

LEARNING AND DEVELOPMENT OF CHINESE NAVY'S SURFACE FLEET

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Executive Summary

1. Since the late 1980s, China has endorsed a new naval strategy of “near-seas active defence” and “far-seas protection”. This strategy requires the PLA (People’s Liberation Army) Navy to shift from coastal defence to developing capabilities that can operate effectively in the seas near and far away from China.
2. However, little progress in naval development was made for the first decade of the new naval strategy. The naval modernisation that began in the late 1990s nevertheless stressed the acquisition of asymmetrical capabilities typical of a coastal defence navy. These capabilities include conventional diesel-electric submarines and single-role fast attack craft.
3. It was not until after the late 2000s that China has embarked on a more serious naval modernisation drive to build up its major surface fleet. Such a fleet includes major power projection capabilities such as aircraft carriers, modern guided-missile destroyers and frigates, large and advanced amphibious warfare ships and fleet replenishment ships.
4. To account for the new emphasis on the surface fleet, learning, particularly learning-driven conceptual development, is highlighted as a critical explanatory variable. Two PLA conceptual developments are central for understanding this new emphasis.
5. The first is the notion of “balanced development” of naval capabilities, a lesson learned from modern Western naval history and Soviet naval development during the Cold War.
6. The second is the concept of “information system-based system-of-systems operations” (“基于信息系统的体系作战”), one that is informed by the notion of network-centric operations of the US military. This operational concept has been endorsed and promoted by both Hu Jintao and Xi Jinping to guide PLA development.

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Explaining Shifting Priority of China's Naval Development

- 1.1 From the middle to the late 1980s, as China's relations with the Soviet Union began to improve, Deng Xiaoping required the People's Liberation Army (PLA) to make a "strategic transition" ("战略转变") from making preparations for an "early, total and nuclear war" ("早打, 大打, 打核大战") against a possible Soviet invasion to "peace-time army building". This transition, a result of the changing threat perception, particularly required the PLA to prepare to fight and win a "local war" over contingencies on or near the margins of China.
- 1.2 Under the direction of the then PLA Navy (PLAN) Commander Liu Huaqing, China's naval strategy had also shifted from "near-coast defence" ("近岸防御") to "near-seas active defence" ("近海积极防御"). Rather than the old strategy stressing coastal defence to support land operations against a Soviet invasion from the north and to delay a possible second-front Soviet offensive from the direction of the sea, the new strategy has tasked the PLAN to develop into a "strategic service" that can operate independently and effectively in its own maritime operational space. Such a space encompasses the three seas near China, namely, the South and East China Seas and the Yellow Sea.¹
- 1.3 Since the early 2000s, China's naval strategy has integrated the concept of "far seas protection" ("远海护卫"). Such a concept requires the PLAN to develop capabilities that can safeguard the security of expanding Chinese interests in the far seas (seas beyond the near seas) and overseas, including vital sea-lanes and "chock points"

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¹ See Li Nan, "The Evolution of China's Naval Strategy and Capabilities: From 'Near Coast' and 'Near Seas' to 'Far Seas'", *Asian Security*, Vol. 5, No. 2 (Spring 2009).

that the shipping of critical resources and traded goods depends on, and Chinese investment, assets and personnel deployed overseas.²

- 1.4 Despite the official endorsement of the new naval strategy since the late 1980s, China's naval modernisation made little progress for about a decade. The 1996 Taiwan Strait crisis prompted a naval modernisation programme that nevertheless stressed the acquisition of asymmetrical capabilities typical of a coastal defence navy; these capabilities include primarily conventional submarines and single-role fast attack craft (FAC). It was not until after the late 2000s that China has embarked on a major naval modernisation drive to build up its major surface fleet. Such a fleet includes major force projection capabilities such as aircraft carriers, modern guided-missile destroyers and frigates, large and advanced amphibious warfare ships and fleet replenishment ships.
- 1.5 Conventional explanations of this new surface fleet emphasis stress changing threat perception, evolving role of leadership and changing material conditions such as the availability of funding and critical technologies, and the need to replace obsolete surface ships. The previous paragraphs show, however, changing threat perception and subsequent endorsement of a new naval strategy by the leadership had not brought about major changes to China's naval capabilities for more than a decade. Moreover, because major surface ships such as aircraft carriers are perceived as vulnerable targets if faced with a superior opponent, the PLAN could have chosen to shift scarce funding and critical technologies to constructing more and better submarines and FACs, or stealth capabilities that give the PLAN asymmetrical advantages. Finally, major surface ships need not be replaced when they become obsolete; they can be retired so that scarce resources could be shifted to constructing more and better submarines and FACs.
- 1.6 Rather than evolving threat perception, leadership role and changing material conditions, this study highlights learning, particularly the learning-driven

² See Li Nan, "China's Evolving Naval Strategy and Capabilities in the Hu Jintao Era", in Roy Kamphausen et al. (eds.), *Assessing the People's Liberation Army in the Hu Jintao Era* (Carlisle, PA: US Army War College Press, 2014).

conceptual development, as a critical explanatory variable for understanding the new PLAN emphasis on the surface fleet.

Changing Priority of China's Naval Modernisation

- 2.1 For several decades since 1949, the PLAN had remained a small coastal-defence navy comprising a large number of conventional submarines and single-role FACs with limited operational radius. The naval modernisation that began in the late 1990s seemingly continued the emphasis on adding modern submarines and FACs.

Primacy of submarines and FACs

- 2.2 China acquired a total of 12 Kilo-class diesel-electric submarines from Russia in the late 1990s and early 2000s. It had also built and commissioned 13 Type 039 diesel-electric submarines since the late 1990s. Since 2005, China has launched 17 Type 039As or Type 041, a more advanced model of diesel-electric submarines; three more are still under construction. With a displacement of 3,600 tons, Type 039A is air-independent propulsion (AIP)-powered and armed with anti-ship cruise missiles (ASCM). It is presumed to be one of the quietest diesel-electric submarine classes in service in the world, since it can remain submerged for a long period of time because of AIP. Moreover, the PLAN has added six Type 093 nuclear-powered attack submarines since 2006. To enhance China's sea-based nuclear deterrence, seven Type 094 nuclear-powered ballistic missile submarines have been completed and deployed since 2007, and one more is projected.³
- 2.3 From 2004 to 2012, the PLAN also built and commissioned 83 Type 022 FACs. Featuring a wave-piercing catamaran hull, the Type 022 reportedly travels at a maximum speed of 36 knots an hour and has an operational range of 300 nautical miles. It also incorporates stealth features that reduce radar, visual, acoustic, infrared and electronic emission signatures. Moreover, it is armed with eight 100 nautical

³ For submarines, see US Department of Defence, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2020*, p. 45.

mile-range YJ-83 ASCMs and a datalink antenna that can receive off-board sensors for over-the-horizon targeting information.⁴

- 2.4 The high speed, small profile and stealth features enable the Type 022 FACs to approach a target quickly and quietly from multiple directions. The operational range combined with the missile range and datalink antenna allows the Type 022 to cover most of the sea areas near China's shores. These features increase the craft's chance of success in engaging a superior opponent, thereby raising the cost to the opponent of operating in China's coastal waters and near seas.
- 2.5 When the PLAN emphasised the integration of submarines and FACs into its order of battle, it conspicuously neglected the procurement of major surface combatants such as aircraft carriers and modern guided-missile destroyers and frigates. As recently as by the mid-2000s, the PLAN's holdings of the more advanced variants of these ship types had consisted of four Sovremenny-class guided-missile destroyers acquired from Russia, two Type 051C destroyers, two Type 052B destroyers, two Type 052C destroyers and two Type 054 guided-missile frigates.
- 2.6 The acquisition of a small quantity of various types of new surface ships led analysts to believe that the PLAN approach to its surface fleet was largely experimental and based on the principle of "more research, more technological accumulation, but less armament" ("多研制, 多技术储备, 少装备"); a small number of hulls are built for test and trial, followed by construction of another small number that incorporate remedies to the defects identified during the test and trial. After launching of the first two 052Cs in 2003, no new 052Cs had been built for about seven years, prompting analysts to conclude that the PLAN would no longer acquire major surface combat ships for its surface fleet.

Shifting priority to the surface fleet

- 2.7 Since the late 2000s, however, construction of major surface combatants has gained momentum. The PLAN's first Type 001 aircraft carrier, a Russian Kuznetsov-class

⁴ See Li Nan, "China's Navy Develops Fast Attack Craft", *Jane's Intelligence Review*, September 2009.

ship purchased from Ukraine and refurbished with modern systems, was commissioned in September 2012. Based on similar Russian design, China's second aircraft carrier, or Type 002, began construction in 2015 and was commissioned in 2019.⁵ Both ships are conventionally powered and feature ski-jump take-off for the combat aircraft they carry, a method known as short take-off but arrested recovery (STOBAR). The full displacement of Type 001 is 67,500 tons and that of Type 002 is 70,000 tons. Type 001 carries 26 combat aircraft and Type 002 carries 32.

2.8 The construction of China's third aircraft carrier, or Type 003, began around 2017. This ship is conventionally powered by an integrated electric propulsion system, which enables the operation of electromagnetic catapults. It thus features the more efficient take-off and landing method known as catapult-assisted take-off but arrested recovery (CATOBAR), a method used on US aircraft carriers.⁶ With a full displacement of 85,000 tons, Type 003 reportedly carries 40 combat aircraft. More importantly, the catapult can launch fixed-wing airborne early warning and control (AEW&C) aircraft, thus increasing substantially the situational awareness of the PLAN fleet.⁷ The launching of aircraft carriers clearly lays the hardware basis for organising the PLAN's carrier strike groups.

2.9 Since the late 2000s, the PLAN has also begun to acquire a large number of modern guided-missile destroyers. Construction of Type 052C destroyers resumed in late 2010, resulting in four new hulls. Since 2012, 25 Type 052D destroyers, an upgraded variant of the Type 052C hull, have been launched.⁸ With a full displacement of 7,500 tons, Type 052D has a larger active phased-array radar system than the Type 052C. Rather than the 48 surface-to-air missile (SAM) cells embedded in eight revolver-type vertical launching systems (VLS) on Type 052C, Type 052D has two canister-type 32-cell missile VLSs. A total of 64 missile cells reportedly include a mixture of SAMs, ASCMs, antisubmarine warfare (ASW) missiles and land-attack

⁵ For Types 001 and 002, see US Department of Defence, *Annual Report to Congress*, p. 47.

⁶ For a discussion of the major differences between CATOBAR and STOBAR, see Li Nan and Chris Weuve, "China's Aircraft Carrier Ambitions: An Update", *US Naval War College Review*, Vol. 63, No. 1 (Winter 2010).

⁷ See "003 and More: An Update on China's Aircraft Carriers", *Diplomat*, 29 September 2020.

⁸ See "Shipyard in China Launched the 25th Type 052D and 8th Type 055 Destroyers for PLAN", *Naval News*, 30 August 2020.

cruise missiles (LACM), making it China's first dedicated multirole destroyer. Type 052D also carries close-in weapons systems (CIWS), a 24-cell short-range SAM system, a helicopter and a variety of ASW sensors and weapons systems. 052DL, an extended variant, has a metre-wave radar to detect stealth aircraft and a longer helicopter deck to accommodate the larger Z-20 attack/utility helicopter. Dubbed the Chinese "Aegis", a US naval combat system that integrates powerful computer and radar technologies to track and guide weapons to destroy enemy targets, more Type 052D hulls are expected.

2.10 Since 2014, China has begun to build Type 055, a more advanced and larger model of guided-missile destroyer. With a full displacement of 13,000 tons, it is sometimes classified as a "cruiser". Type 055 is highly integrated and streamlined and thus stealthy, with significantly reduced radar, noise, infrared and electromagnetic radiation signatures. The ship is tasked to fulfil multiple missions including air and missile defence, anti-ship warfare, ASW and land attack; its 112 VLS-based missile cells thus carry missiles that specialise in these tasks. It is also armed with a CIWS, a 24-cell short-range SAM launcher, two helicopters and improved ASW sensors and weapons systems. With its fleet air defence and ASW capabilities, Type 055 is particularly appropriate for expeditionary missions; it is likely to constitute the primary escort for China's aircraft carriers. Eight Type 055s have been launched by 2021, and more are planned.⁹

2.11 A large number of new guided-missile frigates have also been added to the PLAN's surface fleet since the late 2000s. Thirty-one Type 054A frigates, an upgraded variant of Type 054 hull, have been commissioned since 2007.¹⁰ With a full displacement of 4,053 tons, Type 054A features 32 VLS-based cells for SAMs and ASW missiles, two four-cell canister launchers for ASCMs and LACMs, and two CIWSs. Type 054A has a clean profile that enhances stealth and it is equipped with a helicopter and a variety of advanced ASW sensors and weapons systems. Its decent combat and blue-water capabilities make it the PLAN's workhorse ship. Twenty more hulls of an improved variant of Type 054A are planned.

⁹ Ibid.

¹⁰ See US Department of Defence, *Annual Report to Congress*, p. 46.

- 2.12 From 2012 to 2020, 72 Type 056 light frigates were launched and commissioned.¹¹ This 1,400-ton ship features a deep-V hull, sloped surface and reduced superstructure clutter; it is armed with two two-cell canister launchers for ASCMs, one eight-cell short-range SAM system, a helipad at the stern and a variety of advanced ASW sensors and weapons systems. The relatively simple and conventional sensors and weapons systems reduce the production cost, enabling the acquisition of a large number of Type 056s. Even though Type 056 is not a major ship class, its stealth and versatility enable it to fulfil major surface warfare and ASW missions in China's near seas.
- 2.13 Since the late 2000s, China has also begun to produce large and advanced amphibious warfare ships. Eight Type 071 amphibious transport dock ships (also known as landing platform dock or LPD) have been launched since 2007.¹² With a full displacement of 25,000 tons, Type 071 features a vehicle deck, a well deck, a landing deck and a hangar. The vehicle deck houses armoured amphibious assault vehicles; the ship can also embark 600 to 800 marines. The well deck accommodates four air-cushioned landing craft (LCAC); they can be launched by flooding the docking area and transfer vehicles or troops to the shore at high speed. The hangar houses four helicopters and the stern helicopter deck offers two landing spots to support helicopter operations. The ship is also armed with a ship gun and four CIWSs. Besides amphibious assault, Type 071 can carry out disaster relief, counterpiracy and civilian evacuation missions.
- 2.14 Since 2019, China has launched three Type 075s, a new generation, much larger class of amphibious assault ship known as landing helicopter dock (LHD); five more Type 075s are projected. With a full displacement of 40,000 tons, Type 075 features a full-length flight deck for helicopter operations and a floodable well deck to disembark LCACs and amphibious assault vehicles. It carries 30 attack helicopters and has the potential of operating vertical take-off and landing (VTOL)

¹¹ Ibid.

¹² Ibid, p. 47

fix-wing aircraft; it also comes with CIWSs and short-range SAM systems.¹³ Type-075 thus constitutes the hardware basis for organising the PLAN's amphibious expeditionary group.

- 2.15 Since the late 2000s, the PLAN has begun to build up its fleet replenishment ships.¹⁴ From 2007 to 2020, for instance, the PLAN commissioned eight 25,000-ton Type 903A underway replenishment ships. These ships joined the two 25,000-ton Type 903 replenishment ships commissioned in 2004 and one 37,000-ton Type 908 earlier imported from Ukraine. More importantly, the PLAN commissioned two 48,000-ton Type 901 fast combat support ships in 2017 and 2018.

Why the New Emphasis on the Surface Fleet?

- 3.1 Two PLA conceptual developments may help understand this new emphasis. The first is the concept of “balanced development” and the second is the notion of “information system-based system-of-systems operations”.

“Balanced development”

- 3.2 The concept of “balanced development” is based on lessons learned from modern Western naval history and Soviet naval development during the Cold War.

Learning from modern Western naval history

- 3.3 By examining the modern history of Western naval powers, PLA analysts have identified two distinct models of fleet development. The first is the primacy of the large surface fleet based on the centrality of capital ships such as battleships in the earlier days and aircraft carriers in more modern times. Contributing to and informed by the classical theory of sea power developed by Alfred Mahan, such a fleet is largely associated with traditional sea powers such as Great Britain and the United

¹³ See “China Building Navy’s Biggest Amphibious Assault Vessel, Sources Say”, *South China Morning Post*, 29 March 2019 and “China Launches Third Type 075 LHD for PLAN”, *Janes*, 29 January 2021.

¹⁴ See US Department of Defence, *Annual Report to Congress*, p. 47.

States. According to PLA analysis, the primary mission of such a fleet is to amass and manoeuvre in order to seek and fight the opponent frontally and directly in a “decisive fleet engagement” (“舰队决战”). Victory in this engagement accomplishes the ultimate objective of a sea power: the absolute command of the sea. Missions such as sea-lane operations, maritime commerce raids and amphibious operations are only secondary for this fleet; these missions can be accomplished following the seizure of the command of the sea. By the same logic, smaller-sized vessels such as submarines have only secondary importance for this fleet; they generally play a supportive role to battleship and aircraft carrier operations.¹⁵

3.4 The second model, according to PLA analysis, is the small and asymmetrical fleet composed mainly of submarines and FACs. Such a fleet is largely associated with traditional continental powers that developed maritime aspirations and sought to challenge the status quo sea powers; France and Germany are major examples. Due to its technological inferiority, an asymmetrical fleet would avoid a direct and frontal engagement with the powerful navy of a dominant sea power; it would eschew the “decisive fleet engagement” that would surely doom it. Such a fleet may acquire some capital ships which are not intended for “decisive fleet engagement” but for protecting and coordinating with submarine and other types of asymmetrical operations.¹⁶

3.5 French naval strategists of the 19th century, according to PLA analysis, argued for a small and asymmetrical fleet that would leverage new technologies such as automated torpedoes, torpedo boats and submarines. Rather than a frontal fleet engagement that would favour the comparative advantages of a powerful opponent such as Great Britain, this fleet would target the critical vulnerability of this opponent as a maritime trading and colonial power: its merchant fleet. By raiding

¹⁵ See Shi Xiaojin, “Historical Position of Small Ships and Craft and a Balanced Navy with Chinese Characteristics” (“Xiaoxing jianting de lishi dingwei yu zhongguoshi junheng haijun”), *Military History* (Junshi lishi), No. 1 (2011), p. 33 and “Another Path to Understanding Sea Power” (“Lijie haiquan de lingwai yitiao lujing”), *Peace and Development* (Heping yu fazhan), No. 1 (2011), p. 56. *Military History* is a bimonthly journal published by China’s Academy of Military Science (AMS). Shi is an analyst in the War Theory and Strategy Studies Department of AMS, author of *On Sea Power and Sino-US Relations* (Lun haiquan yu zhongmei guanxi) (AMS Press, 2012) and deputy editor-in-chief of *Strategic Studies* (Zhanlue yanjiu), an internal publication of AMS. For a review of Shi’s book, see Li Nan, “On Sea Power and Sino-US Relations by Shi Xiaojin”, *US Naval War College Review*, Vol. 67, No. 3 (Summer 2014).

¹⁶ See Shi, “Historical Position of Small Ships and Craft”, p. 33.

the opponent's maritime commerce, the French hoped to create chaos in Great Britain and eventually force it to negotiate on terms favourable to France. This French Jeune École (Young School) of thought influenced not only French naval development but also naval thinking of other continental powers such as Germany; Germany prioritised submarines among its naval acquisitions during the later phase of World War I.¹⁷

- 3.6 While the Jeune École emphasised the offensive use of the asymmetrical fleet, according to PLA analysis, the “small war strategy” school of the Soviet Navy in the 1930s stressed the defensive value of a small and asymmetrical fleet. The central premise of this school of thought was that submarines and shore-based torpedo bombers made close blockade of a continental power like the Soviet Union difficult for traditional sea powers. Since command of the sea was not the objective of the Soviet Navy, it would employ its submarine-based fleet to counter naval blockades and amphibious landing operations of the opponent, forcing the latter to retreat.¹⁸
- 3.7 Due to advancement of ship-protection technologies against torpedoes and improvement in ASW technologies after the failure of German submarine warfare in World War I, PLA analysts believe that the role of surface ships in protecting and coordinating with submarines gained importance. It thus became increasingly important to develop a balanced fleet that combines both surface ship and submarine capabilities to raid the opponent's maritime commerce. The inter-war German Navy, for instance, built high-speed “pocket battleships” or “heavy cruisers” for conducting sea-lane operations. They were designed to be fast enough to outrun the opponent's more powerful and heavier battleships in order to avoid a frontal fleet engagement; their stronger armour and firepower would enable them to defeat the opponent's cruisers and destroyers escorting convoys of merchant ships against German submarines.

¹⁷ Ibid, pp. 35-36.

¹⁸ Ibid. For Soviet “small war theory”, see also Zhang Xiaolin, Wang Pan and Zhang Yinan, “Revelations from the Soviet Construction of a Far-Oceans Navy” (“Sulian yuanyang haijun jianshe de qishi”), *Military History Studies* (Junshi lishi yanjiu), No. 4 (2011), p. 98. *Military History Studies* is a quarterly journal published by the PLA Political College in Nanjing. Zhang Xiaolin is an associate professor at the Naval Command College in Nanjing and Wang is a doctoral student there.

- 3.8 Despite some successes, this strategy did not achieve the desired result in early World War II owing to a lack of coordination between surface ships and submarines. The German Navy then adopted a “wolf pack” strategy of employing its submarines en masse in attacking the opponent’s merchant shipping in convoy. The German strategy failed partly because of an insufficiency in submarines. A more important reason, according to PLA analysis, was the German inability to coordinate surface combatants and submarines effectively, or to employ surface ships to protect submarines and use submarines to support surface ships. The German experience had apparently informed Soviet naval development, as Soviet Navy Commander Sergey Gorshkov allegedly believed that the Germans’ mistake was their “unbalanced fleet structure” (“失衡的舰队结构”).¹⁹

Learning from Soviet naval development

- 3.9 PLA analysts believe that Soviet naval development in the late 1950s and early 1960s was highly “unbalanced” or “deformed” (“畸形”), narrowly focusing on acquiring submarines, particularly strategic nuclear submarines. This bias largely stemmed from Soviet Leader Nikita Khrushchev’s view that in the nuclear age, “cruisers are good only for state visits”, “aircraft carriers are moving targets for nuclear rockets” and the only effective naval weapons were nuclear submarines armed with ballistic missiles. The lack of major surface combatants and ship-borne naval aviation, however, seriously hampered the comprehensive operational capabilities (综合作战能力) of the Soviet Navy. This weakness was made starkly evident during the 1962 Cuban missile crisis when the Soviet Navy had no major surface combatants to deploy against the US naval blockade; the deployed Soviet submarines during the crisis were mostly locked on (锁定) by the US Navy’s ASW force. As a result, the US Navy could intercept Soviet cargo ships en route to Cuba with relative and embarrassing ease.²⁰

¹⁹ See Shi, “Historical Position of Small Ships and Craft”, pp. 36-37.

²⁰ See Zhang, Wang and Zhang, “Revelations from the Soviet Construction of a Far-Oceans Navy”, pp. 97-98 and Shi, “Historical Position of Small Ships and Craft”, pp. 37-38.

- 3.10 After Leonid Brezhnev succeeded Khrushchev as the Soviet leader in 1964, he highlighted the role of conventional war and military intervention in Soviet foreign policy; this emphasis elevated somewhat the role and status of the Soviet Navy. Guided by the notion of balanced development endorsed by Admiral Gorshkov and sustained by Soviet economic and technological development, the Soviet Navy was able to expand its narrow focus on strategic nuclear submarines to developing a substantial surface fleet and the associated ship-borne, fixed-wing aviation. This expansion helped to achieve a balanced fleet of both submarine and surface forces capable of challenging Western naval powers. By 1981, there were 342 Soviet submarines, including strategic nuclear submarines, nuclear attack submarines and conventional attack submarines. The Soviet surface fleet also boasted five heavy air cruisers or Soviet-style aircraft carriers, 50 guided-missile cruisers and more numerous destroyers and frigates. According to PLA analysis, however, the more balanced fleet of the Soviet Navy continued to favour submarines. Since the Soviet surface fleet worked primarily to protect submarines, particularly strategic nuclear submarines, its offensive capabilities such as fleet engagement and power projection were constrained and limited.²¹

Lessons learned

- 3.11 PLA analysts acknowledge that like the navies of other continental powers, the PLAN began as a small and asymmetrical fleet comprising primarily shore-based combat aircraft, submarines and FACs (飞, 潜, 快). While the PLAN acquired a few major surface combatants in its early years, they were not even intended to coordinate with submarines on matters of command and control, mutual protection and offshore supplies. The small and asymmetrical fleet was to wage “maritime sabotage and raid guerrilla warfare” (“海上破袭游击战”). Such warfare featured quick concentration of the dispersed and well-concealed small-force groups (小兵力群) to conduct surprise raid against critical vulnerabilities of the enemy fleet such as its supply lines, followed by quick dispersion. This was to weaken the opponent through protracted, small-scale operations rather than a frontal and decisive fleet

²¹ See Zhang, Wang and Zhang, “Revelations from the Soviet Construction of a Far-Oceans Navy”, p. 98 and Shi, “Historical Position of Small Ships and Craft”, pp. 37-38.

engagement. This strategy particularly aimed to support land operations in an overall land war.²²

- 3.12 Since the official endorsement of the new Chinese naval strategy of “near-seas active defence” and “far-seas protection” from the late 1980s on, however, the maritime operational space of the PLAN has greatly expanded. The PLAN, for instance, has shifted away from merely manoeuvring in coastal waters to support land operations; it has developed substantial capabilities in conducting sub-surface, surface, air and missile and amphibious war-fares in the seas near and further away from China.
- 3.13 The current PLAN acquisition of major surface combatants, including aircraft carriers, shows that the PLAN is “following the historical path that the German and Soviet Navies had travelled” (“沿着历史上德国和苏联海军曾经走过的道路”), particularly in increasing the proportion of surface combatants in its fleet and adding ship-borne, large-deck aviation. Consequently, the “PLAN is standing at a crossroads. It needs a fundamental re-evaluation of both its strategic thought and its fleet structure” and determine whether it wants to become a US-style, aircraft carrier-centred navy, or a Soviet-style, submarine-based navy in which aircraft carriers are employed more to support submarine operations than for “decisive fleet engagement” and power projection.²³
- 3.14 To guide the PLAN’s future development, PLA analysts have proposed specific lessons learned, particularly from earlier continental powers that had developed maritime aspirations. First is the importance of “balanced development” of naval capabilities for these powers, including China, to fulfil their maritime aspirations. Different types of naval combatants deployed to different spatial domains including subsurface, surface and air, for instance, can generate synergy that reduces the vulnerabilities of the fleet and supports one another in multiplying force

²² See Shi, “Historical Position of Small Ships and Craft”, pp. 38-39 and Zhou Dehua, Hu Peng and Yu Yonghong, “Historical Retrospect on the Thought of Maritime Sabotage and Raid Guerrilla Warfare of the People’s Navy” (“Renmin haijun haishang poxi youjizhan sixiang de lishi huigu”), *Military History Studies*, No. 1 (2011). Zhou is an associate professor at the Naval Command College in Nanjing and Hu is a staff officer in the Command Department of PLA Unit 92674.

²³ See Shi, “Historical Position of Small Ships and Craft”, pp. 39-40.

effectiveness against the opponent. These “balanced capabilities” are also indispensable to handling “multiple types of security threats” and fulfilling “diversified military missions”, a task that China’s top civilian leadership has assigned to the PLA.²⁴

- 3.15 Moreover, PLA analysts believe that top-level design (顶层设计), long-term planning (长远规划) and institutionalised implementation are critical in optimising scarce resources to realise the “balanced development” of the PLAN. Top-level design and long-term planning are critical because naval development is capital and technology-intensive; it requires long-term, consistent and heavy investment through long shipbuilding and personnel-training cycles. Institutionalised implementation can help avoid major disruptions resulting from changes in civilian leadership; the Soviet example revealed the “high cost” the ascendance of erratic leaders such as Khrushchev and Mikhail Gorbachev could incur to naval development, including “unbalanced development” and naval decline.²⁵
- 3.16 Finally, according to PLA analysis, Gorshkov’s notion of balanced development indeed broadened the Soviet Navy from its narrow focus on nuclear submarines to include major surface combatants. This expansion also led to the expanded role of the Soviet Navy in Soviet foreign policy, as reflected in more ocean manoeuvres by the Soviet Navy, more foreign port visits by Soviet naval ships, more foreign sales of Soviet naval armament, and regular naval transport operations to support client states such as Cuba, Egypt, Syria, Libya and Vietnam. Soviet naval expansion also contributed significantly to the growth of the Soviet shipbuilding industry, fishing fleet and other maritime capabilities.
- 3.17 PLA analysts, however, argue that the primary drivers of the Soviet naval expansion were power politics and political ideology, and not maritime commerce and trade. As a result, Soviet naval expansion went “beyond the defensive needs” and embarked on a path to “seek hegemony” beyond the country’s means; this over-

²⁴ See Zhang, Wang and Zhang, “Revelations from the Soviet Construction of a Far-Oceans Navy”, p. 100.

²⁵ Ibid, pp. 99 and 100.

extension had contributed to the weakening of the Soviet economy that ultimately caused the Soviet regime's decline and collapse.

- 3.18 PLA analysts believe that in contrast, Chinese development has primarily been driven by the concern for security of China's maritime commerce and trade due to the integration of the Chinese economy with the global economy. While US and Chinese naval development bears similarity in this regard, PLA analysts insist that unlike that of the United States and the Soviet Union, China's naval development is "not intended for competition and contest against certain opposing forces" ("不是与某一对立力量的竞争和较量") but for cultivating a maritime environment and order that can benefit China's development.²⁶

"Information System-Based System-of-Systems Operations"

- 3.19 The second PLA conceptual development that helps understand the PLAN's new emphasis on the surface fleet is the notion of "information system-based system-of-systems operations" ("ISSO"), which is clearly informed by the concept of network-centric operations (NCO) of the US military.
- 3.20 Following the Vietnam War, the US military adopted a "second offset strategy" that stresses advanced intelligence, surveillance and reconnaissance (ISR) platforms, improved precision-guided weapons, stealth technology and space-based communications and navigation in gaining battlefield advantages. Such a strategy resulted in the impressive US victory in the 1990-91 Gulf War.
- 3.21 After the war, however, the US military integrated the new concept of NCO in its operational planning. NCO highlights the integrative role of computer and networked communications technologies in achieving a shared awareness of the battlespace for US forces; a new architecture known as "command, control, communications, computer, intelligence, surveillance and reconnaissance" or C4ISR thus has emerged. The shared awareness enhances synergy for command and

²⁶ Ibid, and Shi Xiaoqin cited in "China Should Learn to Employ Its Naval Force Rationally to Sustain Its Ideal of a Global Order" ("Zhongguo ying xuehui heli yunyong haijun Liliang zhicheng qi quanqiu zhixu"), *Oriental Morning Post* (Dongfang zhaobao) (Shanghai), 1 August 2011.

control, resulting in warfighting advantage stemming from superior decision-making and coordination of complex military operations over long distances. NCO thus was instrumental for the defeat of Saddam Hussein in the 2003 Iraq War.

- 3.22 Hu Jintao endorsed the concept of ISSO at an “important army conference” in December 2005,²⁷ clearly based on the lessons learned from the notion of NCO in the 2003 Iraq War. This concept was adopted also because of the increasing PLA concern about the unintended but serious consequences for China’s military modernisation stemming from the policy of “informatisation”, a policy promoted by Jiang Zemin in the 1990s based on the lessons learned from the 1990-1991 Gulf War.
- 3.23 One such consequence, according to PLA analysis, was inter-service separateness. Since the policy of “informatisation” was individual service-based, as each service developed its own information technology (IT)-based system and became more informatised, “isolated information islands” (“信息孤岛”) or stove-pipes proliferated for lack of lateral networking among different services. Similarly, under the pretext of enhancing joint operations, each service sought to become an “all-round service” (“全能军种”); the army attempted to develop its air and ship capabilities, while the navy and air force tried to expand their land warfare capabilities. This caused not only redundancy and waste of resources but also erosion of each service’s comparative advantage. Finally, individual service-centred “informatisation” caused a lack of shared technical and information standards, thus contributing to inter-service disconnect which may cause a loss of initiative in times of war.²⁸

²⁷ See Major General Ren Liansheng, “A Preliminary Understanding of Information System-based System of Systems Operations Capabilities” (“Dui jiyu xinxi xitong de tixi zuozhan nengli de chubu renshi”), *China Military Science* (Zhongguo junshi kexue), No. 4 (2010), p. 26. Ren is director of Scientific Research Guidance Department of AMS.

²⁸ See Senior Colonel Lin Dong, “Development Concepts for Information System-Based Military Force System of Systems” (“Jiyu xinxi xitong de junshi Liliang tixi de fazhan linian”), *China Military Science*, No. 1 (2011), pp. 19-20 and Colonel Zhang Hong and Captain Yu Zhao, “Forging New-type Operational Force System of Systems based on Information System” (“Jiyu xinxi xitong duanzao xinxing zuozhan liliang tixi”), *China Military Science*, No. 5 (2010), p. 12. Lin is an associate professor at Strategy Teaching and Research Department of National Defence University in Beijing. Zhang is an associate professor and director of Combined Arms and Tactics Teaching and Research Office of the Army Command College in Shijiazhuang, and Yu is a graduate student there.

- 3.24 PLA analysts argue that the concept of ISSO can help reduce inter-service separateness and enhance integration. Rather than individual services, for instance, ISSO emphasises the development of an integrated PLA operations “system of systems”, or shifting military modernisation from “forging all-round services to constructing an all-round system of systems” (“从打造全能型军种转向建设全能型体系”). ISSO would “stress the role of services in force construction and management”; services, for instance, “constitute the builders of PLA system of systems” and “supply functional forces and weapons systems to PLA operational commands according to operational needs”. ISSO, however, would “weaken the role of services in operational command and control of their forces and capabilities”. “Transferring communications bandwidth and satellites from individual services to the PLA system of systems, for instance, can give full play to the system-level utility of these capabilities”.²⁹
- 3.25 More importantly, ISSO highlights the construction of an all-PLA, unified IT-based system (全军统一的信息体系), or an “integrative network that can laterally integrate system-of-systems operations capabilities” (“以集成网络为中心, 建设横向一体的体系作战能力”). This “network-centric” approach leverages computer and networked communications technologies to connect and fuse all PLA operational forces and weapons systems deployed at different distances and in different spatial domains to achieve interconnectedness (互联), intercommunications (互通), interoperability (互操作) and mutual complementarity (互补), particularly in terms of reconnaissance and early warning, command and control, communications, weapons control and combat support.³⁰
- 3.26 PLA analysts believe that ISSO can optimise military operations in major ways. First, this information system-based system of systems approach generates synergy that helps enhance effectiveness and reduce vulnerability. “Employing the PLA

²⁹ See Lin, “Development Concepts”, pp. 20-21, 22.

³⁰ See *ibid*, Ren, “A Preliminary Understanding,” pp. 27-29 and Senior Captain Jiang Lei, “Reflections on Enhancing Information System-Based Maritime System-of-Systems Operations Capabilities” (“Tigao jiyu xinxi xitong de haishang tixi zuozhan nengli de sikao”), *China Military Science*, No. 5 (2010), pp. 27-28. Jiang is professor and director of Navy Development and Construction Studies Office of the Naval Command College in Nanjing.

information system to connect and fuse weapons systems can accomplish operational effectiveness that far exceeds what a single weapons system such as an aircraft carrier can accomplish. At the same time, this integration can reduce the risks to an aircraft carrier”.³¹

3.27 Moreover, information system-based integration leads to real-time and common battlespace transparency for PLA system of systems, thus enhancing effectiveness of command and control, making it possible for dispersed (分散) and pointed (点状化) force deployment but concentrated firepower. This deployment can expand from traditional spatial domains such as land, sea and air to new domains such as the space, cyberspace and electromagnetic spectrum, exhibiting a trend towards “comprehensive spatial domains” (“全域性”). These deployment patterns of different distances, altitudes and visibilities should enhance not only force survivability but also battlespace versatility and flexibility.³²

3.28 Finally, PLA analysts believe that information system-based integration enables real-time and synchronised target acquisition, decision-making, mobility, strikes and control. This integration shortens decision cycles and increases operational tempo, hence enabling synchronised joint action (同步联动) or highly coordinated parallel operations and resulting in “all-dimensional superiority” (全维优势) over the opponent by “maximising the comprehensive effects of system of systems operations”.³³

3.29 After becoming the top leader in 2012, Xi Jinping has also endorsed the ISSO concept to guide China’s military modernisation, calling on the PLA to “strengthen the information system-based system-of-systems operations capabilities” (“增强基

³¹ See Lin, “Development Concepts”, p. 22.

³² See Ping Zhiwei, Major Zeng Xiaoxiao and Major Zhang Xuehui, “A Study of Mechanisms for Information System-based Systems of Systems Operations” (“Jiyu xinxi xitong de tixi zuozhan jili yanjiu”), *China Military Science*, No. 4 (2010), p. 41. Ping is professor and deputy director of Campaign and Tactics Department of the Army Command College in Shijiazhuang, and Zeng and Zhang are lecturers in the Combined Arms and Tactics Teaching and Research Office of that department.

³³ Lin, “Development Concepts”, p. 22.

于信息系统的体系作战能力”).³⁴ More importantly, Xi operationalised the ISSO concept in the post-2015 restructuring of the PLA.

- 3.30 Xi, for instance, divested PLA services of the power for operational command and control of their forces, limiting their power to peacetime force construction and administration. PLA services, however, supply functional forces and weapons systems to the five newly established PLA regional theatres. Integrated by a PLA information system, each theatre constitutes a PLA operations system of systems. Unlike the pre-reform, army-dominated military regions where non-army service forces reported primarily to their service headquarters in Beijing, the army, naval, air and conventional missile forces deployed to any of these theatres are mandated to report to their theatre command on all operational matters. These theatre commands thus are vested with the power for operational command and control of these service forces.³⁵

Constructing PLAN operations system of systems

- 3.31 As the builder of the PLA operations system of systems, the PLAN also supplies its functional forces and weapons systems to PLA regional theatres or its systems of systems. However, the PLA system of systems may not be able to protect PLAN operations in distant waters. The PLAN thus needs to develop its own system of systems for its operations in the far seas and overseas, particularly in defending the fleet against air, missile and submarine threats.
- 3.32 PLA analysts believe that an aircraft carrier strike group is an ideal “maritime operations system of systems” (“海上作战体系”). Composed of an aircraft carrier and escorts such as guided-missile destroyers and frigates, nuclear attack submarines and oceangoing replenishment ships, this system of systems is capable of air operations, surface warfare, submarine and anti-submarine warfare, air and missile defence and electronic and cyber warfare; it thus possesses “five integrated

³⁴ See “Letting Informatization Become Combat Effectiveness Multiplier” (“Rang xinxihua chengwei zhandouli de beizengqi”), *Liberation Army Daily*, 22 April 2016.

³⁵ See Li Nan, *Civil-Military Relations in Post-Deng China: From Symbiosis to Quasi-Institutionalization* (Palgrave Macmillan, 2020), pp. 124-125.

operations capabilities” (“五为一体作战能力”). If well integrated by the PLA information system, it represents a “fully functional and optimally combined” (“功能完备, 优化组合”) system of systems, in which various weapons platforms not only work together to generate operational synergy against the opponent but also offer mutual protection by reducing the vulnerabilities of the fleet.³⁶

- 3.33 An isolated surface ship or submarine, for instance, is vulnerable to air, missile and submarine attacks. However, if it is integrated into an aircraft carrier-based system of systems, this vulnerability is reduced. An aircraft carrier provides air capabilities that can compete for air superiority and provide air cover for surface ships. These air capabilities can also be deployed against the opponent’s air ASW capabilities, thus protecting one’s own submarines. Moreover, a carrier-based air ASW capabilities can be deployed against the opponent’s submarines, thus protecting one’s own surface ships and submarines. Together, the aircraft carrier and its surface and subsurface escorts can generate synergy against the opponent and protect the carrier itself.
- 3.34 Finally, the utility of a system of systems is reflected in the system’s deploy-ability not only to different distances and spatial domains but also at different times and for different purposes. All naval weapons systems, including both surface ships and submarines, are designed to fight and win war, with some more appropriate than others for peacetime missions. Since a navy can play an important role in serving a country’s foreign policy in peacetime, a major surface fleet may be more appropriate to play this role.
- 3.35 Peacetime missions that may require substantial naval surface capabilities, for instance, include provision of sea-launched humanitarian assistance and disaster relief to a foreign country, evacuation of citizens from a foreign country by sea in times of crisis, and naval deployment to secure international sea-lanes against pirates and terrorists; submarines and FACs are clearly not appropriate for performing these missions. Peacetime missions requiring a visible naval presence may also include port visits, naval patrols and naval manoeuvres for the purpose of

³⁶ See “China’s Aircraft Carrier, from Today to the Future” (“Zhongguo hangmu, cong jintian shixiang weilai”), *Liberation Army Daily*, 26 September 2012.

reassuring allies and deterring adversaries from engaging in risky behaviour. Due to their less visible features and lower profile, submarines and FACs are probably less appropriate for performing these missions.

Challenges

- 4.1 The new emphasis on the surface fleet, however, may also lead to unintended but critical challenges. First, as the PLAN operates further away from China's coastal waters and near seas, logistical support is increasingly indispensable to sustain its operations. The PLA, however, has only one logistical support base overseas, in the East African country of Djibouti by the Gulf of Aden. The lack of such bases may present a critical logistical challenge to PLAN's far-seas and overseas operations.
- 4.2 Moreover, the information system-based system-of-systems operations of the PLAN are likely to be heavily dependent on the survivability and security of its information system, which is likely to be space, air, cyber, seabed, island, shore and weapons platform-based. How to enhance the security of such a system is likely to be a major challenge to the PLAN.
- 4.3 Finally, a critical driver for the naval build-up of the two superpowers during the Cold War was the mutual perception of threat. Even though PLA analysts insist that China's naval development is not intended for power politics but for cultivating a maritime environment that can benefit China's development, it is likely to be perceived by the United States and some other countries as China's attempt to compete for power and influence that undermine their interests. Such a perception may drive a US-led containment policy that can incur high security cost to China, a cost that China's naval development originally aims to reduce. Therefore, how to avoid a "security dilemma"- driven arms race that may cause a Soviet-style over-extension and decline presents a critical challenge to China's leadership.