strategy when SSNs and SSBNs became a critical component of that strategy.⁹² Prior to that period, the strategy was driven by “near coastal defence”.⁹³ A strategy of defence of only the coastal areas doesn’t justify the requirement for nuclear powered submarines, as this role can be filled by SSKs as discussed earlier. The requirement for nuclear power was initially generated by the CCPs desire to be seen as a great power in the world and not necessarily

other nation or seek one from another country”; “credible minimal deterrence”: “This newest strategy, as it evolves, is not limited to the classic minimum deterrence view that nuclear weapons have the single function of threatening adversary cities to deter nuclear use”; “limited deterrence”: “comprised of counterforce, warfighting capabilities ‘to deter conventional, theater, and strategic nuclear war, and to control and suppress escalation during a nuclear war.’” Liping Xia, “China’s Nuclear Doctrine: Debates and Evolution,” *Regional Insight*, 2016.

⁹⁰*Ibid*

⁹¹ Christopher McConaughy, “China’s Undersea Nuclear Deterrent”

⁹² Bernard Cole, “China’s Maritime Strategy.”

⁹³ Christopher P. Carlson and Jack Bianchi, “Warfare Drivers Mission Needs and the Impact on Ship Design”

one based in defence policy. Early into the founding of the PRC, a stated goal of the Communist Party of China (CCP) was to develop SSNs and SSBNs as part of a strategy of nuclear arms development.⁹⁴ Chairman Mao Zedong, the first leader and great was quoted as saying “China is determined to develop nuclear weapons even if it would take us ten thousand years”.⁹⁵ This desire can be aligned initially to competition with the great powers at the time, especially the Soviets, who initially supported Chinese nuclear development, but due to tensions between both countries, left China to develop nuclear weapons and propulsion on their own.⁹⁶ Admiral Liu Huaqing, former commander of the PLAN and chairman of the Central Military Commission viewed SSBNs as not only a “deterrent force of the nation” but also as “an expression of our countries overall strength”.⁹⁷ The latest Chinese Military Strategy published in 2015 has the PLAN moving from “offshore waters defence” to a combination of “offshores water defence” and “open seas protection”.⁹⁸ Maintaining and enhancing a credible SSBN deterrence is one of the five stated components of this strategy and therefore is a core mission of the Chinese Submarine Force.⁹⁹ The other four components are preparing for operations in Taiwan, defending South and East China Sea Claims, protecting SLOCs and conducting diplomacy.¹⁰⁰ All five components have a submarine focus, but for the purposes of this essay conducting diplomacy won’t be discussed as it is both self-evident and a mission set that can be conducted by any vessel in the PLAN by way of their ability to operate in the maritime environment.

Defending China’s claims in the East and South China Sea and defending far flung SLOCs, which are both missions suited to SSNs.¹⁰¹ Hu Jintao discussed the “Malacca Dilemma” to emphasize the inability of China to secure trade in the straits of Malacca despite their reliance on the area.¹⁰² The continuation of trade is extremely important for China, and 85 to 90 per cent of that trade is conducted on the ocean.¹⁰³ In the event of a conflict on the Indian Ocean, China would be particularly vulnerable, necessitating the ability to respond to maintain commerce on the Indian Ocean so China can meet its domestic requirements (energy being the most discussed).¹⁰⁴ While China is taking steps to minimize the impact of a cession of energy shipments including potentially building a pipeline from Gwadar, Pakistan to the Chinese Province of Xinjiang, the ability to project Sea Control via SSNs is critical to maintaining traffic

⁹⁴ Guang Zhang Shu, 'Between 'Paper' and 'Real Tigers': Mao's View of Nuclear Weapons', in John Gaddis and others (eds), “Cold War Statesmen Confront the Bomb: Nuclear Diplomacy Since 1945” Oxford, 1999.

⁹⁵ *Ibid*

⁹⁶ *Ibid*

⁹⁷ Andrew S. Erickson, “China’s Future Nuclear Submarine Force.”, p. 184

⁹⁸ PRC, “China’s Military Strategy”

⁹⁹ Bernard Cole, “China’s Maritime Strategy.”

¹⁰⁰ *Ibid*

¹⁰¹ *Ibid*

¹⁰² Andrew S. Erickson, “China’s Future Nuclear Submarine Force.”, p. 32

¹⁰³ Bernard Cole, “China’s Maritime Strategy.”

¹⁰⁴ Khurana, Gurpreet S. “China’s Yuan-class Submarine Visits Karachi: An Assessment.” NMF Commentary 24 (2015).

flows in the event of a dispute outside the first island chain.¹⁰⁵ In 1998, Chinese International Relations Scholar Zhang Wenmu contended the US hegemony on sea control at the time threatened China not only economically, but militarily and politically as energy resources affected those realms, “[U]nder globalization a nation’s energy resources is no longer an economic issue alone. Instead it is also a political issue, as well as a military issue”¹⁰⁶

A fourth component of China’s latest Military Strategy that applies to their SSK force is preparing for kinetic operations in Taiwan.¹⁰⁷ Chinese policy towards reunification with Taiwan is a core goal of the Chinese Communist Party, who sees the “One China” policy as a pillar of Chinese domestic policy.¹⁰⁸ The CCP sees a “One China” policy as one where the PRC has control over Taiwan and Taiwan becomes a “Special Administration Region” similar to Hong Kong.¹⁰⁹ During the Twentieth National Congress of the Communist Party of China in October 2022, Xi Jinping reemphasized reunification of Taiwan with China, preferably under peaceful means, but did not rule out the use of force.¹¹⁰ Reunification of Taiwan continues to be a paramount concern of the PLAN, with deployment of submarines to the East China Sea a critical component of that strategy.¹¹¹ As discussed, due to the proximity of Taiwan and China, SSKs are more than capable of fulfilling that role and this is an indicator of why we are seeing a modernization of the SSK fleet with the *Yuan* Class. As air support can be provided from the mainland, this may be a possible indicator why Chinese Aircraft Carrier development has not been as critical to the PLAN modernization as SSKs, SSNs and SSBNs.¹¹² In the event of the use of force, Chinese Military strategists have identified two possible Centres of Gravity, the will of the Taiwanese people to fight and the will of the US to come to the defence of Taiwan.¹¹³ Both of these centres of gravity can be combatted using SSKs in the Taiwanese Strait. By denying access to the strait, the Taiwanese people will lose both basic necessities supplied to the island through seagoing

¹⁰⁵ Rahu Jaybhay, “China’s pipeline dream in Pakistan”, *The Interpreter*, 30 June 2020, <https://www.lowyinstitute.org/the-interpreter/china-s-pipeline-dream-pakistan>.

¹⁰⁶ Liu Xinhua and Zhang Wenmu, “China’s Oil Security and Its Strategic Options,” *Contemporary International Relations* no. 12, December 2002, 35-37,46.

¹⁰⁷ Bernard Cole, “China’s Maritime Strategy.”

¹⁰⁸ Jessica Drun, “One China, Multiple Interpretations”, *Center for Advanced China Research*, 28 December 2017, <https://www.ccpwatch.org/single-post/2017/12/29/one-china-multiple-interpretations>

¹⁰⁹ Kan, Shirley A. (2001-03-12). China/Taiwan: Evolution of the "One China" Policy—Key Statements from Washington, Beijing, and Taipei (Report). Congressional Research Service. Retrieved 2021-10-16.

¹¹⁰ Xi Jinping, “Full text of the report to the 20th National Congress of the Communist Party of China”, Ministry of Foreign Affairs of the People’s Republic of China, October 2022, https://www.fmprc.gov.cn/eng/wjdt_665385/zyjh_665391/202210/t20221025_10791908.html

¹¹¹ Bernard Cole, “China’s Maritime Strategy.”

¹¹² Andrew S. Erickson and Andrew K. Wilson, “China Aircraft Carrier Dilemma”, from Andrew S. Erickson, Lyle J. Goldstein, William S. Murray, and Andrew R. Wilson, “China’s Future Nuclear Submarine Force.”, Annapolis, Md: Naval Institute Press, 2007

¹¹³ Gareth Heckler, Ed Francis, and James Mulvenon, “C3 in the Chinese Submarine Fleet”, from Andrew S. Erickson, Lyle J. Goldstein, William S. Murray, and Andrew R. Wilson, “China’s Future Nuclear Submarine Force.”, Annapolis, Md: Naval Institute Press, 2007

means and an ability to conduct maritime trade, which would have significant repercussions on the Taiwanese Economy.

THE U.S. RESPONSE TO THE PLAN SUBMARINE MODERNIZATION

The U.S. and its allies' policies towards the PRC have become more adversarial in recent strategic documentation. In the most recent U.S. Indo Pacific Strategy, the PRC's "coercion and aggression spans the globe, but it is most acute in

the Indo-Pacific."¹¹⁴ The strategy identifies that U.S. partners in the Indo-Pacific are most affected by a more aggressive China.¹¹⁵ In Canada's recent Indo Pacific strategy, China was mentioned by name, "China's assertive pursuit of its economic and security interests, advancement of unilateral claims foreign interference and increasingly coercive treatment of other countries".¹¹⁶ Despite the increase in adversarial language, these strategies conditionally emphasize the requirement to maintain relations and trade with China. Other Indo Pacific and Western countries are reliant on the integrated economic relationships between their countries and China, and an unnecessary degradation of that relationship will have economic and political consequences.¹¹⁷

This essay has made the argument that China is emphasizing and modernizing their submarine force. This modernization is at least in part due to the success displayed by the U.S. submarine force during the Cold War, where U.S. innovations in nuclear propulsion, quieting and training forced the Soviets to invest heavily to keep pace in the underwater realm and also pushed towards the bastion strategy, committing a large portion of the Soviet Navy to ASW activities to protect their SSBNs.¹¹⁸ The U.S. and its allies' approach to that modernization may have repercussions beyond the naval realm if the U.S. increases preparations for a strategic ASW campaign against China, and China sees that as escalatory, creating a Cold War style arms race in the underwater realm.¹¹⁹ That being said, an evaluation of current Chinese writings on the U.S. ASW capabilities finds that while the SSN is an extremely capable platform, the reduction in surface fleet size and the emphasis on multi-mission platforms vice ASW specific platforms puts the U.S. in a less advantageous position to conduct ASW than in the past.¹²⁰ Chinese military analysts have also relatively recently assessed that due to the declining U.S. investment in

¹¹⁴ US Indo Pacific Strategy

¹¹⁵ *Ibid*

¹¹⁶ Government of Canada, "Canada's Indo-Pacific strategy: A more prosperous, sustainable and secure future", 2022, <https://www.international.gc.ca/transparency-transparence/indo-pacific-indo-pacifique/index.aspx?lang=eng>

¹¹⁷ *Ibid*

¹¹⁸ Gabriel B. Collins, Andrew S. Erickson, Lyle J. Goldstein, and William S. Murray, "Capability Analysis: Chinese Evaluations of the U.S. Navy Submarine Force, Pt. 1," Center for International Maritime Security (CIMSEC), 29 October 2018.

¹¹⁹ Geoffrey Till, "Submarines, ASW and the South China Sea. A Cause for Concern."

¹²⁰ Gabriel B. Collins, Andrew S. Erickson, Lyle J. Goldstein, and William S. Murray, "Capability Analysis: Chinese Evaluations of the U.S. Navy Submarine Force, Pt. 2," Center for International Maritime Security (CIMSEC), 6 November 2018.

SSNs, the USN submarine force is not as dominant as it was during the Cold War.¹²¹ In October 2020, the U.S. Defence Secretary Mark Esper called for an increase in the overall US fleet size and specifically for 3 *Virginia* Class Submarines to be built a year.¹²² As of 2022, the Chief of Naval operations had a goal of 70 SSNs in service versus an actual fleet size of 66 with plans to build two *Virginia* Class SSNs per year for FY24-28¹²³

The U.S. has recently shown its defensive commitment to the region through the AUKUS agreement which is a defence sharing agreement between the U.S., the U.K. and Australia.¹²⁴ It is comprised of two parts, the first is a commitment to build SSNs for Australia, at first in the U.S. and then as a shared construction between the U.K. and Australia, using U.S. nuclear reactor technology.¹²⁵ The second is a technology and intelligence sharing agreement to share information on technology including AI, Quantum Computing and Hypersonic missiles.¹²⁶ In response to AUKUS, the Chinese government has issued a condemnation, stating that the agreement is an escalation and urging member states to uphold their commitments to nuclear non-proliferation.¹²⁷ They have expressed a preference for economic ties in the region, rather than an increase in SSNs.¹²⁸ Despite their public stance, China has been increasing the number of SSNs and SSBNs they are constructing, and this response may indicate concern over potential competition in the region. The U.S. needs to continue to update its ASW capability in order to be prepared to counter Chinese submarine modernization. While maritime competition is not as overt as land-based competition, naval vessels still have diplomatic implications. The US should be cautious of the discrepancy between the CCP's political statements on U.S.'s ASW improvement efforts and the PLAN's submarine modernization, and should seek to limit escalation while preventing China from becoming a destabilizing force in the region through a tempered ASW response,

¹²¹ *Ibid*

¹²² Megan Eckstein, "SECDEF Esper Calls for 500-Ship Fleet by 2045, With 3 SSNs a Year and Light Carriers Supplementing CVNs", 6 October 2020, <https://news.usni.org/2020/10/06/secdef-esper-calls-for-500-ship-fleet-by-2045-with-3-ssns-a-year-and-light-carriers-supplementing-cvns>

¹²³ Congressional Research Service, "Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress", 19 April 2023, <https://sgp.fas.org/crs/weapons/RL32665.pdf>.

¹²⁴ Andrew S. Erickson, "Australia Badly Needs Nuclear Submarines", *Foreign Policy*, 20 September 2021, <https://foreignpolicy.com/2021/09/20/australia-aucus-nuclear-submarines-china/>

¹²⁵ The White House, "Joint Leaders Statement on AUKUS", 13 March 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2023/03/13/joint-leaders-statement-on-aucus-2/>

¹²⁶ Robert Fife and Steven Chase, "Canada seeks to join non-nuclear pillar of AUKUS alliance", *The Globe and Mail*, 8 May 2023, <https://www.theglobeandmail.com/politics/article-canada-eyes-entry-into-aucus-alliance-to-help-keep-china-in-check/>

¹²⁷ Edward White, "China says Asia needs jobs over submarines in fresh Aucus salvo", *Financial Times*, 22 September 2021, <https://www.ft.com/content/f99307c1-f827-4d7e-ba07-e4461b21a077>.

¹²⁸ *Ibid*

otherwise rhetoric on the probability of a Chinese invasion of Taiwan may become a self-fulfilling prophecy.¹²⁹

CONCLUSION

The PLAN is conducting a modernization of their submarine force both in terms of size and capability. Each of the types of submarines that is being constructed and modernized has a potential role in China's Maritime Strategy. The SSKs are highly likely to be used to provide sea denial within the first island chain and are especially useful in the event of conflict with Taiwan. SSNs have similar uses, but due their speed and stealth, they can also be used to protect critical SLOCs maintaining trade routes in the event of a dispute outside of the first island chain. SSBNs and their SLBMs are being modernized to increase the range and survivability of the Chinese Nuclear Deterrent. The U.S. response to this modernization will be guided by commitment to their allies in the region while managing tensions with China to avoid escalation if at all possible. The PLAN submarine force is a fundamental aspect of the naval service, and it is essential to assess advancements in Chinese submarine technology, not only in terms of the technology employed but also for potential strategies that the PLAN may use these submarines for in the future.

¹²⁹ Jessica Chen Weiss, "Even China isn't Convinced it can Replace the U.S." *New York Times*, 4 May 2023, <https://www.nytimes.com/2023/05/04/opinion/china-us-world-order.html>.

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